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NURSE PRACTICE IN PEDIATRICAL DENTISTRY

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“Українська медична стоматологічна академія”

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МЕДСЕСРИНСЬКА ПРАКТИКА В ДИТЯЧІЙ СТОМАТОЛОГІЇ (англійською мовою)

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Навчальний посібник містить відомості з організації роботи та здійснення заходів санітарно-протиепідемічного режиму в дитячій стоматологічній поліклініці. В посібнику у повному об'ємі на сучасному рівні викладені питання обробки стоматологічних інструментів, обладнання, приміщень, захисту медичного персоналу і пацієнтів на стоматологічному прийомі. Розглянуті особливості роботи медичної сестри у рентгенологічному та фізіотерапевтичному кабінеті. Наведені тести з розгорнутими відповідями.

Рекомендований студентам, асистентам стоматолога, викладачам стоматологічних факультетів медичних вузів.

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The manual contains information about the organization of work and activities of sanitary-epidemic regime in pediatric dental clinic. Guidance on the up-to-date processing of dental instruments, equipment, facilities, protection of medical staff and patients at the during examination dental surgery has been provided in the book. Specificity of the nurse responsibilities in the X-ray and physiotherapy rooms has been analized. Tests supplied by detailed answers have been given in the handbook. The book is intended to be used both in the training of dental students, by dentist assistants, university teachers of dental faculties.

CONTENTS

INTRODUCTION

Practical training is an important element in the preparation of a dentist, sequential continuation of the educational process, an organic combination of theory and practice, which is essential for the formation of a highly qualified specialist.Main objective of practical training is consolidation of the knowledge gained during training, learning and improving skills in future work.

The goal of practical training is:

- Mastering with modern methods of organization and maintenance of disinfection, sterilization, sanitation and anti-epidemic regiment in a dental clinic;
- Knowledge of the students with the organization of children's dental clinic;
- Mastering the rules of execution of medical documents;
- Consolidation of knowledge in ethics, aesthetics, medical ethics;
- Development of professional skills and abilities to make independent decisions during the reception of patients;
- Formation of needs systematically update knowledge and to apply them in practice;
- Practical assistance to the health care authorities in community health.

Nursing practice in a dental department is on the second course (IV semester), eight lessons are assigned to the work in a children therapeutic dental department. These classes are held in the facilities of a children dental clinic. A precise list of skills and abilities that students should learn during practice; recommendations on the types and forms of testing the level of skills and abilities; and report forms for students taking practice are presented in a student's practical training journal . Practice facilities should have working place for every student. Students should be acquainted with up-to-date technology of hospitals, which are clinical facilities for practical training .

Practice management is carried out by teachers - associate professors, assistant lecturers, assistants of corresponding chairs.

Responsibilities of the teacher are:

- Organize practical training of students, monitor its compliance with a curriculum;
- Directly supervise the practice of students in workplaces;
- Instruct the students on labour safety rules and, control its compliance with curriculum;
- Check practical training journals of the students;
- Assists the students in the preparation of sanitary newsletters, lectures, essays, etc.;
- Report on the progress and result of the practice to the Head of practice in a higher educational establishment;
- Provide necessary conditions at each workplace in accordance with a syllabus of practice;
- Control maintenance by the students of internal regulations, accident prevention, fulfillment of the practice syllabus;
- Immediately report to the head of the practical training about any breach of internal regulations, safety rules, the failure of the program by students;
-Regularly make a list of students presented during practical training.

Students responsibilities during practical training are:

- Prior to practical training student should have medical and have records about his

health status;
- Complete the tasks assigned by practical training syllabus;
- Be familiar with a structure of the medical institution, its daily routine;
- Study and strictly observe the rules of labor protection, accident prevention and industrial hygiene;
- Observe the rules of medical ethics and basic regulations of deontology in relation to medical staff and patients; to be tidy;
- Keep a journal of practical training and other records assigned by the program of training;
- Participate in community health.

The student should know:
- The organization of children dental rooms of different profiles;
- Guidance of disinfection and sterilization of dental instruments and equipment;
- CPR and emergency;
- Dental instruments;
- Dental formula, and its record;
- X-rays of teeth and jaws;
- Physiotherapy.

The student should be able to:
- Prepare the dental materials for sterilization;
- Prepare a sanitizing dental equipment and dental instruments for sterilization;
- Sterilize dental materials and instruments;
- Prepare a workplace of a dentist;
- Prepare the patient for reception;
- Write down a dental formula;
- Assist a dentist in filling out card of epidemiological survey and medical records.

Student's self-study. Unassisted work during practical training is done as a summary by one or a group of students under supervision of a teacher.

Suggested issues:

1. Provision of sanitary and epidemic regime in a dental clinic premises;
2. Prevention of hepatitis, HIV infections and other nosocomial infections, transmitted parenterally in a dental clinic;
3. Oganization and provision of disinfection and sterilization in a dental clinic;
4. Emergency care of the patient in a dental chair;
5. X-ray of teeth and jaws;
6. Physiotherapy in dentistry 7. Principles of medical ethics and deontology.

Sizing up of practical training is carried out after presentation by the student of the completed student's journal, reflecting the work of the student. Criteria of the quality of practical training done by a student is evaluation practical skills, abilities and knowledge of the practice program. Grade for practical training is entered in students credit record and student's individual plan by responsible for practical training university teacher. Students who failed the program of practical training without good reason and did not pass the module test and did not pass the exam failed before the next semester are expelled from university.

Chapter I.
ORGANISATION OF THE CHILDREN'S DENTAL CLINIC

Children's medical institutions provide medical service to children from their birth to the finishing of a secondary school. There are different types of the medical institutions which render the pediatric dental service:

1. Children's dental polyclinic in Ukraine which is an independent establishment.
2. Children's departments of the dental polyclinics and the dental departments of the children's territorial polyclinics in the cities.
3. Children's dental surgeries at the municipal and the regional children's hospitals.
4. At countryside, where children's dental surgery is not available, a dentist examines children without waiting, he provides 2 days a week for sanitization of school and preschool children.
5. Private dental surgeries which have a license for the children's dental service.

In Ukraine all children at schools and kindergartens are provided by free dental service.

The basic dental services:

1. Room for the patients' examinations.
2. Department for prophylaxes of dental diseases with a mobile surgery for sanitization of an oral cavity at preschool institutions and schools.
3. Department of therapeutic dentistry.
4. Department of surgical dentistry.
5. Orthodontic department.

Auxiliary services:

1. Physiotherapeutic department.
2. Radiological department.
3. Sterilising room.
4. Logopaedic room.
5. Accounting department.
6. Reception.
7. Dental laboratory.

Dentists are to give both therapeutic and surgical service to the patients at the dental surgeries of the ambulance stations, some enterprises, hospitals or educational establishments, especially at a countryside. In case of absence of an independent childrens dental polyclinic the childrens dental department can be organised as a part of an adult dental polyclinic. Adults are not examined and treated at the childrens dental surgery.

Dental department (a polyclinic, a surgery) has to have a centralised hot and cold water supply with a sewerage. Closable containers for gathering of a dry rubbish and waste materials (after desinfection) should be placed near the polyclinic building.

Requirements to a dental cabinet (room, surgery)

The square of a dental surgery with one dental unit should be not less than 14м^2. 7м^2 is added for installation of each next dental unit, 10m^2 is added for universal dental

unit.

Floor should be tiled or covered with linoleum. Walls and a floor in a dental facility is necessary to paint in a light colour. It is desirable to use neutral light grey tint, which doesn't interfere in color's evaluation of mucous membrane, skin, blood, teeth and filling materials. Doors and windows in the room should be painted with white enamels or oil paint. The dental cabinet should have an exhaust ventilation and easily opened windows.

The dental cabinet should have natural illumination. The light ratio (relation of a glazed surface of the windows to the floor area) should be 1:4 — 1:5. The room should have a general artificial illumination provided by luminescent lamps of cold natural colour. Level of illumination of the room with luminescent lamps should be 500 lx. Dental surgeries, except the general one, should have local illumination such as a dental lamp on dental unit.

Dental cabinet working with amalgam has to meet the following sanitary-and-hygienic requirements: floor is covered with linoleum 5 cm turning up toward the wall surface , walls should of 2м height and ceiling are painted with silicate paints (oil-paint is possible); draft hood is to be installed for amalgam.

The room of an oral surgery with one dental unit should be not less 23м^2. 7м^2 is added for an installation of each next unit. Walls of an oral surgery room, a sterilization room and a preoperational room are glaze tiled with to height of 1,8m; walls of the operational room are fully tiled. Walls above the tile, a ceiling at the surgical surgery, at the operational and sterilization rooms are painted with white oil paint.

Surgery design

Fig 1. Sterilisation zone of a dental surgery

The layout of the surgery, which should be simple and uncluttered, is an important aspect of infection control. There should be two distinct areas: one for the operator and one for the dental nurse, each with a washbasin, which should have elbow- or foot-operated taps, and liquid soap dispensers (fig.1). The operator's area would have access to the turbines, three-in-one syringe, slow handpiece, bracket table and operating

light. The dental nurse's area would contain the suction lines, perhaps the three-in-one syringe, curing light, all the cabinetry containing dental materials and a designated area for clinical waste disposal and the decontamination of instruments.

Clean and dirty areas within the surgery should be clearly defined. Where possible, instruments should be decontaminated away from the surgery in a room containing the autoclave(s), ultrasonic bath(s), instrument washer(s) and sinks and a separate hand wash basin. If instruments are cleaned manually before sterilisation, the sink must be of sufficient depth to enable instruments to be fully covered with water during cleaning to minimize the risk of splashing.

Ventilation

• the surgery should be well ventilated; usually an open window will suffice but, in some
cases, it might be appropriate to install an extraction fan;
• ventilation systems should exhaust to the outside of the building without risk to the public or re-circulation into any public building;
• the recommended fresh air supply rate of ventilation systems should not fall below 5-8 litres per second per occupant and should not create uncomfortable draughts;
• mechanical ventilation systems must be regularly cleaned, tested and maintained according to the manufacturer's recommendations to ensure they are free from anything that may contaminate the air;
• recycling air conditioning systems are not recommended.

Basic equipment of a dental surgery

1. Dental chair.
2. Dental stool.
3. Dental unit with handpieces, lamp, spittoon, scaler, air/water syringe..
4. Doctor’s instrumental table close the stool.
5. Writing table (small size) for filling in of case histories and other necessary documentation.
6. Desk for auxiliary medical personnel (a nurse, etc.).
7. Chairs.
8. Sink hands washing .
9. Sink with a bench table for washing of used instruments.
11.Table or small table for amalgamator .
11.A sterile table or cabinet with a set up of sterile instruments, material, syringes, etc.
12. Cabinet for storage of medicines, instruments, dressing means, filling materials, etc.
13. Diagnostic and medical equipment.

Extract from „Regulations for a nurse of a dental department”

Dental surgery is a work place of a dental nurse. Nurse should completely provide a dentist work place for reception of patients, to fulfil appointments of the doctor, instructions of the senior nurse and head of department, and control the performance of sanitary-and-hygienic regimen of an surgery by auxiliary medical personal.

Functional duties of a nurse in the dental surgery

Nurse responsibilities:

1. General provisions.

- to check up work of auxiliary medical personal at the beginning of patients reception;
- to prepare a dental equipment for work; to switch it on if necessary
- to check up serviceability of equipment; to send for a technical worker if the equipment does not work;
- to prepare a workplace of a dentist: examination set and medicines for a reception;
- to process instruments, to give to doctors the sterile instruments, to prepare dressing, to mix up filling materials during reception of patients;
- to air ,to carry out UV -desinfection of the room, and the general cleaning according to the schedule; to fulfil azopiramic and phenolphthalein tests;
- to fill in the necessary documentation in an dental office;
- to watch over a presence of the medical instruments in clinical room and to transfer it to the next nurse on duty;
- to provide an emergency care to patient in case of emergency, nurse must know her/his actions at the suspicion of especially dangerous infection in a patient;
- to watch over a shelf life of medicines in a clinical room;
- to control availability of instruments at the dental surgery
- to provide a surgery with necessary medical materials (received from head nurse);
- to control the economical use of materials, electric power, water, the observance of safety precautions regulations and fire-prevention actions;
- to talk with patients; to take part conferences for nurses;
- to use rules of the medical ethics and deontology while communicating with patients and medical personal;
- do not leave without reasonable excuse a workplace during reception of patients.

Extract from „Safety arrangement and precautions during work with electric equipment"

1.1.Electric current of 220V is dangerous for life; therefore it is necessary keep to the established order of electric devices operation .

2. Safety regulations before the working session.

2.1. Be confident as to serviceability of an electricity cable, a plug, and an electric socket before power up the device. Above-listed details should not have malfunctions, isolation damages and bad attachment to the electric outlet.

2.2. All medical, diagnostic electric devices and mechanisms should be earthed, i.e. connected with grounding mat or a zero wire in 3-polar electric socket.

3. Safety regulations during working session.

3.1. It is forbidden :

- To leave without the supervision powered up devices;
- To turn on electric devices with the damaged isolation, without a reliable fire-resistant support;
- To turn electrical switches on or off or to touch an electric appliance while your hands

are wet and to wipe the electric connection, electric lamps, and electric devices by a damp rag during their operation;
- To allow water to hit in an electric motor;
- To take instruments from a switched on sterilizer;
- To use electric devices without dielectric carpet and personal protective equipment (dielectric gloves, electric tool with an isolating handle);
- To be in the operational room wearing woollen or synthetic clothes;
- To replace electric lamps which are under tension.

It is forbidden to touch defective of electrical cables. In case of failure it is necessary to keep the object under observation and to call an electrical engineer.

4. Safety regulations after working session .

4.1. To disconnect electric devices .

4.2. Sanitary processing is conducted only at the disconnected electric equipment.

5. Safety regulations for emergency cases.

5.1. In case of burnt isolation smell or smoke, it is necessary immediately switch off electric equipment from an outlet and to inform a head of department.

5.2. In case of a fire it is necessary:
- To turn off the power;
- To activate fire extinguisher and start put out a fire;
- If the fire is not liquidated call 1001 and inform an administration or a doctor on duty

Emergency care and first aid to a person suffered from an electric current

If you can't shut off the source, with dry feet and hands, use a board, wooden stick, rope, etc. to get the person away from the source. A nurse must put on rubber gloves and separate a victim from the power source with a dry rag before touching him. A nurse must haul a victim by dry parts of clothes and do not touch the bared sites of a body. A nurse must release a victim from compressing clothes.

If the victim is not breathing, restore breathing in an unconscious victim, do the artificial respiration by a method „ mouth to mouth” ventilation or „ mouth to nose” and urgently call the doctor-reanimatologist. Make sure the airway is open. Place your hand on the victim's forehead and two fingers on their chin and tilt the head back to open the airway (if you suspect a neck injury, pull the jaw forward rather than lifting the chin). If jaw thrust fails to open the airway, do a careful head tilt and chin lift. If there are no signs of life, place a breathing barrier (if available) over the victim's mouth. Give two rescue breaths. Keeping the airway open, take the fingers that were on the forehead and pinch the victim's nose closed. Make a seal with your mouth over the victim's mouth and breathe out for about one second. Make sure you breathe slowly, as this will make sure the air goes in the lungs not the stomach. Make sure you keep your eye on the victim's chest.

Chapter 2. STOMATOLOGICAL INSTRUMENTS

Dentists use different instruments for diagnostics and treatment of patients.

Instruments for therapeutic dentistry are divided into such groups:

1) instruments for examination of the oral cavity (dental mirror, probe, tweezers);

2) instruments for the caries cavity preparation (cutting instruments, dental handpieces, burs of different shape and size);

3) instruments for caries cavity filling (glass plate, metallic spatula, plastic spatula, plastic instruments, burnishers; pluggers, condensers);

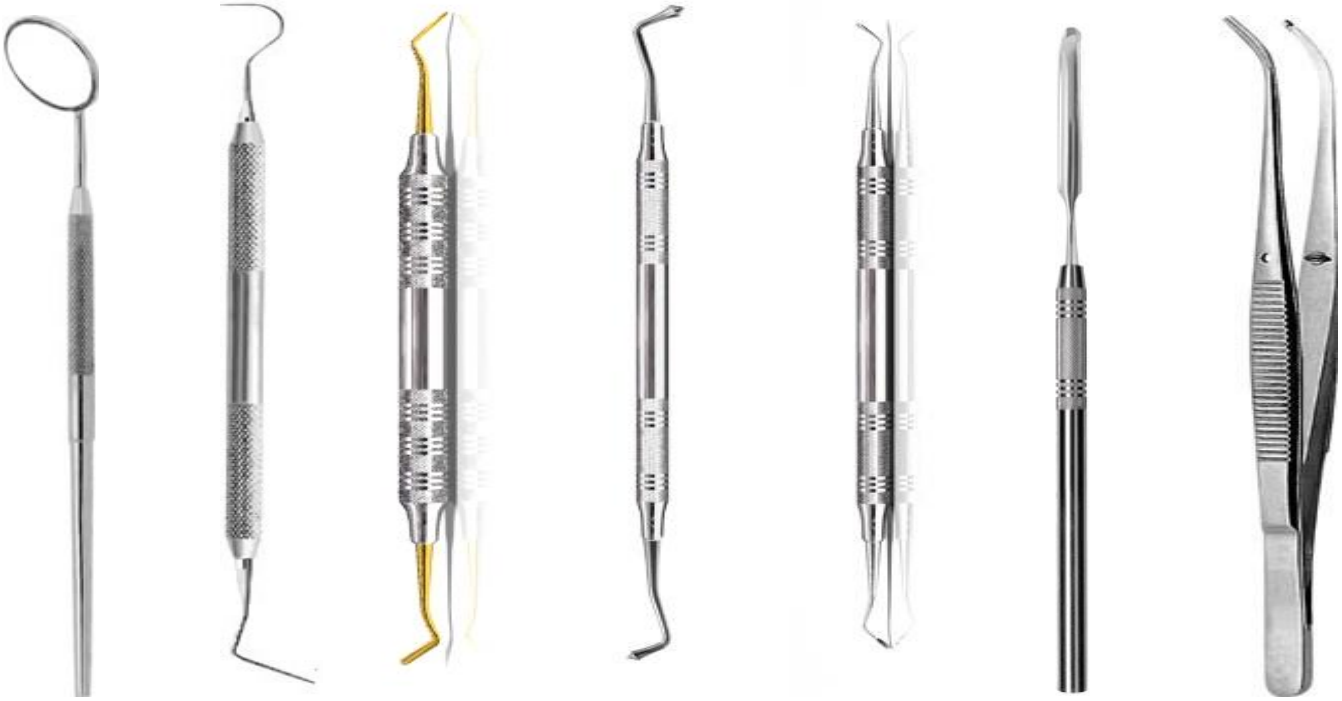
4) instruments for finish processing of a filling (abrasive stones, finishing burs, paper abrasive disks, brushes, occlusion paper, silicone heads, abrasive strips);

5) auxiliary means for the filling (celluloid plates, caps, metal matrixes, wooden/plastic wedges);

6) instruments for the removal of dental deposits (dental hoes, ultrasonic device, excavators, scalers).

Instruments for oral cavity examination

A dental mirror consists of rounded mirror image surface in a metal frame and a handle. Mirrors are divided into plain, which give a true image and the concave that magnifies an image. Mirrors are used to provide indirect vision, to reflect light, for retraction and protection of oral tissues.



1 2 3 4 5 6 7

Fig.2.Stomatological instruments:1-dental morror,2-probe(explorer),3-composite plastic filling, 4-barnisher,5-excavator,6-spatula,7- tweezers (forceps).

The dental probe can be straight and contra-angle. Probe can be used for detection of caries cavity, calculus, defective pits and fissures and evaluation of their condition hardness of tooth tissue, the topography of root canals, the presence periodontal pockets. Periodontal probes are used to measure the depth of periodontal pockets; they

have three types: with a ball on the working end, with notches, with colour bands (marking).

The college tweezers can be of locking and non-locking types. Working ends can be straight, curved, serrated or smooth. Tweezers are used for placing small objects (cotton balls, medicines, small dental instruments in the mouth and for retrieving small objects from the mouth. They are also used to evaluate a tooth movability.

Instruments for caries cavity preparation

Carious cavities are preparated with burs fitted in a handpiece. The speed of the bur circulation depends on the type of a handpiece (fig 3). Low-speed handpieces (runs up to 40000 revolutions per minute (rpm)) are rotated by an electric motor that fits into the base of the handpiece. A contra-angle handpiece is used for an access to every tooth. A straight handpiece is used extra-orally or in the dental laboratory.

Air turbine handpiece (high speed handpiece, air rotor handpiece) can run up to 500000 rpm. Turbine handpieces are of contra-angle type; they must be run with water to cool the tooth to prevent pulpal damage. They are driven by turbine. Compressed air rotates turbine which then rotates the bur. The advantages of the air turbine handpieces are their small weight, high speed and absence of vibration.

Burs. Each of bur has a particular function: cutting, polishing and finishing or caries removal. Bur has a head, which can be of different size and shape. Each used for a different function: cutting, polishing and finishing. The part that connects the head to a shank is a neck of a bur. Shank is the part that fits into the handpiece. Shape and lengths of a shank vary, depending on function. Burs are made from various materials: tungsten carbide, diamond and steel. The end of the shank determines which handpiece the bur will fit to: long straight shank – straight handpiece, latch grip –low/slow speed hanpiece, friction grip shank –air turbine handpiece.

Fig.3. HAND PIECES / CARTRIDGES: air rotor handpiece, super torque handpiece, mini head handpiece, set of contra-angle and straight micromotors.

Burs for the low-speed handpiece are made from steel. They are used for the cutting of carious tissues and other laboratory work. Burs for air turbine handpiece have the diamond or the carbide cutting surface; they are used for the high-speed removal of enamel, dentine and old fillings. Long burs are used for a straight handpiece. Short burs are also used for the turbine and contra-angle handpieces.

Cutting instruments are excavators and chisels. Excavators are acute double-ended or single–ended hand instruments for removal of carious tissues. There are few types of excavators: angle formers, spoons, hoes. Chisels are used for cutting enamel, such as planing walls or beveling a preparation. Chisels are enamel hatchets, gingival margin trimmers, straight chisels, curved chisels, bin-angle chisels.

Instruments for the carious cavities sealing

Glass plates are used for mixing of material on smooth and rough surfaces. The metallic spatula is used for the preparation of medical substances and filling materials. The plastic spatula or anodise aluminium spatula will not stick to any composite material and discolour material (silicate, glass ionomer cement, chemical resins). These materials are mixed on a paper or parchment mixing pad. Flat plastic instruments are used to deliver materials to the cavity preparation and to remove excess materials. They can be of various size and shapes. They can be single-ended or double-ended.

Instruments used for amalgam restorations

Metal amalgam carrier is used to pick up, transport and place amalgam into the cavity preparation. Pluggers or condensers are used to pack or condense amalgam into a cavity preparation. Their working ends are flat. They have different shape of the working end (round, pear-shaped or cylindrical) and size. Burnishers are instruments used to smooth amalgam once condensed. Carvers are used to carve and shape the amalgam restoration for correct anatomy and occlusion.

Instruments for the finishing of filling

A great variety of instruments use for finishing: abrasive stones, discs and strips, finishing burs, brushes and polishing pastes. Finishing burs and stones are used for smoothing of cavity margins and trimming of fillings. Abrasive discs and strips are used for polishing. Brushes are made from different materials (a bristle, synthetic fibres). Brushes are used with polishing pastes. Paper and celluloid strips are applied for the finishing of rough contact surfaces of fillings. They have one or two abrasive surfaces, different abrasive property and size.

Auxiliary means for sealing

Celluloid strips, caps, and semicaps for different groups of teeth, matrixes are used for the restoration of interproximal surface, the modelling of fillings A matrix band creates a temporary interproximal surface, and, when appropriate, a matrix retainer secures the matrix band in place. Wedges are used in conjunction with matrix band, sectional matrix or celluloid strip and help to support and adapt the matrix to the tooth, assists in maintaining adequate contact points between two adjacent teeth. They are wood en and plastic. Light-reflecting wedges are used in composite restorations, they reflect the light from curing light onto composite material.

Instruments for removal of dental deposits

There are many hand instruments for a removal of dental deposits: excavators, sickles, scalers, curettes, files, silicone and resin heads, and polishing pastes. Such devises as ultrasonic scalers and air abrasion scalers (sandblaster-like machines) are used to remove calculus on the teeth by mechanized way.

Chapter 3. ASEPSIS AND ANTISEPSIS. DESINFECTION

A sanitary-antiepidemic regimen is a complex of organizational, sanitary-preventive and antiepidemic measures preventing intrahospital infections. The sanitary-antiepidemic regimen includes requirements to a sanitary status of a territory, hospital equipment, illumination, heating, ventilation, and to sanitary conditions at hospital premises.

Desinfection and strict fulfilment of asepsis, antisepsis and sterilization requirements are basic measures directed to the maintenance of the sanitary-and-hygienic regimen in medical institutions.

A head doctor is responsible for the organisation of desinfection-sterilization measures in a dental clinic. An assistant of the head on medical work and a head nurse usually control a sanitary-and-hygienic regimen.

Every month medical institutions carry out the departmental monitoring of sterility of medical articles (dental instruments, linen, gloves, cotton wool rolls, tampons, drainages, burs, endodontic instruments, etc.) and control of the air in an operational room, room for sterilization, and autoclave room.

The antisepsis is a series of measures directed on the destruction of the microbes in a wound, a pathological locus or in all organism.

Methods of antisepsis are physical, mechanical, chemical and biological.

The aim of physical methods of antisepsis is to create in a wound of unfavourable conditions for bacteria development, for absorption of toxins and products of a tissue decay. It is provided by the external drainage of the infected wound, bathing with antiseptic solutions, and treatment of the wound by thermal and light procedures.

The mechanical antisepsis are measures directed to prompt removal of necrotic tissues, blood clots, and foreign bodies from a wound.

The chemical antisepsis is destruction of microbes in a wound by antiseptics.

Biological methods of the antisepsis are directed for rising of immunodefence and to create unfavourable conditions for the development of microorganisms.

Asepsis is measures directed to the prevention of microbial penetration into a wound. All subjects that are in contact with a wound (hands of medical personnel, instruments, dressing, laundry, air) should be sterile.

Desinfection – is the complex of measures directed at infectious diseases prevention and elimination of bacterial and viral ethyology causative agents (treatment of department surfaces, inventory, and equipment by chemicals killing microbes, viruses and funguses). Desinfection is a process used to reduce the number of micro-organisms but not usually bacterial spores. The process does not necessarily kill or remove all micro-organisms, but reduces their number to a level which is not harmful to health.

Desinfection is a method of destroying of pathogenic microorganisms (bacteria, viruses, rikettsia, fungus), their carriers (insects, mites, ticks), and also their carries in person's environment (premises, air, subjects, ware, linen, clothes, saliva etc.).

Desinfection is: 1 –desinfection proper– destroying of pathogenic microorganisms, 2 – disinsection – killing of such carriers of diseases as insects, ticks, 3 – deratization – eradication of rodents, 4 – sterilization – destruction of all microorganisms.

Desinfection is divided into focal and preventive. Focal desinfection complex includes current (destructive) and final.

Destructive (current) desinfection processing is conducted in respect of any surfaces, raw products affected by microorganisms and according to epidemiological statements.

The purpose of the *current desinfection* is immediate destruction of a causative agent of an infection and prevention of its spreading in the environment. The medical personnel or persons who take care of patients carry out current disinfection in infection centre at the presence of a patient or a bacilli carrier.

Final desinfection is conducted with the purpose of elimination of accumulated microorganisms, their spores, toxic and allergic products resulting from their activity in the whole processed area. Its purpose is total desinfection of all infected objects which could be infected. Desinfection brigades of the sanitary epidemiological station (SES) conduct final desinfection. The brigade consists of the infectiologist and 1-2 subordinatores. The brigade should be equipped by hydropulper (stirrup pump), buckets for 5 and 10 litres, brushes for cleaning, bags for transportation of things to desinfection chamber; the container for disinfectants; pure disinfected rags; oil-cloth bags for clean and disposed clothing; packaged disinfectants, a dressing, respirators, protective glasses, rubber gloves and soap.

Preventive desinfection is conducted in case if infection source is not detected. Its aim is to prevent occurrence, spreading of infectious diseases, and the accumulation of causative agents of these diseases or their carriers in the environment. Preventive desinfection is conducted at the limited areas and in vast territories. Such desinfection is taken after finishing reception and during pause between receptions of patients. Preventive desinfection is especially required in crowded places.

Efficiency of desinfection depends on different factors; each of them can reduce process efficiency. In particular, the following factors can affect desinfection process: biological resistance of microorganisms to different desinfection facilities, physical-chemical characteristics of disinfectant, the character of processed materials, volume of objects` microbe insemination, method of desinfection processing, exposure time.

There are mechanical, physical, chemical and combined methods of desinfection. Irrigation, ointment, washing, desinfection agents' impact and others are considered to be the means of desinfection processing. Choice of special desinfection agents depends on preliminary laboratory examinations, object peculiarities and other factors directly influencing on final result.

Each instrument or piece of medical equipment which comes into contact with a patient is a potential source of infection.

These are divided into 3 groups of risk: high risk, intermediate risk,low risk.

High risk items come into close contact with a break in the skin or mucous membranes or are introduced into a normally sterile body area. e.g. surgical

instruments, needles, urinary and other catheters. Sterilization is required for this group. If sterilization is impossible then to intesify desinfection is sufficient.

Intermediate risk items come into close contact with mucous membrane or are items contaminated with particularly virulent or readily transmissible organisms. e.g. Items of respiratory equipment including laryngoscope blades, endotracheal and tracheostomy tubes, oropharyngeal and nasal airways. Desinfection after cleaning is required for this group.

Low risk items only come into contact with normal intact skin. e.g. stethoscopes or washing bowls or subjects of the environment which have not contact with a patient (walls, floor, ceiling, furniture, sanitary and sewer equipment). Cleaning and drying is usually adequate for this group.

Physical method of desinfection is carried out with physical means (mechanical, thermal, beam). High–level desinfection is best achieved by moist heat (***physical*** desinfection) such as boiling in water at temperature 100^0C. An item subjected to the desinfection is placed into a container filled with cold distilled water, which then boils 15-30 minutes. Boiling in 2 % sodium soda solution with distilled water removes dirt. This desinfection method is used for glass and metal items, heat-resistant polymers. Other methods of *physical desinfection* are uviolizing and radiation.

Chemical method of desinfection is the application of a liquid chemical agent to eliminate the majority of pathogenic microorganisms, with the exception of bacterial spores, on inanimate objects or surfaces.

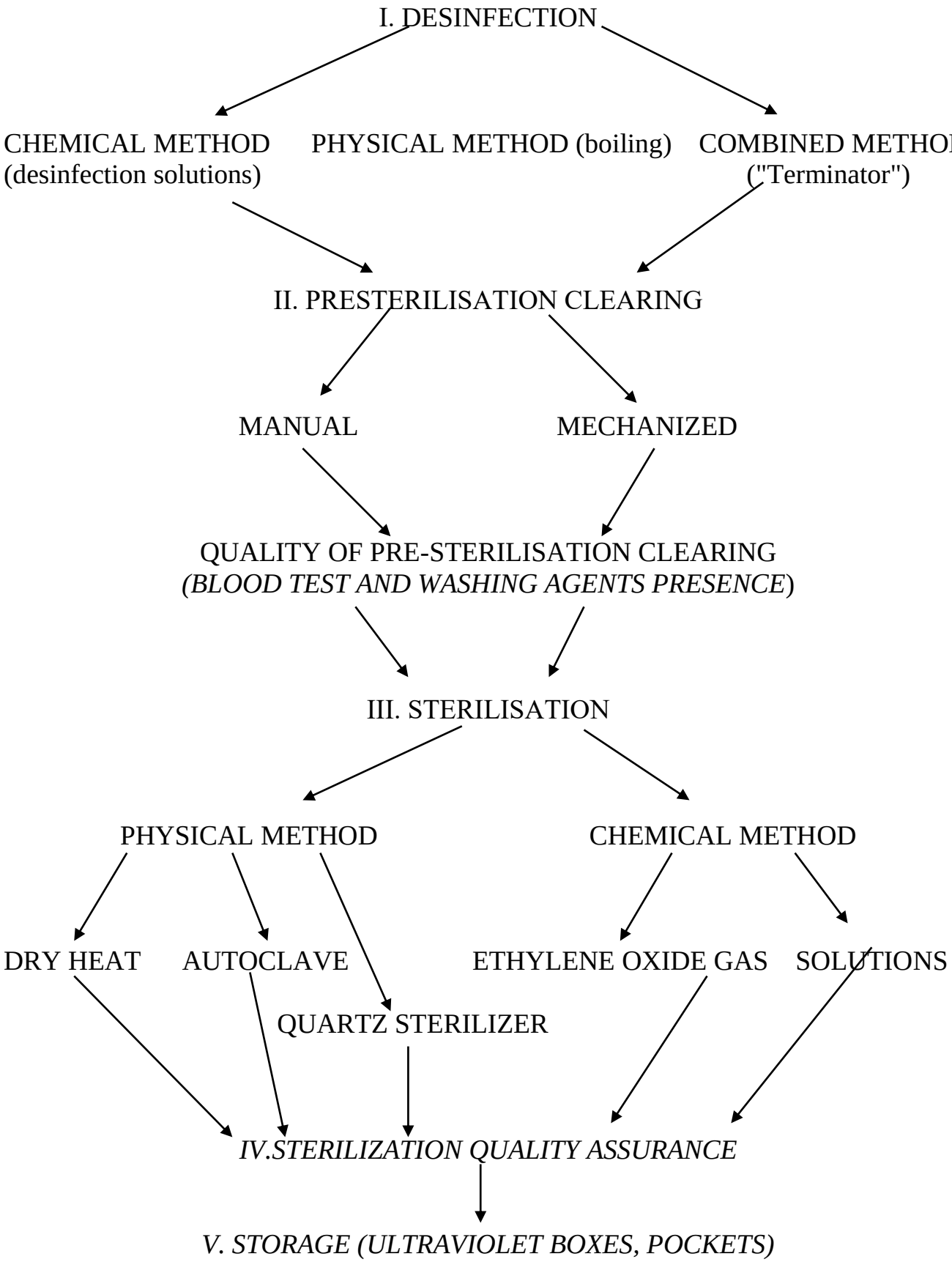
Spualding's classification provides a simplified outline of the recommended processing methods for items of patient care equipment, based on the intended use of them depending on the intended use of an item, medical and surgical equipment may be required to undergo the following process between uses on different patients: cleaning, followed by sterilization, cleaning, followed by high, or intermediate level desinfection, cleaning alone.

Table 1

Spaulding classification of surfaces

	Item use	**Example**	**Disease transmission risk**	**Appropriate process**
Critical items	Items entering sterile tissue, the body cavity, the vascular sustem and non intact mucous membranes; blood present	Surgical ,dental instruments: needles, probes, burs, endodontic instruments, mirrors, tweezers, condensers. implants	High	Sterilization or use of single use sterile products -steam sterilization -low temperature methods(ethylene oxide, acetic acid, plasma)
Semi-critical items	Items that make contact, directly or indirectly, with intact mucous membranes or no intact skin	Medical "scopes" (e.g.endoscopes), nonsurgical dental instruments, specula	Intermediate	Heat sterilization High-level desinfection: thermal, chemical
Noncritical	Objects that come into contact with unbroken skin but not mucous membranes	Face masks, clothing, blood pressure cuffs, electrodes	Low	Low level desinfection: cleaning (manual or mechanical) Intermediate-level desinfection if blood presents.
Environmental surfaces	Usually no direct patient contact	Floors, walls, scales	Minimal	Sanitize (if no blood) Intermediate level desinfection
Medical equipment	Usually no direct patient contact	Knobs, handles of x-ray machine, dental units	Minimal	Low level desinfection

SCHEME. **PROCESSING OF STOMATOLOGICAL INSTRUMENTS**

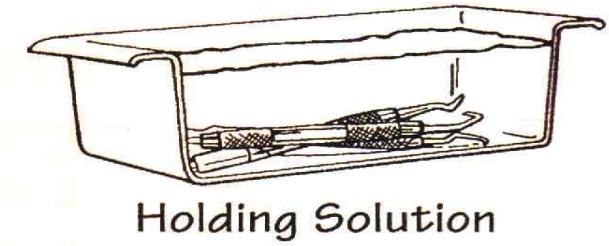


CHAPTER 4. PROCESSING OF STOMATOLOGICAL INSTRUMENTS

Sterilisation of stomatological instruments consists of three parts: desinfection, presterilisation clearning and sterilisation (scheme).

Desinfection of stomatological tools

For desinfection the used instruments can be placed directly into desinfection solution and rinsed. A holding solution is a liquid disinfectant/sterilizing solution to soak contaminated instruments before they are cleaned and sterilized. It has the purpose to: dicrease infectious microbes on instruments which cannot be cleaned and sterilized immediately loosen and minimize debris before scrubbing or ultrasonic cleaning, minimize the physical handling of the instruments. It is important to use a covered container with a separate instrument basket to ensure complete immersion. Currently there are seven major active ingredients used for disinfectants in dentistry worldwide. They are ethyl alcohol, isopropyl alcohol, chlorine iodophores and iodines, glutaraldehyde (3.2% solution for 40 minutes), phenolics, quaternary ammonium compounds.



The "cleaned" instruments will still be contaminated and the cleaning solution will be contaminated with live microorganisms. The solution should be changed at least once a day, using gloves, mask, protective eye wear and clothing.

The following medicines are used for chemical desinfection:

- 3% chloramin (5 %TB infection) for 60 minutes;
- 6 % hydrogen peroxide for 60 minutes;
- presept 0,05 % for 30 minutes (10 tab.x 0,5 g);
- lyzetol 4 % – 15 minutes (40 ml of lyzetol + 960 ml of water), 5 % – 5 minutes (50 ml of lyxetol + 950 ml of water);
- lizoformin-3000 1 % – 60 minutes, 1,5 % – 30 minutes (15 ml of substance + 985 ml of water); 2 % – 15 minutes (20 ml of substance + 980 ml of water);
- vircon 2 % – 10 minutes (20g substance + 980 ml of water);
- dezoform 1 % – 60 minutes (10 ml of substance + 990 ml of water), 3 % – 30 minutes (30 ml of substance + 970 ml of water), 5 % – 10 minutes (50 ml + 950 ml of water);
- dezactin 0,2 % – 60 minutes (2 ml of substance + 988 ml of water);
- septodor forte – 0,4 % solution – 60 minutes, 0,5 % solution – 30 minutes, 0,7 % solution – 15 minutes;
- chlorgexidine 0,5 % – 30 minutes.

Closed cassette systems provide a more efficient and safer way to process, sterilize and organize instruments in a dental office (Fig 3) - these eliminate manual steps during

instrument reprocessing such as hand scrubbing and time-consuming sorting of instruments, thereby improving safety and increasing efficiency.

Fig 3. Closed cassette system

High-quality metal dental cassettes specially designed to withstand high temperatures are preferred for use with steam and chemical vapour sterilizers.

Take the following precautions while working with disinfactants:

- work with concentrated solutions should be done in nitrile or heavy duty rubber gloves and protective glasses to ensure protection of eyes and skin and mucous membranes;
- in case of emergency when using chemical agents, adopt the following first measures:

Mouth. Rinse the mouth with clean water if the injured is conscious.

Eyes. Push the eye open and rinse with slow-running clean water for at least 15 minutes. Avoid splashing the uncontaminated eye while rising. After rinsing drop in «Albucid» in eyes and seek medical assistance if required.

Skin. Flush the skin with copious clean water for at least 15 minutes and take off the contaminated clothes.

Inhalation. Rescue personal should be protected with all necessary protective equipment first. Move the injured to a location with fresh air. Administer mouth-to-mouth resuscitation if the injured has difficulty breathing or stop breathing, A cup of milk is recommended if the injured is conscious.

Each time in case of emergency seek medical assistance if required. It is forbidden to eat and smoke while working with solutions; hands are washed with water and soap after work termination.

Presterilisation clearing

There are 3 kinds of presterilasation clearning: hand scrubbing, ultrasonic cleaning and automates washer.

Hand cleaning of dental instruments is the least efficient cleaning method. If this method is used, however, the instruments should be fully immersed in a sink pre-filled with warm water and detergent and a long-handled kitchen-type brush used to remove debris. Instruments should be washed under water with the sharp end of the instrument held away from the body; extra care must be taken when cleaning instruments that are sharp at both ends. Thick waterproof household gloves must be worn to protect against accidental injury and protective eyewear to shield against splashing. The brush used to remove debris from the instruments should be cleaned and autoclaved at regular intervals

– at the end of each clinical session, for example. Cleaned brushes should be stored dry. Advantage: effective if performed properly. Disadvantages: increases chances for operator injury; increases spread of contamination through splatter; labor-intensive, need proper care of scrub brush.

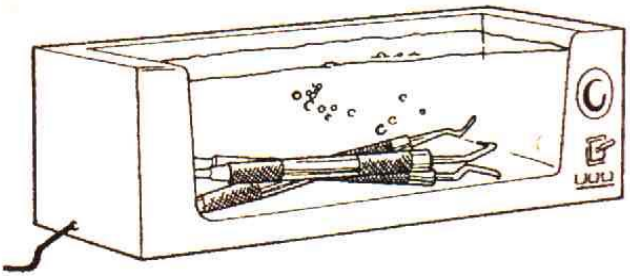
In general, three classifications of mechanical cleaning devices are available for the dental office. They are the ultrasonic cleaner, instrument washer and instrument washer/disinfector.

Ultrasonic cleaning devices

An ultrasonic cleaner uses sound waves, called cavitation. These bubbles act on debris to remove it from the instruments. Some manufacturers also use intermittent or sweeping sound waves to help improve the device's cleaning ability and to decrease the potential for hot spots in the ultrasonic bath. Specialized detergent formulations are available for the solutions in ultrasonic machines. Household products are inappropriate because they cause pitting, corrosion, rust or other damage to instruments, and potentially to the ultrasonic chamber.

The procedure for cleaning the instruments in the ultrasonic cleaner is as follows.

Suspend instruments in the ultrasonic bath using a rack or basket fitted to the unit. Do not lay instruments directly on the bottom of the ultra sonic cleaner, as this can interfere with cleaning and cause damage to instruments and the ultrasonic machine.



Avoid overloading the ultrasonic device, since that could inhibit its cleaning ability. It is important to follow the manufacturer's instructions for the ultrasonic cleaning cycle. In general, the timer is activated for three to six minutes for loose instruments and ten to twenty minutes for instrument cassettes, and the timing is adjusted as necessary. While the ultrasonic device is running, the lid or cover should be kept on to reduce the release of aerosol and spatter into the area from the ultrasonic cleaner. Routinely replacing the cleaning solution in the ultrasonic machine is important, and is necessary at least once a day, more often with heavy usage.

Disadvantages: microorganisms may accumulate in cleaning solution; ultrasonic cleaning will not remove hardened permanent cement (solution: remove cement while it is still soft.).

Using mechanical means of instrument cleaning rather than hand scrubbing should minimize handling of instruments. If procedures are used heavy-duty (utility) gloves, mask, eyewear and gown should always be worn while cleaning. Minimize the risk of puncture injury by scrubbing only one instrument at a time while holding it low in the sink.

Instrument washers

Instrument washers use high-velocity hot water and a detergent to clean instruments. Widely used for decades in hospitals and large facilities as part of the central sterilization process, these devices have recently become available for the dental office. These devices require personnel to either place instruments in a basket or to use instrument cassettes during the cleaning and drying cycles. Instrument washers for dental offices come in two different designs. Type of washer on picture does not require professional installation. The other type is built-in and resembles a kitchen dishwasher (Fig 4).

Fig 4. Instrument washer

Some models have the ability to dry the instruments after washing, some do not. The instrument washer/disinfector device connects the desinfection and the presterilisation clearing. For example, the Reliance 333 is pre-programmed with the following applications: cold water pre-wash, enzyme wash utilizing a pulsed spraying pattern for effective protein removal, neutral detergent wash with bi-directional spray arms on top and bottom of each load level, thorough rinsing of instruments, guaranteed thermal desinfection rinse at minimum 180° F for 1 minute.

All instrument washers and thermal disinfectors use either a detergent or a water-softening agent. After cleaning, all instruments must be examined thoroughly and, if there is residual debris, re-cleaned.

Desinfection and sterilisation can carry out in the special hood (Fig 5).

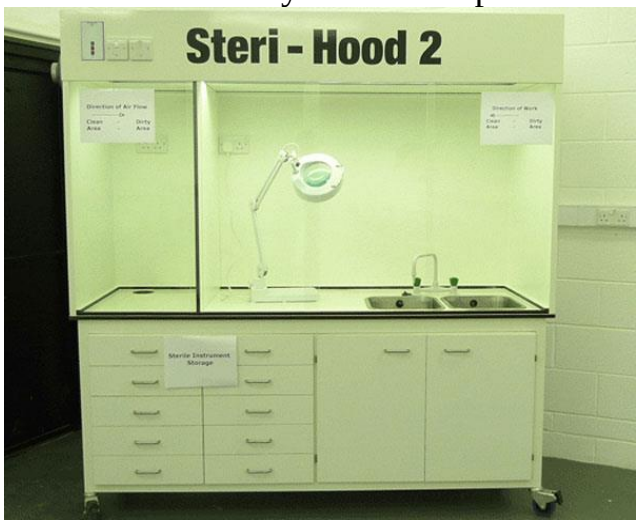


Fig 5. Steri-hood

Steri Hood is a free standing unit which can be situated anywhere in a room where you have water and electric supplies and an outside air source. Steri Hood is a fully compliant decontamination unit providing a small clean area suitable for dental practices, without the expense of a fully functional clean room. The Steri Hood works providing you with a twin sink working from a dirty wash to clean wash to an inspection area, and then onto the separate clean area with your autoclave. The positive air flow works in the opposite way to keep the clean area clean. A separate room is not needed.

Instrument examination and care

Cleaning instruments, provides a good opportunity to examine, replace or remove damaged instruments; lubricate items such as handpieces; and otherwise prepare instruments for sterilization. Instruments must be dry before packaging - if drying was not part of the cleaning process, time must be taken to dry the instruments completely.

Quality of presterilisation clearning (tests for blood and washing agents presence)

These tests are done at the sterilization room every day; self control of these tests at the department is done once a week.

Azopiram test – test monitor the presence of blood on the instruments. Necessary items: 1% of all instruments, not less than 3-5 units, azopiram solution from chemical shop, 3% hydrogen peroxide, gauze, glasses with blood smear, registry for quality control of presterilization.

Step by step actions:

1. Prepare working solution of azopiram: mix equal volumes (1:1) of azopiram basic solution and 3% hydrogen peroxide (the valid for 1-2 hours).
2. Check the activity of the working solution by dripping a few drops on the glass with blood smears.
3. Cold instruments (t < 25°C) are wiped with gauze moistened with the working solution or drip 3-4 drops by pipette of the working solution, particularly in the junction place.
4. Exposure time is 0,5 - 1 minute.
5. Test readings:

- Pink-lavender color shows blood presence;
- Brown color indicates the presence of oxidants, detergents and rust.

6. If the test is positive then all set of instruments must be reprocessed.
7. The test results are recorded into register.

Phenolphthalein test is done to estimate presence of detergents on the instruments.

Prepare: 1% alcoholic solution of phenolphthalein.

1. Drip 2-3 drops of the solution on the instrument in the points of its contact with a wound surface and on the on the junction of flexible parts of the instrument.
2. Pink color indicates the presence of not washed surface-active substances. In this case all instruments are washed again. The instrument with positive test are washed under running water and placed in cleaning solution container for the re-presterilization processing.

Packaging

Packaging used for instruments and cassettes prior to sterilization includes wrap, paper pouches, plastic pouches, combination paper/plastic pouches and nylon tubing. Sterilization packaging is specifically designed to allow penetration of heat, steam or vapour and then to seal the sterilized instruments inside the package for sterile storage (Fig 6).

Fig 6. Dental sterilization sealing machine

STERILIZATION

Sterilization refers to the use of a physical or chemical procedure to destroy all forms of microorganisms, including the highly resistant spores.

Most dental offices have a designated area for instrument reprocessing that is separate from the dental treatment room. This is ideal, since cleaning, sterilizing and storing instruments in the same room where the delivery of patient care is provided increases the risk of cross-contamination.It is mandatory to sterilize all instruments that penetrate soft tissues and bone. Instruments that are not intended to penetrate the tissues, but that may come into contact with oral tissues should also be sterilized after each use.

Kind of sterilisation

Sterilization is reached in case of application of physical factors and chemical substances. From physical factors apply high temperature, radiating, an infra-red irradiation, ultra-violet beams, ultrasound, boiling. From chemical substances use iodine, spirit etc. Chemical methods include a gas method (formaldehyde) and sterilization by solutions of chemical preparations.

Physical sterilization methods

1. *Steam autoclave* - at 120ºC, total time about 45 minutes. There is good penetration and it maintains integrity of liquids, like handpiece lubricants, due to the 100% humidity within the chamber. The dressing, the whiteness, cotton balls, platens are sterilized in steam or electric autoclaves. A material for sterilization put into bags and metallic boxes.

Steam autoclaves are the most commonly used type of heat sterilizer in dental practices. Two types of processes employ steam under pressure. The difference between the two is the manner in which the machine evacuates the air from the sterilization chamber and then introduces the steam (Fig 7). Gravity displacement sterilizers rely on the forces of gravity to force air out of the chamber through air escape vents. The steam entering the chamber from the water reservoir displaces the air as it leaves the chamber. The combination of pressurization of the chamber, steam and a high temperature for a prolonged period has the ability to kill virtually all microorganisms. A typical cycle for wrapped instruments includes heat-up and pressurization time, followed by a 45-minute cycle during which sterilization is taking place (120°C at 15 psi). The sterilization cycle time decreases as the temperature is increased. It is important to use cycle times and temperatures described in the owner’s manual, and never to interrupt the sterilization cycle to remove or add items, or for any other reason.

Fig 7. Autoclave

After the sterilization cycle, the sterilizer must depressurize and the packs remain in the sterilizer for drying. The drying phase may take anywhere from 20-45 minutes. The unit must only be opened after completion of the drying cycle. Upon removal from the sterilizer, sterile packs must be stored in a clean, dry area. Packs that become wet, torn, contaminated, or otherwise compromised require resterilisation.

Disadvantages: non stainless steel metal items corrode, use of hard water may leave deposits, and it may damage plastic and rubber items. Sharp instruments get dulled.

Rapid steam autoclave- at 132 ºC, total time is 20 minutes. A material for sterilization put into packets. Now this way of sterilisation is prevalent, it is used for sterilisation of metallic and heat-resistant plastic dental items. Disadvantages: requires use of distilled water and small chamber size necessitates frequent cycles.

Prevacuum autoclaves (also called Class B or Type B sterilizers) use a variety of technologies to remove air from the chamber before the steam enters, thus creating a vacuum. Most use a pulse vacuum to ensure elimination of air from the chamber. This is generally a more efficient means of pressurizing the chamber; therefore, the operator may notice some minor time saving in the start-up of the prevacuum sterilizers. Most prevacuum sterilizers use a temperature of 132°C-135°C for 3-10 minutes to achieve sterilization. This higher temperature may be unacceptable for some items, such as Teflon-coated instruments. Total time for pressurization, sterilization, venting and drying is generally considerably shorter than that for gravity sterilizers - about 45 minutes.

2.Chemical vapour chemiclave - at 270ºF (25psi), total time is 40 mts. It is very efficient, and items dry quickly after cycle.

Unsaturated chemical vapour sterilization relies upon the use of a proprietary chemical that contains formaldehyde, alcohol and other inert ingredients, instead of water, to produce a vapour to promote the sterilization. Use of this proprietary chemical also results in the vapour having less humidity and therefore being less corrosive to sensitive instruments than if water were used. Disadvantage: may damage plastic and rubber items. It requires the use of a special solution, which is difficult to dispose off once used. Instruments have to be pre-dried. It emits odor which some find irritating.

3.*Dry heat oven*. There’s no corrosion of instruments, emits no odor, and it is easy to operate. Such sterilization is carried at 180ºC during 1 hour in Ukraine for metallic instruments besides dental mirrors (Fig 8). All instruments for sterilization put into dental trays.

Fig 8. Dry heat oven

The method of heat circulation in dry-heat sterilizers is usually convection, which helps to ensure that the heat circulates throughout the sterilization chamber during the process. Mechanical convection is more effective; the sterilizer contains a fan or blower that continually circulates the heated air to maintain a uniform temperature throughout the chamber. The higher temperature of a dry-heat sterilizer means that paper will scorch and plastic will melt. Specialized packaging material is available for dry-heat sterilizers. Most handpieces will not tolerate the higher temperatures of a dry-heat sterilizer. Mechanically driven handpieces that contain turbines and bearings are susceptible to damage at higher temperatures. Disadvantage: may damage plastic and rubber items, longer sterilization time, instruments are hotter and require longer to cool.

4. *Rapid dry heat*-375º F, total time about 30 mts. The cycle is short, items are dry after cycle and there's no corrosion. Disadvantage: may damage plastic and rubber items, small capacity per cost, and instrument emerge very hot.

5. *Gas Plasma* - Ethylene Oxide Gas kills microorganisms. Total time from start of cycle t end of degas is 14 hours. It can be used for heat sensitive items.

Fig 9. Sterilizer-aerator AMSCO Eagle 3017

The instruments are cool and dry at the completion of cycle. Ethylene Oxide Gas Sterilizers are fully automatic devices that sterilize, either resistant to heat or not, any kind of plastic, rubber, sensitive, metal, mechanic or electromechanic medical, surgical materials and laboratory equipment by applying the anti-bacteriologic agent, Ethylene Oxide at 54°C. New technology for Gas Sterilizers cancels the need for complex infrastructure, such as: pressured air, water, vacuum line, drainage canals (Fig 9). The

Amsco Eagle 3017 EO sterilizer combines the needs of sterilizing heat and moisture sensitive items with the assurance of sterility in a safe and economical sterilization cycle. Supported by over a century of engineering excellence, the Eagle 3017 features an advanced microprocessor control system which monitors multiple parameters for each of the four pre-programmed cycles. The Eagle 3017-s 5 cu/ft chamber utilizes two convenient baskets for sterilization and aeration within one chamber. Further, the Eagle 3017 sterilization cycle operates entirely under vacuum with the added safety of a disposable EO cartridge placed within the sterilization chamber. Disadvantage: very long cycle time. If the cycle is interrupted before completion, there can be possibility of ethylene oxide exposure.

6.Boaling is old method for sterilization of all-metal tools. Duration of sterilization — not less than 30 min from the boiling beginning. Boiling water does not kill spores and cannot sterilize instruments. However, heat can reach and kill blood borne pathogens in places that liquid sterilants and disinfectants used at room temperature cannot reach. Boiling is a method of high-level desinfection that has been used when actual sterilization cannot be achieved (e.g., in case of a sterilizer breakdown)

7. Thermal processing applies for sterilization of a working part of stomatological tools (root needles, a drill, files, burs): tools are sterilized with high temperature of glass balls in special device *(quartz beads sterilizer*). It is the fastest way of sterilisation. Temperature of sterilisation is 230°C, time: 2" - Mirror / Probes, 5" - Files / Root canal, 10"-Tweezers / Surgical instruments (Fig 10).

Fig 10. Quartz beads sterilizers Tau Quartz 150 and 500

Means and sterilization regimens of chemical (cold) method of sterilisation

Chemical means	Temperature (^{0}C)	Exposition
6 % hydrogen peroxide	18-20	6 hours
6 % hydrogen peroxide	50	3 hours
1 % Dezoxon-1	18	45 minutes
2,5 % glutaraldehyde	20	6 hours
8 % Lizoformin-3000	20	1 hour

Ultraviolet light is not highly effective against RNA viruses such as HIV and is not very effective against bacterial spores.

Sterility assurance

All the efforts that go into the preparation of instruments are futile if the sterilization process itself is not successful. There is no way of seeing that instruments are sterile by simply observing the sterilizers and packs, even though a chemical or mechanical indicator may have changed. An indicator such as autoclave tape may change colour when exposed to heat, but there is a possibility that the heat was not present for the proper length of time or that there was inadequate pressure. Indicators that go on the outside of the packs are useful for identifying processed and unprocessed packs. Failure of sterilization can occur due to mechanical malfunction of the sterilizer or due to operator error. There are several methods to provide assurance of sterility.

Quality of sterilisation in an autoclave is supervised by means of visual, physical, chemical and bacterial methods.

Chemical indicators indicate the presence of certain conditions during the sterilization cycle, such as the presence of heat and steam. There are five classifications of indicators recognized by the FDA, and it is important to note that it is now recommended that all packs or cassettes include internal and external indicators.

Class 1 - Process Indicators. These are placed on the outside of packs and are useful in determining which packs have been properly processed versus those that have not. Class 1 process indicators include autoclave tape and the colour change indicators embedded on the outside of sterilization packaging materials.

Class 2 - Bowie-Dick Indicators. These show the pass/fail in prevacuum sterilizers. This test is conducted daily with the chamber empty, during the first cycle of the sterilizer, and is available as a kit from commercial sterilization monitoring companies.

Class 3 - Temperature-Specific Indicators. These react to one of the critical parameters of sterilization and indicate exposure to a specific value such as temperature or psi.

Class 4 - Multi-parameter Indicators. These react to two or more of the critical parameters in the same manner as Class 3 indicators.

Class 5 - Integrating indicators. These are designed to react to all critical parameters of sterilization cycles. When used properly, integrating indicators may serve as the basis for the release of processed items, excluding implants. It is important to follow the manufacturer’s specific instructions for use regarding a test challenge pack.

Biological monitoring

The use of biological monitors (spore tests) is the most reliable method to validate that the sterilizer is functioning and that the sterilization of instruments is effective. These monitors consist of paper strips or vials impregnated with bacterial spores that are specifically resistant to the sterilization process. New spore tests have been developed that enable completion of biological monitoring in-office and yield results in as little as 24 hours. It is recommended that biological monitoring be conducted at least weekly and with every load that includes an implantable device. A work of sterilising equipment is controlled with use of the biotests infected with sporous form B Stearothermophilus for steam sterilisation and B Licheniformis for control of air sterilizers 1 time a 2 weeks.

Chapter 5. PROCESSING OF OTHER OBJECTS IN A DENTAL SURGERY

The *basic reusable dental instruments* are processed by rinsing from blood, sputum and tissue debris in solution used for desinfection and presterilization cleaning (for example desefect, desactin, lysoformin etc.). Instruments are completely submerged into a closed tank with desinfection solution for 60 minutes, wash with by running water for 5 minutes, rinsed in distilled water for 1 minute, dried up in dry hot oven at t=85°C till disappearance of a moisture and sterilised.

„Terminator" – device for desinfection of handpieces and dental instruments for 3 seconds; it is connected with a dental unit. Cleaning, desinfection and deactivation with „*Terminator*" is a combination of mechanical and physical processes. If a dental instrument enters into „*Terminator*" the photo element automatically turn on four high pressure tubes and desinfection solution comes to the tunnel. Everything that covers the instrument is sucked out through sluices. Blood, dust, soil are close in a specially integrated container where all microbes are killed. Instruments are disinfected by high pressure desinfection solution.

Fig 11. Device «Terminator»

Fig 12. Device «Assistina»

The Assistina device is a small, counter-top unit that automatically cleans the air/water spray channels and lubricates the moving parts of contra-angle handpieces, straight handpieces, turbines, airmotors, and air-driven dental scalers. Pressing the program button for approximately two seconds activates the Assistina. Once activated, alcohol based cleaning fluid and service oil is applied to the internal rotating parts, and finally, compressed air purges the air and water channels and internal parts of cleaning fluid and service oil respectively. Since the handpiece is totally enclosed by the Assistina during operation, aerosolized oil and cleaning fluid is trapped by absorbent fleece pads and an exhaust filter. This minimize the release of aerosols and messy lubricants into the work area. The device operates on clean compressed air and doesn't require electricity.

If a cleaning machine is not used, the following protocol should be adopted for the pre-sterilisation cleaning of handpieces:

• leave the bur in place during cleaning to prevent contamination of the handpiece bearing;

• clean the outside of the handpiece with detergent and water – never clean or immerse the handpiece in disinfectan. In therapeutic dental surgeries, as a rule, the desinfection of dental handpieces is done after each patient by careful double wiping of external parts and

bur channel with sterile cotton-gauze tampon moistened with 70° ethyl alcohol or bazillol. The interval between wiping should make 15 minutes;

• remove the bur;

• if recommended by the manufacturer, lubricate the handpiece with pressurised oil until clean oil appears out of the chuck and clean off excess oil. The turbine handpiece is blown with an air and oiled with a special spray;

• the most widespread way of the handpiece sterilization is autoclaving. But it necessary to observe some rules: place only dry instruments into an autoclave, a handpiece is to be packed into sterilization pouch before autoclaving, only distilled water is used for autoclave (the chemical autoclave is excluded); holding temperature is 132°C: pressure 2,2 bar or 120°C and 1,1 bar;

• if recommended by the manufacturer, lubricate the handpiece after sterilisation and run it briefly before use to clear excess lubricant;

• the oil used for pre-sterilisation cleaning/lubrication should not be the same as used for poststerilisation lubrication; either two canisters should be used or the nozzle changed between applications.

Burs are instruments subjected to desinfection, cleaning, and sterilization.

Tips for dust injectors are for removing of dust, small parts and aerosols are items subjected to desinfection, cleaning and sterilization in an autoclave.

Dental cotton pellets are made of sterile absorbing cotton by hands and sterilised in an autoclave. They are disinfected and utilised after use.

Desinfection napkins are used for the desinfection of headrests, armrests of units, surfaces of hard furniture, devices, door handles, phones, surfaces from different materials (plastic, glass, metal, vinyl skin, etc.). After use they are disinfected and utilised.

Mirrors are items subjected to desinfection, presterilization processing and sterilization by steam, air or the chemical method (according to the instruction). The working part of a mirror can be sterilised in the glass-pearled sterilizer. 6% hydrogen peroxide is used for the chemical desinfection of dental mirrors for 60 minutes. Mirror are rinsed by sterile water after desinfection, wiped with a sterile napkin and are kept at sterile conditions.

Glasses for mixing are sterilised in the autoclave after cleaning and the desinfection. *Small instruments* (barber broaches, etc.) are disposable. They are sunk into 10 % hypochlorite potassium solution or 3 % chloramines' solution for one hour. After desinfection they are utilized. New instruments are used after presterilization processing and sterilization.

The aseptic shelf „Ultraviol" and the box «Aseptic» are used for instruments' storage (up to 7 days); the principle of its work bases on the bactericidal action of ultra-violet light. Air recirculation in the box intensifies the bactericidal effect and reduces to a minimum "a dead zone" effect.

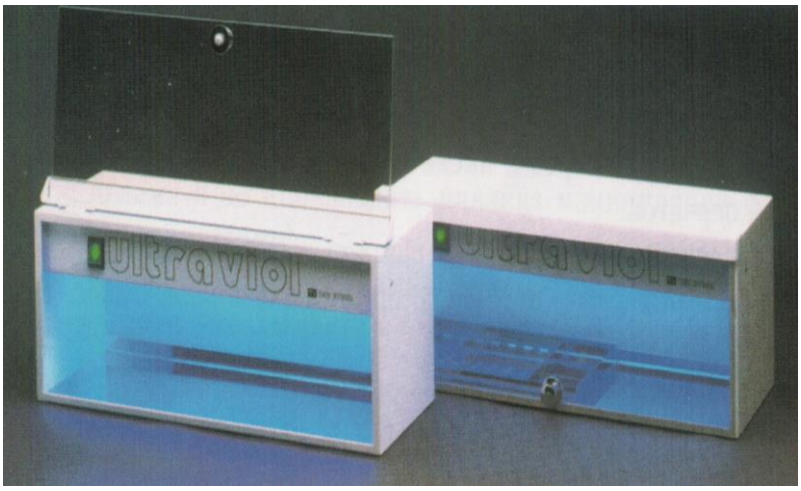


Fig 13. Aseptic shelf „Ultraviol”

Chapter 6. CLEANING OF A DENTAL SURGERY

Dental department (polyclinic, a dental surgery) should have three groups of premises: general, medical-diagnostic, housekeeping. Destructive desinfection and general cleaning of premises are conducted to support hygienic conditions, for the prevention of microbial contamination of equipment, air and surfaces in dental department. Frequency of cleaning depends on functional purpose of a premise.

Zoning (delineating areas) simplifies and speeds up the decontamination process. The aim is to separate the areas that are likely to become contaminated by direct contact or splatter during treatment procedures ("dirty zones") from those areas unlikely to be directly contaminated ("clean zones"). Most of the splatter settles out within 1 metre radius of the patient's mouth.

"Dirty zones": bracket table and handle, dental handpiece unit, connectors and switches, dental chair head rest, light handle and switch, chair handle controls, suction connectors/manifold, spittoon. Only the "dirty zones" or visibly soiled areas need to be cleaned and disinfected between each patient, which reduces the time required for decontamination. Dirty areas which cannot be disinfected easily between patients or which are not practical to disinfect between patients such light handle and switches, dental unit switches, buttons on 3 in1, ultrasonic handle, control buttons on the dental chair can be covered with clear plastic wrap (cling film) or impervious plastic sleeves. Because such covering become contaminated by splatter and direct contact with gloved hands, the covering should be disposed of (wearing gloves) into hazardous waste bags and replaced between patients. If impermeable plastic coverings are not employed then a surface disinfectant should be used to disinfect these items and surfaces between patients.

At the end of the clinical session all work surfaces whether within the clean or dirty zones need to be thoroughly cleaned and disinfected. Wearing of heavy duty household gloves offers greater protection to the skin when using chemical disinfectants. Protective eyewear and masks should be worn during environmental cleaning to protect the staff from exposure to hazardous chemicals and infectious material.

The exception is the dental chair headrest where a detergent should be used, unless the headrest is visibly soiled with blood or saliva; as repeated use of chemical disinfectants can cause damage to the dental chair. The dental chair manufacturer will

recommend a suitable cleaning agent.

Clean zones: cabinets, surgery drawers, radiographs, patients notes, computer keyboards and pens are clean zones and should not be touched with contaminated gloved hands or instruments

During patient treatment impervious clinical sheets or plastic sheaves should cover all work surfaces that cannot be readily disinfected between patients. Items can be passed into "dirty zones" but contaminated items should not be passed out into "clean zones". Storage containers of dental materials should not be placed in the "dirty zone". Remove cling film/plastic sheaves and disinfect "dirty zones" between patient

At the end of a working session all surfaces should be thoroughly cleaned and disinfected using alcohol spray/wipe or proprietary antimicrobial disinfectant spray/wipe

Suction apparatus, aspirators, drains and spittoons should be flushed daily with a non-foaming disinfectant/ detergent (e.g. Tridaclens, Dekaseptol or Orotol) according to the manufacturer's instructions. Stationary spittoons are filled up with 3 % chloramin solution or 10-20 % chloride lime and covered with a polyethylene film for an hour. Wastes from spittoons is covered with 20 % bleach milk for an hour or 3 % chloramin solution and then throw them intoa trash can.

Trap filters must be removed and cleaned on a daily basis. Rinse thoroughly before replacing. Bleach or hypochlorite should not be used as they rust metal. Replace with new filters as specified by the manufacturer. Dental unit waterlines should be drained down at the end of the day and purged with a biocide for the time recommended by the manufacturer. Work surfaces should be kept clear overnight.

Current desinfection is carried out 2 times a day (at the beginning and at the end of the working day) in general and surgery premises (registry, corridors, hall, waiting room, locker room, etc.) with of 0,1 % desactin or others disinfectants. A door, a windowsill, tables, furniture are wiped with a rag moistened with a desinfection solution. Surgery premises for medical staff are washed once a day with 0,5 % washing liquid agent ("lotus" etc.).

The sequence of the current desinfection at medical-diagnostic premises: sterile table, medicine cupboard, manipulation table, dental units, windowsill, radiators, door, bowls, and floor last of all. Clean premises are lighted by bactericidal ultra-violet radiators (UVR) for 60 minutes and then ventilated.

Working surfaces of a medical table, a dental unit are wiped twice with the desinfection solution with an interval 15 minutes at the beginning of the working day, after each patient, at the end of the first shift, and at the end of the working day. The following disinfectants are used: 3% chloramin, 0,1 % Clorsept-17, 0,056 % Presept, 0,4 % Septodor-forte.

Walls are wiped with a sterile rag moistened with 3 % chloramin, 0,056 % Presept or other at the beginning of the working day, in the end of the first shift, and at the end of the working day. Light conductors of light-curing lamps are wiped with the sterile napkin moistened with 70° ethyl alcohol with an interval of 15 minutes twice.

Unit clean-up or unit turn-over step by step between patients:
1. Students and clinical assistants will wear masks, eyewear, gowns and utility gloves during unit clean up.

2. Safely dispose of sharps first in the designated rigid containers. Remove and discard body tissue fragments or items soaked in blood or saliva to biohazard waste containers. Sort and remove other disposables and debris from cassette and discard in general trash. Discard disposable gowns and large barrier trash in large trash bins located at sides of clinic areas. Small trash receptacle at unit is only for smaller non-biohazard trash.
3. Do not allow gross debris or cements to dry on instruments. It is the joint responsibility of clinic assistants and students to start instrument decontamination as quickly as possible to avoid dried debris damaging instruments and cassettes. Wipe cements and gross debris from cassettes and instruments by wiping against damp gauze (never use gauze in finger tips to remove debris from sharp instrument tips.)
4. Check for damaged or missing instruments and accessories required for that set. Separate endo files, holders and bur sets and note if replacements needed. If present, wipe gross soils from surface of hand pieces using damp paper towels. Contaminated instruments and equipment will be transported to dispensary area via carts within cassettes or solid side pans.
5. Remove all surface barriers and place in general trash. Turn off unit light.
6. After unit light has cooled off, leave light cover in place and clean off with damp paper towels. If noticeable spatter cannot be removed or is inside cover notify a clinic assistant.
7. Flush all hand piece and air/water lines for one minute.
8. Use diluted evacuation line cleaner to suction at least one to two cups solution through each evacuation line of the unit.
9. Clean all clinical contact surfaces after last patient of day including surfaces covered by barriers. Use the disinfectant / cleaner towelettes. Check all unit surfaces including countertops, unit arms, computer monitor screen cover, etc. for any visible soils, especially blood spatter. All visible soils must be cleaned and the same area disinfected using the two step method: clean first, discard towelettes, obtain fresh towelettes, reapply disinfectant, and allow 10 minute contact time. The upholstery of patient and clinician chairs, keyboards, and monitor covers may be cleaned with disinfectant wipes and then wiped off with plain paper towels dampened with water. If visible blood or other body soils are noted on upholstery or keyboards, the two step process should be used.
10. Replace unit light directly over chair. Raise chair slightly to allow floor cleaning.
11. Turn off unit control.
12. Change unit suction trap weekly.
13. Wash utility gloves with soap and water then remove and hang.
14. Wash hands thoroughly with soap and water prior to leaving clinic.

Dental Unit Set Up Step by Step:

1. Wash hands thoroughly with soap and water upon entering clinic and before touching any supplies or equipment. Remove personal items, backpacks, books, etc. from the treatment unit and store in student lockers. Don disposable clinic gown, eyewear, mask and clean gloves.
2. Water bottles may be left on units. Rinsing and disinfecting bottles is not necessary as all water used during treatment is continuously treated through a centralized silver ion system on the first and second floor clinics. Water for third floor clinic is treated from a centralized silver ion system. Treated water is then used in unit bottle systems. Bottles

will be removed, disinfected and allowed to dry on a daily basis in 3rd floor Orthodontic department clinics.

3. Flush all lines for at least one minute prior to installing tips, disposables or hand pieces.

4. Check treatment area for general cleanliness including floors, countertops, arms of unit. Use disinfectant / cleaner towelettes for spot cleaning. Remember – patients perceive infection control via visual assurance of a clean, neat treatment area.

5.Disinfect clinical touch surfaces using the two step method:

Clean first using an intermediate level tuberculocidal disinfectant with cleaning surfactants. Discard wipes or paper towels used for cleaning.

Apply disinfectant - dispense fresh disinfectant towelettes sufficient to reapply disinfectant to all clinical contact surfaces, counter tops and adjacent areas in the zone of aerosolization. Disinfectant total contact time is 10 minutes. Collect disposables and treatment items.

6. Wipe off excess disinfectant if necessary and ensure that seating areas of chairs and stools are clean and dry.

7. Place barriers over all clinical contact areas including: patient chair back, cart, keyboard, mouse, operator stool and height control, unit light handles and light switch, air/water handle, and controls for evacuation lines.

8. Attach air / water tip, evacuation tips and hand pieces. Place sterile bur in chuck of hand piece and run for 30 seconds. Re-cover hand pieces if they will not be immediately used. (After hand piece and bur are used during treatment, return to holder with bur end down.)

9. With clean bare hands collect disposable supplies, paper goods, biohazard bag, patient education and home care supplies, etc. Do not access supplies with gloved hands during patient treatment.

10. Seat patient, place bib and protective eyewear for patient. After initial conversation and medical history update, wash hands (soap and water or alcohol rub), place clinician PPE starting with mask, then eyewear, gloves last.

General cleaning is carried out in medical-diagnostic premises once a week and has the following stages: the first stage is the washing of a ceiling, walls, a floor with the 0,5 % washing agent l (50gr detergent for 10 litres of water) or 2 % soapy-soda solution according to the system of two buckets (tank №1 and tank № 2). First of all area of 2-3м^2 is carefully wiped with rag wetted in the tank №1 (a washing agent), rinse it in tank №2 (clean water), take it out, and wet it again in tank №1 and wash a new surface. Water in tank №2 is changed as it becomes dirty during cleaning; in tank №1 water is changed after washing of 60м^2 square area.

The second stage is the desinfection of walls and floor with 6 % hydrogen peroxide or 0,5 % desactin according to the system of two buckets with the exposure time for 60 minutes. After that processed area are washed with clean water. The third stage is the ultra-violet lighting of the premise with bactericidal ultra-violet sterilizer for 2 hours with the further airing. General cleaning of general and medical premises is carried out once a month.

DENTAL WASTE DISPOSAL GUIDE

This diagram is intended as a disposal guide for some types of regulated waste. It is not intended to serve as a comprehensive list of all regulated wastes.

Regulated Medical (Sharps) Waste

Needles, blades, endodontic files, partially full carpules, carpules contaminated with biohazardous waste.

- ✍ Sharps container treated by steam autoclave.
- ✍ Sharps container disposed of via a registered medical waste hauler.
- ✍ Alternative treatment technology.
- ✍ Mail back sharps.

Regulated Medical (Biohazardous) Waste

Fluid blood in IV tubing, infectious tissues, cultures.

- ✍ Red biohazard bag, stored inside a rigid container, treated by steam autoclave.
- ✍ Red biohazard bag, stored inside a rigid container, disposed of via a registered medical waste hauler.

Regulated Medical (Biohazardous) Liquid Waste

Body fluids and liquid blood.

- ✍ Sanitary sewer system.

Solid Waste

Waste of apparent medical origin that is not regulated medical waste, such as dressings with non-liquid blood.

- ✍ Regular trash disposed in a dumpster or trash enclosure maintained in sanitary condition.

Hazardous Waste

Iodine, lead, most cold sterilant solutions, isopropyl alcohols, cleaners that are corrosive, (with a pH=12.5 or 2.0). Lead foil, sludge from silver recovery unit (waste resulting from treating X-ray fixer onsite), dental amalgam, teeth with amalgam.

- ✍ Container with a hazardous waste label, a tight fitting lid and removed off site under a manifest by a registered hazardous waste hauler.
- ✍ Store in an appropriate container and maintain records that indicate that the waste is managed by a legitimate recycler.
- ✍ If not recycled, these wastes must be stored, labeled, and disposed of as a hazardous waste, as described above.

Chapter 7. PHYSIOTHERAPY IN PEDIATRIC DENTISTRY

Physiotherapeutic procedures have a great value at the treatment of different diseases. They are prescribed for a majority of forms and stages of pathological processes.

UHF-therapy

UHF-therapy is an application of variable electric field of the ultrahigh frequency (40 MHz) with the medical purpose.

Fluctuation of ions and orientation of dipoles of charged particles causes the transition of electric energy to thermal energy in body tissues. UHF electric field causes expansion of vessels, especially in deep tissues , activation of metabolism and ferment activity. Phagocytises, cellular and tissue protective mechanisms, and tissue dehydratation are growing. Due to the accumulation of calcium ions pH increases to alkaline level. Thus, UHF electric field has the anti-inflammatory action, stimulates the regeneration of damaged tissues, decreases angiospasm and pain, and increases salivation.

Indications: acute (including purulent) inflammatory processes, traumas of soft tissues and jaws, ulcerous erosive lesion of skin and oral cavity mucous membrane.

Contraindications: malignant growths, blood diseases, insufficiency of cardiovascular system, hypotension , pregnancy.

Equipment. The portable UHF device with frequency 40,68 MHz is more often used in dentistry .

Fig.14. UHF device

Operating procedure. UHF-therapy is carried through clothes, dry gauze, and plaster bandages. Metal crowns, dentures and splints in an oral cavity are not an obstacle for this procedure.

Seat a patient on a wooden chair with a special wooden headrest which allows to create an exact head position and provides the correctness of this procedure. Right position of an object in electric field is a guarantee of a resonance reception between therapeutic and generate contour of the device

Condenser plates for UHF-therapy are metal disks in the isolating rubber. The arrangements of condenser plates can be longitudinal or diametrical. If a distance between condenser plates is small, tissues can overheat . Diametrical arrangement of condenser plates is not used on a head. Condenser plates are placed at the distance of 6

cm from skin. Condenser plates are fixed by rubber bandages and are covered textile linings in children.

Exposure time of UHF electric field is 5-20 minutes, a quantity of procedures is 10-15 for the treatment course and dose depends on subjective heat sensation by the patient. They distinguish three doses: without the heat sensation (athermal), with weak heat sensation (olygothermal), with expressed heat sensation (thermal). The athermal dose is prescribed for a serous inflammation, olygothermal is prescribed for increase of blood supply, and thermal is prescribed for strengthening of an inflammatory reaction.

Ultra-violet (400-180 nm) rays

Mechanism. The variety of UV-rays action explains their vital necessity for normal course of physiological processes. Bactericidal action of UV-rays (280 - 180 nm) is in destruction of albuminous components of microorganisms. Bactericidal action of UV-rays is not directed only on a wound surface, but also into its depth. Under the influence of UV-rays an erythema appears on skin and mucous membrane of oral cavity, what is accompanied by vessels dilatation, increase of enzymatic processes and pH and formation of biogenic amines after the latent period (2-10 hours). Erythema reaches its maximum size after irradiation for 12-24 hours and then gradually decreases. On mucous membrane of the oral cavity erythema is forming during shorter latent period (2-4 hours) and disappears faster (12-24 hours) , because of powerful blood supply of the mucous membrane. Due to the change of chemical activity and blocking of nervous receptors the sensitivity to pain decreases and analgesia appears.

Indications: acute (including purulent) inflammatory processes, trauma of soft tissues and jaws, ulcerous erosive lesion of mucous membrane of the oral cavity, periodontal pain, tonsillitis, nasopharynx diseases, caries preventive dentistry, wounds subjected to anaerobic infection , whitening of teeth.

Fig.15. UFO device

Contraindications: malignant turmors, blood disease, insufficiency of cardiovascular system, endocrine deseases, active tuberculosis of lungs, skin and mucous membrane, supersensitivity to the ultraviolet irradiation.

UV-irradiation is carried out after definition of an individual sensitivity or a biodose (time needed for the formation of erythema on skin).

D'arsonval current

D'arsonval current – therapeutic application of high-frequency alternating currents (100 - 300 kHz), of high voltage (20 kV), and minor current strength (0,02 mA).

Mechanism. Local D'Arsonval current is used only in dental practice. Pulses of high-frequency oscillating current for 50 times a second, penetrate into tissues by means of glass vacuum condenser electrodes. A spark from electrode is resulted in an expressed local reaction. That is vessels dilatation, microcirculation acceleration, increase of tissue metabolism. All these factors add to regenerative process in tissues. Superficial sensitivity and pain become lower. Zones of micronecrosis are formed on skin and mucous membrane of the oral cavity which lead to nonspecific activation of protective tissues processes.

Fig.16. D'arsonval handpiece and different tips

Indications: injuries, mucosal ulceration, fractures of jaws, periodontitis, acute arthritis, periodontitis, catarral and hypertrophic gingivitis, chronic residual aphthous stomatitis, simple geniralized lichen ruber planus, tongue pain, (tri)facial neuralgia.

Contra-indications: malignant tumours, insufficiency of cardiovascular system, bleedings susceptibility, active tuberculosis of lungs, skin, mucous membranes.

Equipment. A device for local *D'Arsonval current application* is a set of vacuum electrodes: mushroom-shaped big and small electrodes, ear, big and small gingival, comb. Working time of device is 8 hours.

Manipulations. A required electrode is placed on skin or mucous membrane of an oral cavity. There are two methods of *D'arsonval current* use in medicine: contact (an electrode is directly applied on tissue) and remote (spark discharge skips through clearance (air gap) between tissue and an electrode therefore current action is more intensive).

To protect a glass electrode from a damage at sudden closing of a mouth, it is necessary to place cotton or gauze swab between teeth. Teeth are isolated with a piece of the sterile rubber glove to avoid unpleasant sensations. The duration of medical procedure is 3-20 minutes. Course of treatment 5-20 procedures.

Medical electrophoresis is a method of introduction of medicinal substance into tissues by means of constant current.

This technique is connected with ability of complex substances to dissociate in water into positive and negative ions which penetrate tissue from an electrode. These ions form an ion depot in tissues. This depot gradually resolves and provide constant

inflow of a medical substance into blood. Such factors as place of electrode application, general state of an organism, pharmacological properties of medical substance, its concentration, an individual sensitivity to current are very important. Optimal concentration for majority of substances is from 1 to 3 %.

Advantage of the electrophoresis is possibility of propelling medical substances into inaccessible tissues.

Indications: enamel and dentin injuries, chronic pulpitis, chronic apical periodontitis, impassability of root channels of teeth, chronic catarrhal and hypertrophic gingivitis, periodontitis after suppression of an active inflammation.

Contra-indications: acute inflammation (especially purulent) processes, turmors, symptomatic cerebral atherosclerosis, epilepsy, acute diseases of a skin, intoxication, susceptibility to bleedings, individual intolerance, chronic cardiac and renal insufficiency, metal denture, contra-indications to medicine.

Procedure. During electrophoresis an active electrode is placed on skin or on oral cavity mucous membrane. There is 2-3 layers gauze pad moistened with1-5 % solution of a medical substance between skin (tissue) and the active electrode. Passive electrode is fixed on a hand or forearm. A spacer of passive electrode is moistened with water or isotonic solution of sodium chloride.

Fig.17. «Potok-01M» for medical electrophoresis

There are different types of electrodes for dental electrophoresis. Root needle is used as anelectrode for the intra canal electrophoresis

Electrodes attach to device by means of clips at conductors. Pads of external electrodes are washed and sterilised by boiling, and metal plates are processed with ethyl alcohol and boiled at the end of working day. Course of electrophoresis treatment is 3-30 procedures, duration of one procedure is 20-30 minutes

Hydrotherapy (balneotherapy)

Hydrotherapy (balneotherapy) is irrigation of oral cavity with special devices feeding different liquids or water solutions under pressure of 1,5-2 atmospheres.

Mechanism. Water has great heat capacity and conductivity. Three factors of hydrotherapy are used in dental practice: temperature, pressure, and medicines which have physiological action.

During hydrotherapy microvessels of oral cavity are dilated; circulating blood volume and its saturation by oxygen increases; vascular wall permeability, fermentative activity, tissue metabolism increase are enhanced by hot water action. Otherwise receptors sensitivity decreases. Procedure with cold water has an opposite action.

The nervously-vascular reaction increases at the mechanical pressure of water (2-3 atmospheres). The greatest effect is observed during intermitten hydromassage when pressure periods alternate with pauses.

Mineral waters (sulphide, carbonic, alkaline, etc.) and artificial saturation of water by carbon dioxide gas, oxygen and medical substances, herbal decoctions (camomile, eucalyptus, etc.) are used for treatment of oral cavity mucous membrane diseases.

The influence of the hydrotherapy is mechanical cleansing, local rise of a temperature; normalisation of gingival colouring, elimination of the venous congestion, shortening of chronic inflammation, and decrease of sensitivity.

Indications: chronic gingivitis, chronic periodontitis, periodontosis, ulcerous erosive lesion of mucous membrane of the oral cavity, chronic residual aphthous stomatitis.*Contra-indications:* malignant tumors, purulent inflammatory processes, insufficiency of cardiovascular system, exhaustion, fever.

Equipment. Dental units are equipped with special cup for medical substance, which is preheated and syringe with a nozzle to spray this substance. It is used for gingival hydromassage.

Fig.18. Irrigator for oral cavity

Application technique. Rinsing, oral applications and water irrigation are widely used in the dentistry. There are three types of hydrotherapy: cold (20°C), indifferent (35 - 36°C), hot (38 - 40°C) and contrast procedure (cold-hot). The patient appreciation of the temperature is individual and depends on temperature differences between mucous membrane and water, and also from water pressure. It is recommended to start procedure with indifferent temperature, and then pass to cold or hot one. Indifferent temperature and small pressure (0,3-1 atmosphere) are used during acute inflammation and high temperature; pressure up to 2 atmosphere is used for chronic disease. High pressure (2-3 atmospheres) with a gradual decrease of a temperature till 25 - 20°C is used for periodontosis. The contrast temperatures with a gradual increase of their difference are used for the training of microvessels. Treatment course consists of 20-30 procedures.

Chapter 8. DENTAL RADIOGRAPHY

Ionising radiation includes X-rays, gamma rays and cosmic rays. The irradiation of cells can result in **somatic** effects (i.e. those occurring in the irradiated somatic cells of an individual) or **genetic** effects (i.e. those occurring in the germ cells and transmitted to the offspring of the irradiated individual) because of gonadal exposure. In properly conducted dental radiography, genetic effects are not usually considered because the gonads should not be irradiated.

Somatic effects can be:

• deterministic: cataract formation, loss of fertility, erythema of the skin, 'radiation sickness'

• stochastic: tumour induction (also occurs in genetic effects).

All deterministic effects have threshold doses below which they do not occur. Above the threshold dose, the effect is certain to occur. In dental radiography these thresholds should never be reached. The risk from dental radiography is for stochastic effects.

Doses in dental radiography can be minimised by considering:

- kilovoltage: for intra-oral radiography a minimum of 50 kilovoltage is set and 65-70 kV is recommended;
- AC/DC generation of X-rays: 'DC' (constant potential) generators lead to fewer low-energy (doseproducing) X-ray photons
- filtration: aluminium filters absorb low-energy X-ray photons
- collimation: on intra-oral X-ray sets, the beam can be restricted to a rectangle of 4 cm by 3 cm, leading to a substantial dose reduction over the conventional
- 6 cm diameter round beam; all new equipment should be fitted with rectangular collimation and it should be retro-fitted on older equipment; on panoramic machines, selective field size collimation facilities may be available
- film speed for intra-oral radiography:
- E-speed film needs approximately half the X-ray exposure of D-speed film, with
- no loss of diagnostic quality.

Dental radiography is one of the most valuable tools used in modern dental health care. It makes possible the diagnosis of physical conditions that would otherwise be difficult to identify and its judicious use is of considerable benefit to the patient. However, the use of dental radiological procedures must be carefully managed, because X-radiation has the potential for damaging healthy cells and tissues. Although no known occurrence of cancer or genetic damage has been observed from radiation doses delivered in modern dentistry, and until more evidence is available, one should practice radiation hygiene with the same care as would be dictated if a hazard were known to exist.

There are four main concerns when dealing with radiation hazards. First, patients should not be subjected to unnecessary dental radiography. Second, patients need to be protected from unnecessary exposures. Third, it is essential that personnel in dental facilities be protected from unnecessary exposure to radiation in the course of their work.

All operators must: understand the recommendations of this safety; recognize the radiation hazards associated with their work and take measures to minimize them; have a thorough understanding of safe working methods and appropriate techniques and procedures; strive to eliminate unnecessary radiographic procedures and reduce to the lowest practical values all patient exposures to radiation.

Design Criteria for Dental Facilities

In the planning of any dental facility, consideration must be given to the operating X-ray tube voltage, expected maximum workload of the equipment, orientation factors of the radiation barriers and occupancy factors for areas adjacent to the facility. Certain basic principles must be observed when determining the shielding requirements for a room used routinely for dental radiography. These are: the radiation levels in controlled areas that are occupied routinely by radiation workers must be such that no radiation worker can receive more than 20 mSv per year; and the radiation levels in uncontrolled areas must be such that no person can receive more than 1 mSv per year.

Protection of the operator and others near dental X-ray equipment should be achieved by:

- ensuring that the room containing the dental X-ray equipment is designed so that during the examination the operator is not exposed to the primary radiation beam and can keep a distance of at least 3 meters from the X-ray tube and from the patient. If it is not possible for an operator to keep at a distance of at least 3 meters from the X-ray tube, an adequately shielded barrier, which allows observation of the patient, must be provided for the operator to stand behind during radiography;
- shielding, where necessary, floor, walls, ceiling and doors, taking into account distance, maximum expected X-ray tube voltage, and workload. The orientation factors for the equipment along with the occupancy factors for the adjacent areas should be considered when more detailed shielding calculations are made;
- constructing shielding to form an unbroken barrier. Care should be taken in the use of shielding materials, especially lead, which must be adequately supported to prevent sagging;
- absorbing the primary radiation beam and stray radiation as close as possible to the source;
- ensuring that the primary radiation beam is always directed towards a shielded or unoccupied area;
- locating the irradiation switch for the dental X-ray equipment outside the room, at a sufficient distance from the X-ray tube, or behind an adequately shielded barrier;
- arranging for the final plans of the installation to be reviewed by the appropriate government agency when a new facility is constructed or modification to an existing one is made.

Conventional Dental X-ray Equipment

Applicator - A position-indicating device must be provided to limit the minimum focal spot to skin distance to not less than 18 centimetres. The applicator must be an open-ended type. Pointed cone or close-ended applicators must not be used. The primary radiation beam must be collimated in size at the end of the applicator to a circle not more than 7 centimeters in diameter, or a rectangle of area not more than 38,5 cm^2.

The maximum presettable irradiation time must not exceed 5 seconds, or the time required to deliver 50 milliampere- seconds, whichever is shorter.

Panoramic X-ray Equipment

Applicator - A position-indicating device must be provided to limit the minimum focal spot to skin distance to not less than 15 centimeters. Beam limiting device - The primary radiation beam must be collimated such that the size of the radiation beam at the image receptor does not exceed any dimension of the scanning slit by more than one-half of that dimension or by more than 2% of the focal spot to image receptor distance, whichever is less.

Cassette carrier - The cassette carrier should be interlocked such that irradiation is not possible, unless a film cassette is in the cassette carrier.

Controlling timer - The maximum presettable irradiation time must not exceed 25 seconds, or the time required to deliver 250 milliampere-seconds, whichever is shorter.

Cephalometric X-ray Equipment

Beam limiting device - The size of the primary radiation beam must not be more than 30 cm in diameter, or 800 cm2 in area for a rectangle, at a distance of 1,5 meter, or at the maximum focal spot to image receptor distance, whichever is less. Furthermore, the collimation must be such that the primary radiation beam is fully intercepted by the film cassette at the focal spot to film distance.

General guidelines on the conditions of storage areas, darkroom, and film processing

Film and chemical storage. Since radiographic films are sensitive to light, heat, humidity, chemical contamination, mechanical stress and X-radiation, they should be stored at temperatures in the range of 10°C to 21°C with humidity between 30% to 60%. It is best to follow the film manufacturer's instruction. Film storage areas should be free of chemical fumes and X-radiation. Processing chemicals should be protected from freezing. Manufacturer's recommendations should be followed in storing chemicals to avoid oxidization and any chemicals showing sign of oxidization or sedimentation must not be used.

Darkroom conditions. The darkroom must be clean of dirt, dust, and spilled chemical residues. The darkroom must be light-tight and that proper darkroom lighting used.

Procedures to Reduce Radiation Exposure to Personnel

To achieve optimum safety, operators of dental X-ray equipment must make every reasonable effort to keep radiation exposure to themselves and to others below the limits specified.

A room must not be used at the same time for more than one radiological investigation. All persons, other than the patient and those whose presence is essential, must leave the room when a radiographic examination is carried out.

Personnel must always keep as far away from the primary radiation beam as practical. Direct radiation exposure to personnel must not occur. Deliberate irradiation of an individual for training purposes must never be allowed. Anatomical phantoms of the human head and jaw regions should be provided for student to practice radiography during training courses. All personnel must use the protective devices available.

The operation of a X-ray tube should be controlled from the control panel located outside the radiography room or behind a protective barrier. In special circumstances, where the operator is required to control the loading while at the side of the patient, protective clothing must be worn. The dental film should be fixed in position with a holding device, whenever possible, otherwise it should be held by the patient. The dental practitioner or other personnel must not hold the film in place for the patient during the procedure. When there is a need to support children or weak patients, holding devices should be used. If parents, escorts or other personnel and be positioned to avoid the primary radiation beam. No one must regularly perform these duties.

An X-ray tube housing must not be held by hand during operation. All operators of X-ray equipment, together with personnel who routinely participate in radiological procedures must wear personnel dosimeters. The personnel dosimeter must be worn under the protective clothing. Energized dental X-ray equipment must not be left unattended.

Where a radiation dose in excess of 5% of the recommended dose limits for radiation workers is being received by any one person, an investigation about the causes and appropriate remedial steps must be taken to improve techniques and protective measures.

Dental X-ray equipment must only be operated by individuals who have been trained in the safe use of the equipment and the procedures being performed.

DENTAL X-RAY TYPES

There are two main types of dental X-rays: intraoral (meaning the X-ray film is inside the mouth) and extraoral (meaning the X-ray film is outside the mouth).

Intraoral X-rays are the most common type of dental X-ray taken. These X-rays provide a lot of detail and allow your dentist to find cavities, check the health of the tooth root and bone surrounding the tooth, check the status of developing teeth, and monitor the general health of your teeth and jawbone.

Extraoral X-rays show teeth, but their main focus is the jaw and skull. These X-rays do not provide the detail found with intraoral X-rays and therefore are not used for detecting cavities or for identifying problems with individual teeth. Instead, extraoral X-rays are used to look for impacted teeth, monitor growth and development of the jaws in relation to the teeth, and to identify potential problems between teeth and jaws and the temporomandibular joint (TMJ, see document, "temporomandibular disorders" for more information) or other bones of the face.

Types of Intraoral X-Rays

There are several types of intraoral X-rays, each of which shows different aspects of teeth.

Bite-wing X-rays show details of the upper and lower teeth in one area of the mouth (fig 19,20,21). Each bite-wing shows a tooth from its crown to about the level of the supporting bone. Bite-wing X-rays are used to detect decay between teeth and

in bone density caused by gum disease. They are also useful in determining the proper fit of a crown (or cast restoration) and the marginal integrity of fillings.

Periapical X-rays show the whole tooth from the crown to beyond the end of the root to where the tooth is anchored in the jaw. Each periapical X-ray shows this full

tooth dimension and includes all the teeth in one portion of either the upper or lower jaw. Periapical X-rays are used to detect any abnormalities of the root structure and surrounding bone structure. *Occlusal X-rays* are larger and show full tooth development and placement. Each X-ray reveals the entire arch of teeth in either the upper or lower jaw.

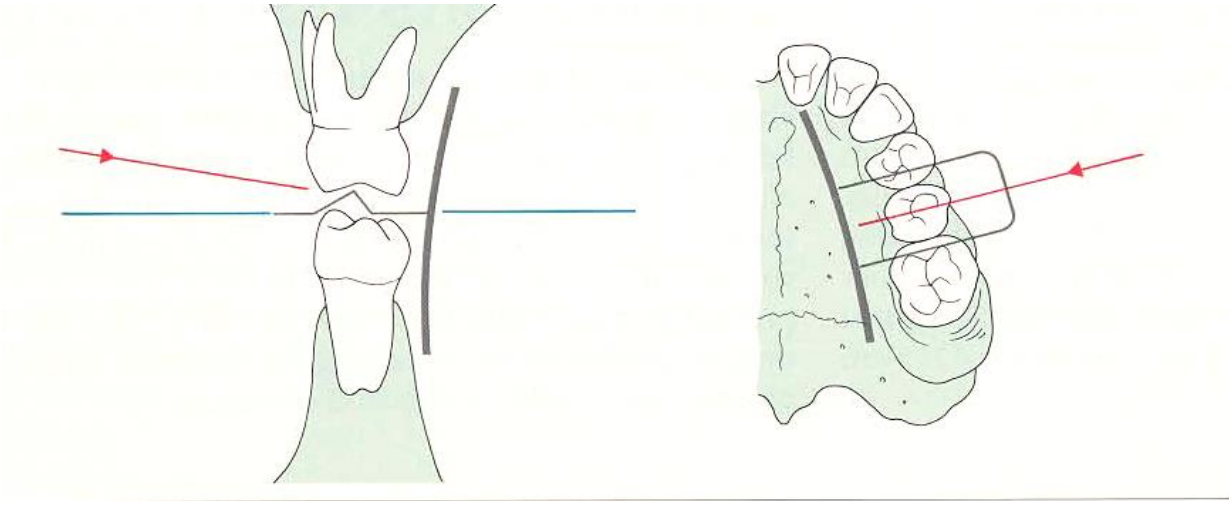


Fig.19.Bite-wing radiograph. The paper lab of the film packetmust not be pulled too tightl. The central ray traverses the first or second deciduous molars and is targeted with approximately a 5°angle.

Fig. 20. Position of a head and a device

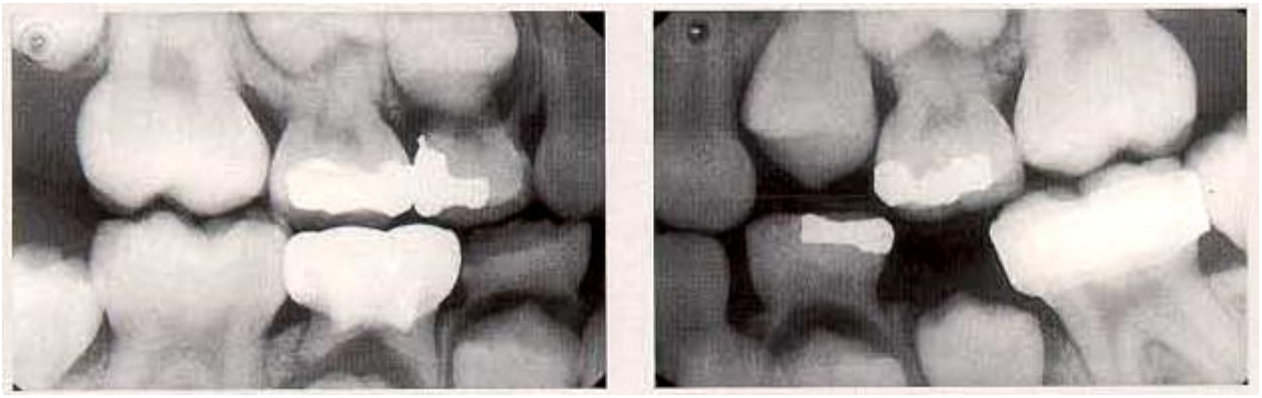


Fig.21. Bite-wing films of deciduos teeth

Types of Extraoral X-Rays

There are several types of extraoral X-rays that your dentist may take.

Panoramic X-rays show the entire mouth area all the teeth in both the upper and lower jaws on a single X-ray. This type of X-ray is useful for detecting the position of fully emerged as well as emerging teeth, can identify impacted teeth, and aid in the diagnosis of tumors.

Fig.22. The Panoramic Film (Panorex)

As you can see from the image above, the Panorex is a large, single x-ray film that shows the entire bony structure of the teeth and face. It takes a much wider area than any intra oral film showing structures outside of their range including the sinuses, and the temperomandibular joints. It shows many pathological structures such as bony tumors and cysts, as well as the position of the wisdom teeth. They are quick and easy to take, and cost a little more than a full series of intraoral films. In addition to medical and dental uses, panoramic films are especially good for forensic (legal) purposes in the identification of otherwise unrecognizable bodies after plane crashes or other mishaps.

Panoramic films differ from the others in that they are entirely extraoral, which means that the film remains outside of the mouth while the machine shoots the beam through other structures from the outside. It fits into a broad category of medical x-rays called tomographs.

Tomograms show a particular layer or "slice" of the mouth while blurring out all other layers. This type of X-ray is useful for examining structures that are difficult to clearly see -- for instance, because other structures are in very close proximity to the structure to be viewed.

Cephalometric projections show the entire side of the head. This type of X-ray is useful for examining the teeth in relation to the jaw and profile of the individual. Orthodontists use this type of X-ray to develop their treatment plans.

Sialography involves visualization of the salivary glands following the injection of a dye. The dye, called a radiopaque contrast agent, is injected into the salivary glands so that the organ can be seen on the X-ray film (the organ is a soft tissue that would not otherwise be seen with an X-ray). Dentists might order this type of test to look for salivary gland problems, such as blockages or Sjögren's syndrome.

Computed tomography, otherwise known as CT scanning, shows the body's interior structures as a three-dimensional image. This type of X-ray, which may be performed in a hospital or radiology center rather than a dentist's office, is used to identify problems in the bones of the face, such as tumors or fractures. A tomograph is a computer assisted method of focusing x-rays on a particular slice of tissue and showing that slice on the film as if there were no other structures outside of that slice. It has a number of real advantages over the intraoral variety of film discussed above. Since it is entirely extraoral, it works quite well for gaggers who could not otherwise tolerate the placement of films inside their mouths. The patient stands in front of the machine (pictured on the right), and the x-ray tube swivels around behind his head. Another advantage of the panoramic film is that it takes very little radiation to expose it.

Computerized Tomography (CT) uses fan shaped, or cone shaped beams of x-rays that scan each point in an object from multiple angles to create an array of data points. Conventional radiographs represent 2-D images of 3-D objects with significant structure superimposition and unpredictable magnification. Cone beam computed tomography (CBCT), however, allows true 3-D visualization of the dentoalveolar structures, avoiding major limitations of conventional radiographs (fig.23,24). The detector takes numerous "snapshots" called "views." About 1,000 views are taken in one rotation. Each profile is analyzed by computer software, and the full set of profiles from each rotation is compiled into a two dimensional image representing a "slice" through the subject in the same plane as the beam.

Digital X-rays (fig 25)

In digital radiography, a sensor replaces the film normally used for traditional radiographs. The sensor plugs into the USB port on an ordinary computer. The most common type of intraoral sensors are solid-state electronic devices called “charged-coupled devices” (CCD).

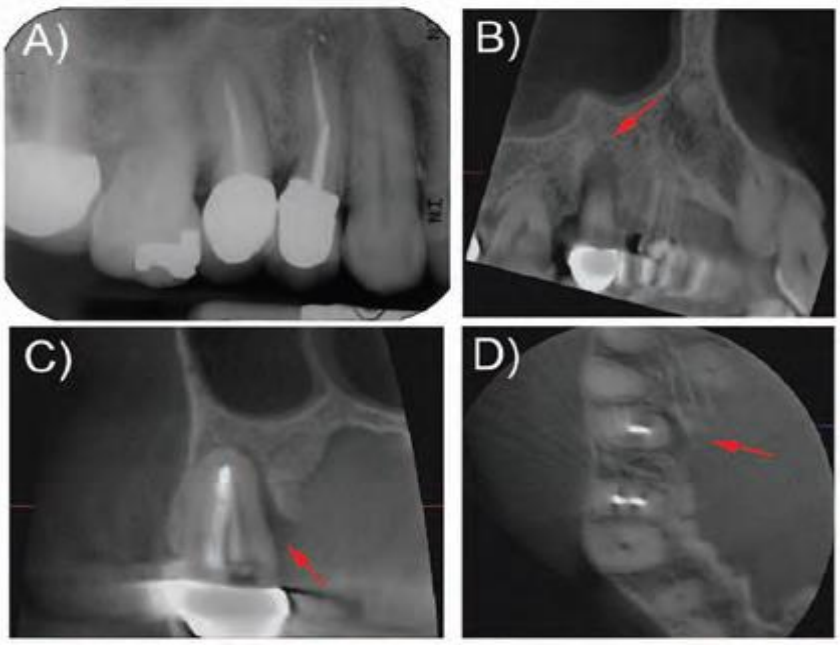


Fig.23. Periapical (a), sagittal (b), cross-sectional (c), and axial (d) CBCT sections of 14 tooth. Red arrow on CBCT images points to periodontal defect. CBCT images in this and the remaining figs were generated by the limited FOV 3-D Accuitomo CBCT scanner.

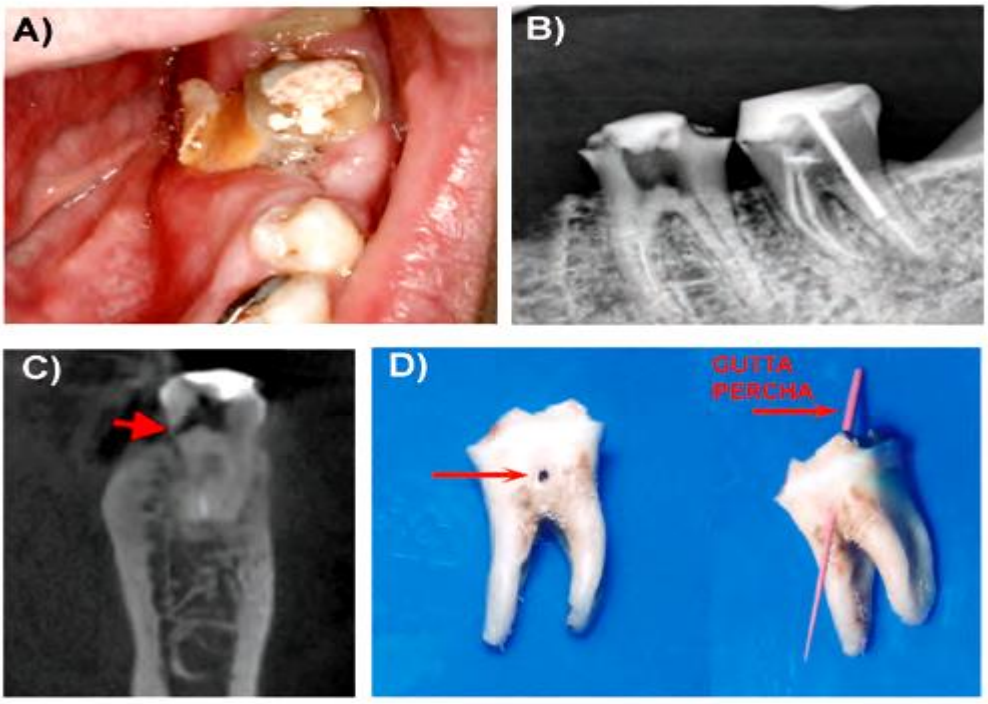


Fig.24. (a) Clinical picture demonstrating soft-tissue sloughing of lingual gingiva after application of sodium hypochlorite during endodontic treatment of 36 tooth. (b) Midtreatment periapical radiograph erroneously demonstrating unperforated root of 36 tooth. (c) CBCT cross-section showing perforation of the lingual surface of 36 tooth at the cervical area (arrow). (d) After extraction of 36, the perforation is clearly seen (arrows). A gutta percha cone has been inserted in the perforation through the coronal surface of the tooth..

Fig.25. Digital sensor is placed in a polythene cover to prevent contamination and cross-infection. It can be held in position with the patient's finger, or in a special Rinn holder.

A CCD is composed of millions of light sensitive silicon cells arranged in a rectangular array on the face of the sensor. Each cell on the face of the sensor will eventually result in one pixel (picture element) in the final image. The x-ray photons falling upon each cell create an analog (continuous) electrical voltage.

The level of the voltage produced depends on the number of photons reaching the cell, and this in turn depends on the density of the structures (teeth and bone) between the x-ray source and the CCD. The voltage level for each pixel is converted to digital data (numbers between 0 and 65,536) by a relatively simple device called an "analog to digital converter". Each value is interpreted by the computer as a shade of gray. In this way, the image is converted to millions of tiny digital picture elements (pixels) which are reassembled by the computer into a coherent image.

Digital technology does, however, require substantially less radiation than film. The largest benefit of digital x-rays is the ability to computer-enhance the images, making them larger, clearer, or higher contrast at will. This can be helpful, particularly for dentists with less experience in reading traditional film, but it is rarely essential in making a correct diagnosis. Larger, sharper images are helpful in patient education and in helping patients to accept a treatment plan. There is no darkroom developing of the images, and the sensor can be moved about in the mouth more quickly than films, which must be exchanged for new ones for each shot. Thus digital radiography cuts down on the time it takes to expose and process a series of intraoral films.

CHAPTER 9. PERSONAL PROTECTION OF A MEDICAL PERSONAL

PPE (Personal protective equipment) is designed to protect the skin and the mucous membranes of the eyes, nose, and mouth of dental health-care personnel from exposure to blood or other potentially infectious material. A visible spray is created during the use of rotary dental and surgical instruments (e.g., handpieces, ultrasonic scalers) and air-water syringes. This spray primarily consists of a large-particle spatter of water, saliva, blood, microorganisms, and other debris. Spatter travels only a short distance and settles out quickly, landing either on the floor, nearby equipment and operatory surfaces, dental health-care personnel, or the patient. The spray may also contain some aerosol (i.e., particles of respirable size: 10 microns). Aerosols take considerable energy to generate and are not typically visible to the naked eye. Aerosols can remain airborne for extended periods and can be inhaled. However, they should not be confused with the large-particle spatter that makes up the bulk of the spray from handpieces and ultrasonic scalers.

Gloves

The Role of Gloves - to provide a barrier to protect the wearer from contamination with patient's blood or saliva, to reduce the risk of transmission of microbes from dentist to patient.

Gloves should be powder-free and have the lowest levels possible of extractable proteins and chemical accelerators (the recommended levels are < 50 m g/g of latex proteins and levels of < 0.1%w/w for residual accelerators). Always choose a glove that fits you correctly. Don't use disposable clinical gloves for scrubbing instruments. To help protect the hands from sharps injuries use heavy duty, lined household gloves for washing instruments and general environmental cleaning. These gloves are reusable, wash whilst on the hands and dry. If excess sweating under the gloves becomes a problem, cotton glove liners can be worn.

The type of glove used should be based upon the type of procedure to be performed (e.g., surgical vs. nonsurgical, housekeeping procedures). Medical-grade nonsterile examination gloves and sterile surgical gloves are medical devices regulated. General-purpose utility gloves are not regulated because they are not promoted for medical use. Sterile surgical gloves must meet standards for sterility assurance established by the FDA and are less likely than nonsterile examination gloves to harbor pathogens that may contaminate an operative wound.

Protective eyewear

The clinical dental team must protect their eyes and those of the patient against splatter, aerosols and foreign bodies such as amalgam fragments. Protective eyewear protects the mucous membranes of the eyes from contact with microorganisms. Protective eyewear for patients also can protect their eyes from spatter or debris generated during dental procedures. Reusable protective eyewear should be cleaned with soap and water, and when visibly soiled, disinfected between patients.

Goggles

Goggles or visors should be worn during all types of dental treatment or when manually cleaning instruments prior to sterilization.

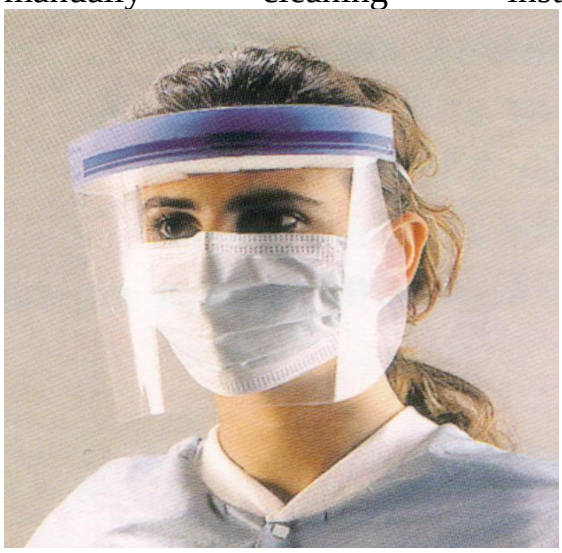


Fig.26. Goggles

Choose goggles or protective glasses with side protection. Goggles should be decontaminated according to the manufacturer's instructions e.g. alcohol based surface disinfectant or hypochlorite 1000 ppm available chlorine followed by thorough rinsing in water.

Visors

Spectacles do not provide sufficient eye protection, so wear a visor or face shield over spectacles. Visors have the added advantage of discouraging touching of the face with contaminated gloved hands. Visors are either single use disposable, or if designated re-useable, then follow manufacturer's instructions for cleaning the surface with disinfectant.

Use disposable visors if treating patients with a contagious respiratory illness (e.g. Flu), as re-useable visors and goggles with elastic straps cannot be readily cleaned.

Masks

Dental health-care personnel should wear a surgical mask that covers both their nose and mouth during procedures and patient-care activities that are likely to generate splashes or sprays of blood or body fluids. Usual masks produce a poor facial seal and are not designed to filter the air as it is breathed into the lungs. So do not protect the wearer from aerosol inhalation. When a surgical mask is used, it should be changed between patients or during patient treatment if it becomes wet.

Respirator type masks offer a higher degree of personal respiratory protection compared to a standard facemask. They filter out airborne particles as the air is breathed in through the mask. However, they are not intended to filter out gases. Standard surgical and respirator type masks provide no or only partial protection of the wearer from respiratory pathogens such as Mycobacteria tuberculosis or influenza.

Protective equipment should be removed in the following order :

First - Gloves (then clean hands)

Second - Mask (or respirator), or a visor if worn and then mask

Third - Protective eyewear (goggles)

Protective clothing

Various types of protective clothing (e.g., gowns, jackets) are worn to prevent contamination of street clothing and to protect the skin of personnel from exposure to blood and body fluids. When the gown is worn as personal protective equipment (i.e., when spatter and spray of blood, saliva, or other potentially infectious material is anticipated), the sleeves should be long enough to protect the forearms. Protective clothing should be changed daily or sooner if visibly soiled.

Tunics and uniforms become contaminated with microorganisms during clinical treatment. It is recommended that tunics /uniforms are washed and changed daily. Protective clothing should not be worn in designated eating and rest areas within the practice. Remove protective clothing when eating and drinking.

When purchasing tunics and other protective clothing choose items that can tolerate washing at the higher temperatures that kill bacteria. Wash protective clothing separately from other clothes using a "hot" washing machine cycle at a setting of 50^{o}C or above. The heat produced by ironing also contributes to destroying bacteria remaining on clothes.

Technique for dairy handwashing

- Remove all jewellery and roll back sleeves.
- Wet hands under running water. Apply soap to all areas of hands.
- Rub hands together vigorously, thoroughly cleansing all surfaces for 10-15 seconds.
- Avoid contaminating arms, splashing clothing or floor. Do not touch equipment e.g. taps
- Rinse hands thoroughly under running water.
- Dry hands thoroughly using paper towels. Turn off tap using paper towel.

Hands must be washed thoroughly with a proprietary disinfectant liquid soap and dried prior to putting on and after removing gloves. Any cuts or abrasions to the hands or wrists should be covered with adhesive waterproof dressing.

Liquid soap disinfectant combinations have been shown to be more than twice as effective as bar soap at removing bacteria from the hands. Water control taps should be wrist, elbow or foot operated. Disposable paper towels are recommended.

Contactless system hands desinfection

Nebucid millennium (Fig 27)

A principle of work of system extremely simple: place hands in the device, but not tough it. The sensor control will automatically define presence of a hand at the device and will include a spray with antiseptic solution Dermocol. After taking off hands from the device

solution will evaporate from a skin surface, having softened and having humidified it. Time of hand exposition into device - 3 seconds without any source of a solution. At the full tank of the device procedure can be repeated more two thousand times.

Procedure to use sterile gloves

- Peel the outer envelope wrap. Place it on a clean, dry surface so that the cuffed end of the gloves is facing towards you.
- Do a sterile scrub of your hands and forearms using a scrub brush before putting on the gloves.
- Open the inner wrapper paper by touching the underside of the wrapper.
- Pick up a glove with the hand the glove will not go on. You should grab it by the folded back cuff that will be inside the glove once it is on your hand.
- Slip your hand into the glove while keeping your fingers pointed downward.
- Slip your fingers inside the glove and wiggle them until each fit firmly inside the finger holes. With your other hand still on the folded cuff part of the glove, pull the glove on the rest of the way.
- Pick up the second glove with your gloved hand. You can do this by sliding your fingertips under the cuff of the second glove that will be on the outside of the glove once it's on your hand.
- Slide your ungloved hand into the glove while holding your hands above waist level. Wiggle your fingers into the correct holes.
- Pull the glove on by pushing it up your forearm with your fingers of the first gloved hand which are inside of the cuff.
- After the glove is on, unfold the cuff with your fingertips inside of the cuff.
- Use the second glove to unfold the first glove's cuff.

Bloodborne Pathogens

Bloodborne Pathogens are any pathogenic microorganism that is present in human blood or other potentially infectious materials (OPIM), and can infect and cause disease in humans. Examples: HIV, HBV, HCV, *Treponema pallidum,* Herpes virus, *M. tuberculosis* (typically an aerosol hazard), human T-Lymphotropic Virus Type I (HTLV).

Some of body fluids that can harbor Bloodborne Pathogens: blood, saliva involved in dental procedures, human tissue and cell cultures, all body fluids containing blood.

Occupational Exposure

- Mucous membrane contact
- Splash to the eyes, nose or mouth
- Percutaneous inoculation
- Misuse of sharps (broken glass, needles, scalpels, dental bur, knife)
- Exposure to broken/damaged skin
- Risk increases if contact involves a large area of broken/damaged skin or if contact is prolonged

Preventive Measures

Risk of exposure can be minimized or eliminated by using the following controls: engineering control, personal protective equipment, administrative control, work place practices.

Engineering Control

- Leak proof containers use for storage and transportation of all bloodborne pathogen material
- Sharps containers fill no greater than ¾ full
- Needleless devices use retractable syringes, self-sheathing needles (if possible).

Administrative Control

- Medical surveillance - TB skin or Quantiferon test, baseline serum
- Immunization against hepatitis B virus
- Training of BBP, infection control, hazard communication
- Management of staff - SOP compliance
- Background checks

Injury Prevention

- Restrict use of fingers in tissue retraction or palpation during suturing or administration of anesthesia;
- Avoid uncontrolled movements of dental instruments.
  THINK BEFORE MOVING AN INSTRUMENT!
- Remove burs from handpiece immediately after completion of dental procedure;
- Use the needle recapped to recap anesthetic needles;
- NEVER use two hands!

Sharp instruments

- Handle carefully
- Do not recap with two hands
- Discard in sharps container
- Do not bend or break needles
- Report all injuries

Discard in sharps containers : used needles, blades, scalpels, burs, anesthetic cartridges, broken glass.

Maintain the Clinical Worksite

- Worksite must be maintained in a clean and sanitary condition
- Equipment and work surfaces must be cleaned and disinfected before and after procedures, and after any contact with blood or OPIM
- Protective covering must be used to cover equipment and work surfaces
- Biological waste and contaminated materials must be disposed of in appropriate biological waste containers

Immunisation

Vaccination against hepatitis B virus (HBV) is strongly recommended for all clinical dental personnel including dentists, dental nurses, assistants, dental hygienists and students. Protection is also advised against diseases such as tuberculosis, varicella, poliomyelitis, measles, mumps, diptheria and tetanus. Non-pregnant women of

childbearing age should be also immunized against rubella if they are not immune. Vaccination against rubella should be avoided during pregnancy.

TABLE 2.

Suggested work restrictions for health-care personnel infected with or exposed to major infectious diseases in healthcare settings, in the absence of state and local regulations

Disease/problem	**Work restriction**	**Duration**
Conjunctivitis	Restrict from patient contact and contact with patient's environment.	Until discharge ceases
Cytomegalovirus infection	No restriction	
Diarrheal disease		
Acute stage (diarrhea with other symptoms)	Restrict from patient contact, contact with patient's environment, and food-handling.	Until symptoms resolve
Convalescent stage, Salmonella species	Restrict from care of patients at high risk.	Until symptoms resolve; consult with local and state health authorities regarding need for negative stool cultures
Enteroviral infection	Restrict from care of infants, neonates, and immunocompromised patients and their environments.	Until symptoms resolve
Hepatitis A	Restrict from patient contact, contact with patient's environment, and food-handing.	Until 7 days after onset of jaundice
Hepatitis B		
Personnel with acute or chronic hepatitis B surface antigenemia who do not perform exposure-prone procedures	No restriction†; refer to state regulations. Standard precautions should always be followed.	Until hepatitis B antigen is negative
Personnel with acute or chronic hepatitis B antigenemia who perform exposure-prone procedures	Do not perform exposure-prone invasive procedures until counsel from a review panel has been sought;	

	panel should review and recommend procedures that personnel can perform, taking into account specific procedures as well as skill and technique. Standard precautions should always be observed. Refer to state and local regulations or recommendations.	
Hepatitis C	No restrictions on professional activity.† HCV-positive health-care personnel should follow aseptic technique and standard precautions.	
Herpes simplex		
Genital	No restriction	
Hands (herpetic whitlow)	Restrict from patient contact and contact with patient's environment.	Until lesions heal
Orofacial	Evaluate need to restrict from care of patients at high risk.	
Human immunodeficiency virus; personnel who perform exposure-prone procedures	Do not perform exposure-prone invasive procedures until counsel from an expert review panel has been sought; panel should review and recommend procedures that personnel can perform, taking into account specific procedures as well as skill and technique. Standard precautions should always	

	be observed. Refer to state and local regulations or recommendations.	
Measles	Exclude from duty	
Active	Exclude from duty	Until 7 days after the rash appears
Postexposure (susceptible personnel)	Exclude from duty	From fifth day after first exposure through twenty-first day after last exposure, or 4 days after rash appears
Meningococcal infection	Exclude from duty	Until 24 hours after start of effective therapy
Mumps		
Active	Exclude from duty	Until 9 days after onset of parotitis
Postexposure (susceptible personnel)	Exclude from duty	From twelfth day after first exposure through twenty-sixth day after last exposure, or until 9 days after onset of parotitis
Pediculosis	Restrict from patient contact	Until treated and observed to be free of adult and immature lice
Pertussis		
Active	Exclude from duty	From beginning of catarrhal stage through third week after onset of paroxysms, or until 5 days after start of effective antibiotic therapy
Postexposure (asymptomatic personnel)	No restriction, prophylaxis recommended	Until 5 days after start of effective antibiotic therapy
Postexposure (symptomatic personnel)	Exclude from duty	
Rubella		Until 5 days after rash appears
Active	Exclude from duty	
Postexposure (susceptible personnel)	Exclude from duty	From seventh day after first exposure through twenty-first day after last exposure
Staphylococcus aureus infection		
Active, draining skin	Restrict from contact with	Until lesions have resolved

lesions	patients and patient's environment or food handling.	
Carrier state	No restriction unless personnel are epidemiologically linked to transmission of the organism	
Streptococcal infection, group A	Restrict from patient care, contact with patient's environment, and food-handling.	Until 24 hours after adequate treatment started
Tuberculosis	Exclude from duty	Until proved noninfectious
Active disease	No restriction	
PPD converter		
Varicella (chicken pox)	Exclude from duty	Until all lesions dry and crust
Active		
Postexposure (susceptible personnel)	Exclude from duty	From tenth day after first exposure through twenty-first day (twenty-eighth day if varicella-zoster immune globulin [VZIG] administered) after last exposure.
Zoster (shingles)		
Localized, in healthy person	Cover lesions, restrict from care of patients§ at high risk	Until all lesions dry and crust
Generalized or localized in immunosuppressed person	Restrict from patient contact	Until all lesions dry and crust
Postexposure (susceptible personnel)	Restrict from patient contact	From tenth day after first exposure through twenty-first day (twenty-eighth day if VZIG administered) after last exposure; or, if varicella occurs, when lesions crust
Viral respiratory infection, acute febrile	Consider excluding from the care of patients at high risk¶ or contact with such patients' environments	Until acute symptoms resolve

	during community outbreak of respiratory syncytial virus and influenza	

Inoculation injuries

Inoculation injuries must be dealt with promptly and correctly – the wound should be allowed to bleed and washed thoroughly with running water. A full record of the incident should be made in the accident book and include details of who was injured, how the incident occurred, what action was taken, which dentists were informed and when and, if known, the name of the patient being treated. Both the injured person and the dentist in charge should countersign the record.

The risk of acquiring HIV infection following an inoculation injury is small. If the injury is risk-assessed as significant for transmission of HIV and the source patient is HIV infected, the use of antiretroviral drugs taken prophylactically as soon as possible after exposure – ideally within one hour –is recommended. Post-exposure prophylaxis (PEP) involves the use of a short course (four weeks) of treatment with anti-retroviral drugs in an attempt to reduce even further the risk of infection with HIV following exposure. Dentists should clarify local arrangements for urgent access to PEP, with the help of an occupational health department or a consultant in communicable diseases, before any incident occurs.

Management of needlestick injuries

The practice Safety Statement should outline in detail the appropriate protocol to be followed in the event of a sharps injury, blood or body fluid exposure. This protocol should include reference to the following:

The staff member affected (the victim) should:

1. Report the incident immediately.

2.Wash the area immediately under running water or use an eye-washing bottle as appropriate

3. Make the wound bleed for three to four minutes whilst continuing to wash the area. Dry area with paper towel.

4. Cover the wound with a water-impermeable sticking plaster and consider double gloving any hand injury, if continuing to work.

5. Seek appropriate medical advice.

6. The source patient should be identified and arrangements made for a blood sample to be obtained, with informed consent. This should be tested for the presence of the blood borne viruses hepatitis B, hepatitis C and HIV.

7. Arrangements should be made for blood samples to be taken from the staff member (victim) with informed consent. One sample is marked “for storage” and is retained in the relevant laboratory. The other is analyzed to determine the staff member’s hepatitis B antibody level.

8. Further assessment, treatment and follow up of the staff member are performed in accordance with current best practice. Arrangements should be in place for speedy assessment and treatment.

9. Counseling, reassurance and information may be required and arrangements for

accessing this should be in place as appropriate. Appropriate records must be kept.

The spilled blood should be completely covered either by disposable towels, which are then treated with 10,000 ppm sodium hypochlorite solution or by sodium dichloroisocyanurate granules. At least 5 minutes must elapse before the towels etc are cleared and disposed of as clinical waste. The dental health care worker who deals with the spillage must wear appropriate protective clothing, which will include household gloves, protective eyewear and a disposable apron and, in the case of an extensive floor pillage, protective footwear. Good ventilation is essential.

EMERGENCY EQUIPMENT SET-UP FOR EXPOSURE INCIDENT

Each dental surgery should have emergency set-up for exposure incident that is any reasonably anticipated eye, skin, mucous membrane, or parenteral contact with blood or other potentially infectious fluids or during the course of one' duties.

Set-up.

1. Finger caps - 1 – 2 items for each worker.
2. Adhesive plaster - 1 item.
3. Scissors - 1 item
4. Potassium permanganate (doses on 0,05gr) - 3 units
5. Tank for preparation of potassium permanganate solution with 1L mark.
6. Ethyl alcohol 70° - 50 ml.
7. Tube-dropper with30 % albucid solution - 1 - 2 units
8. 5 % spirit iodine solution .
9. 3 % solution of hydrogen peroxide.
10. 1 % solution of boric acid.
11. Gloves - 3 steams.
12. Bandage, cotton tampons.
13. Disinfectants (are kept separately):

- chloramin (30,0) - 3 units
- chloricin (30,0) - 3 units

14. Tank for desinfection solution preparation - 1 unit
15. Pipettes for eyes and nose.

The emergency set-up should be stored in a easily accessible place, in a box or a metal box. Managers and head nurse control the terms of set-up storage and its update.

Instructions for emergency case.

1. If the contact with blood, biological liquids or biomaterials is accompanied by percutaneus injury the victim has to take off gloves so as a working surface should be turned inside out and squeeze out blood from the wound; process injured area with desinfection solution (70° ethyl alcohol, 5 % iodine tincture, in case of cuts - 3 % hydrogen peroxide); carefully wash the hands with soap under running water, and then wipe them with 70º ethyl alcohol; apply a plaster on a wound, put on a finger cap; to put on rubber gloves if a work continues; urgently inform a clinic manager about the case for its registration.

2. If contact with blood, biological liquids or biomaterials is not accompanied by any injury of skin the employee has to process a contaminated place with disinfectant

(70° ethyl alcohol, 5 % iodine tincture, in case of cuts - 3 % hydrogen peroxide); wash area with soap and secondary to process with an ethyl alcohol .

3. If a blood, biological liquids or biomaterial contaminate mucous membranes:
Rinse mouth with 70° ethyl alcohol;
Drop 30 % albucid solution into nasal cavities;

In case of eye contact rinse your eyes in plenty of water and drop 30 % albucid solution. It is possible to use 0,05 % solution of potassium permanganate or 1 % solution of boric acid for processing of nose and eyes.

4. If blood, biological liquids or biomaterial have occur on clothes, take it off and soak it in desinfection solution; contaminated footwear should be wiped twice with the rags moistened with desinfection solution .

5.Tables, equipment or floor contaminated by blood or other biological liquids must be cleaned with 0,5 % desactin for 60 minutes (for AIDS- 120 minutes) with further cleaning. The second variant (Dental Branch 2008 Annual Clinic Update) is:

- Wear appropriate PPE and clean up all blood (or OPIM) spills with a 10% bleach solution or another approved disinfectant;
- Apply disinfectant to perimeter of spill and slowly proceed inwards;
- Allow at least 15 minutes of disinfectant contact time;
- Be careful of sharps! Remove any sharps from the spill (after disinfectant contact time) using forceps and discard in sharps container;
- Slowly wipe up spill, working from the perimeter of the spill inwards; clean area with disinfectant again;
- Materials used to clean up the spill (e.g., towels) should be disposed in biohazard container.

Post Exposure Management Report Form

A body fluid exposure occurs when a person has been exposed to another person's body fluids. This includes needle, instrument, bur or file sticks and splashes to eyes, mouth or open skin (cuts). This Policy applies to students, faculty, staff, and patients.

REPORT TO INFECTIOUS DISEASE CLINIC WITHIN 2 HOURS OF EXPOSURE. Take a copy of this form with you.

Step by Step Process: 1. If with a patient, stop treatment process as quickly and safely as possible. Avoid alarming patient with inappropriate remarks.

DO NOT DISMISS PATIENT.

2. Wash wound immediately with soap and warm water. Squeezing the wound is not recommended. DO NOT use antiseptics on the wound. If eye is exposed, irrigate with one liter normal saline.

3. Immediately notify supervisor, or for students - the supervising faculty.

4. Stabilize treatment in progress and assure patient is comfortable.

5. Obtain a copy of this form, complete information below.

6. Instructors must notify program supervisor immediately of incident. Program Supervisor must notify Dean of Academic Affairs.

Name of injured person_____ Student Staff Faculty (circle)

Injured person's normal duties / job description:_____

Time & Date Injury Occurred:_____Time / Date Reported:_____

Location of exposure on injured person (e.g., "right index finger") _____

Hep. B vaccination: Yes No / Full Series? Yes No /Post Titer Done? Yes No

HBV antibody status if known:_____

Tetanus vaccination: Yes No Date of last Tetanus vaccination: _____

Clinic/department where injury occurred:_____Supervisor:_____

General Exposure Incident Information:

Is injury sharps related? Yes No

Type of device: (circle) blade needle / gauge bur endo file instrument

Clinic/department where exposure occurred: _____

Procedure or task in progress: _____

How incident occurred: _____

Describe the injury (depth of wound, gauge of needle):

_____

If fluid injected and volume of infectious material injected:

_____

Mucous membrane exposure? Yes No Where?

_____

Source Patient Information: Source Unknown? Yes (if unknown, skip this section)

Name _____DOB _____

SSN _____ Phone_____

Home Address _____

From chart and medical history, list any known infectious disease status including HBV, HIV, HCV, etc.

Was there exposure of source patient to HCW body fluids during course of exposure incident? Yes No
(For example: Did student nick self with contaminated needle, then proceed with injection.)
If Yes, describe injury to source patient: _____
Written Opinion received from Infectious Disease Clinic within 15 days: Yes No
Copy of Written Opinion filed in employee confidential medical record: Yes No
Copy provided to employee / student: Yes No
Note: If written opinion not received, check with clinic and injured person. OSHA requires the employer and the worker both receive copies. Copy of written opinion must be kept in employee's confidential medical record. Report must only contain documentation that employee was informed of evaluation results and need for follow-up; and whether HBV vaccine was indicated and if received.
All other findings or diagnoses remain confidential and not included in written report.

Chapter 10. DENTAL LABORATORY ASEPSIS

All impressions, appliances, wax rims, bite / jaw registrations or other materials that have been placed in the patient's mouth are a potential source of cross contamination. Also lab items such as burs, polishing wheels, points, pumice pans, lab knives can transfer contamination from case to case. Therefore, IMI dental laboratory infection control will be based on the "clean" lab concept: All impressions, appliances, wax rims, bite / jaw registrations or other materials that have been placed in the patient's mouth will be disinfected in the clinic area before transporting such materials into any lab area including the first floor production lab. If dental prosthetic devices require adjustment or polishing that cannot be completed chairside, such items must be rinsed off and disinfected prior to entering the lab area.

Procedures for disinfecting impressions and prosthetic items

An intermediate level water based disinfectant – ready to use – with squirt top dispenser, and baggies will be supplied at each treatment unit. When it is anticipated that impressions or appliances will need to be disinfected, have disinfectant and several baggies out on counter ready for use on paper towel. All usual clinic PPE should be worn – clean gloves, mask, eyewear and gown.

Upon removal of impressions, appliances, etc. from patient's mouth, gently rinse off blood, saliva or other soils. If necessary obtain denture brush to remove debris from appliances. Shake gently to remove excess water. Place item inside baggie, squirt sufficient disinfectant onto item inside baggie to ensure complete coverage of all surfaces. Close baggie, allow 10 minute contact time. Remove gloves, wash hands. Rinse item gently to remove traces of disinfectant. Wash hands.

Transport disinfected impressions, device, etc. inside clean baggie to lab area with bare hands. Do not transport contaminated items into labs or attempt to disinfect inside lab. Student and faculty clinicians must discard gloves and disinfect hands PRIOR to entering lab areas. Contaminated gowns must also be removed if visibly soiled with blood or if going to lab area that is not immediately adjacent to clinic.

Before returning appliances and restorative items from lab to patient: reclean item with denture brush. Make sure to remove any excess dust, polishing materials, etc. Rinse. Disinfect in clinic area using same protocol in fresh baggie. Rinse thoroughly prior to returning to patient.

Type of Impression Material and Recommended Disinfectants

1. Alginate – Immerse in iodophors or 0.5% hypochlorite
2. Polysulfide – Immerse in glutaraldehyde, iodophor, 0.5% hypochlorite or phenolic
3. Silicone – Immersion in any disinfectant
4. Polyether – Spray and wrap in iodophor, 0.5% hypochlorite, phenolic disinfectants. Polyether is sensitive to immersion
5. Hydrocolloid – Immerse in iodophor, 0.5% hypochlorite
6. Impression Compound – Immerse in iodophor, 0.5% hypochlorite

DO NOT WEAR GOWNS OR GLOVES outside of the dental department and related safety issues for lab areas.

Many lab activities produce spatter or aerosol. Wear safety eyewear and mask. Secure hair away from face and check for loose clothing when working with rotary devices. Use built-in device to suction lab dust. Use built in plastic face screens. Wash hands after leaving lab and before re-gloving for patient contact.

Cleaning and disinfecting lab equipment:

• all heat tolerant semi-critical items (used inside the mouth) must be cleaned and heat sterilized between uses: eg. metal impression trays, face bow forks, burs for chairside adjustment / polishing. Facebow earpieces should be cleaned and disinfected between uses;

• shade guides must be single use disposable, barrier protected, or cleaned and disinfected between uses;

• articulators will be cleaned and disinfected or barrier protected between uses (posterior posts and incisal pins may be barrier protected);

• polishing lathe: use unit dose fresh pumice, clean disposable tray and clean sterile rag wheel;

• clean up splatters and spills immediately;

a sharps container will be kept in each lab for disposal of contaminated sharps (eg. Blades, broken lab knives, orthodontic wire from intra oral procedures, etc.).

All appliances, prosthetic devices received from internal or external lab production for delivery to the patient must be disinfected prior to try-in if not clearly labeled as disinfected from the lab.

Rinse disinfectant off before inserting intra-orally.

Adjustment or polishing of appliances, prosthetic devices, restorative items in the lab areas:

• if items require polishing or adjustments in the lab area after insertion in the patient's mouth, they MUST be cleaned and disinfected before going into any lab area. Clean with denture brush at chairside, rinse, disinfect in clinic, discard gloves, wash hands;

• before returning appliances and restorative items from lab to patient: reclean item with denture brush. Make sure to remove any excess dust, polishing materials, etc. Rinse. Disinfect in clinic area. Rinse thoroughly prior to returning to patient. All items sent to outside lab facilities will be clearly labeled as disinfected & type of disinfectant used.

Guidelines for Sterilization of Orthodontic Pliers and Molar Bands:

1. Ultrasonic cycle for 5 to 12 minutes depending on the capacity of the unit.
2. Rinsing with distilled Water.
3. Remove excess moisture thorough drying with Compressed Air *(Oil-Free).*
4. Lubrication of Plier joints and cutting surfaces with silicone based lubricants.
5. Sterilization protocol using a Dry-Heat Sterilizer at 190°C for 6 to 12 minutes with the placement of pliers in an open.
6. Storage.

Infection control checklist

At start of day/session
Fill the autoclave reservoir and run the autoclave for a complete cycle
Record the sterilisation parameters reached in your autoclave logbook
Compare these with the manufacturer's recommended parameters
Before patient treatment
Ensure that all equipment has been sterilised or adequately disinfected (if it cannot be sterilised)
Put disposable coverings in place where necessary
Place only the appropriate instruments on bracket table
Set out all materials and other essential instruments
Update patient's medical history
During patient treatment
Treat all patients as potentially infectious
Wear gloves, masks and protective eyewear and protective clothing
Provide eye protection for patient
Wash hands before gloving; a new pair of gloves must be used for each patient
Change gloves immediately if they are torn, cut or punctured
Use rubber dam to isolate where appropriate
Use high-volume aspiration
Ensure good general ventilation of the treatment area
Handle sharps carefully and only re-sheath needles using a suitable device
After patient treatment
Dispose of sharps via the sharps container
Segregate and dispose of clinical waste
Clean and inspect all instruments to ensure visibly clean before placing in an ultrasonic cleaning machine or washer/disinfector
Sterilise cleaned instruments using an autoclave and store covered
Clean and disinfect all contaminated work surfaces
Clean and disinfect impressions and other dental appliances
before sending to laboratory
Prepare surgery for next patient
At the end of each session
Dispose of all clinical waste from the surgery area
Clean and disinfect all work surfaces thoroughly
Disinfect the aspirator, its tubing and the spittoon
Clean the chair and the unit
Empty and clean ultrasonic cleaning machine and leave to dry.
At the end of the day
Drain autoclave chamber and water reservoir to remove all residual water and leave to dry.

TESTS

1. Vaccination of employees against the hepatitis B virus must be offered within how many days following the start date of employment?
A. 5 days
B. 7 days
C. 10 days
D. 30 days

2. The most effective method of preventing cross-contamination in the dental office is:
A. using an intermediate level disinfectant on all surfaces.
B. soaking contaminated instruments in a high level disinfectant.
C. wearing the proper PPE for all procedures.
D. performing proper handwashing.

3. Which of the following will determine that instrument sterilization was achieved?
A. Process integrators
B. Physical monitors
C. Biological monitors
D. Chemical indicators

4. A high level disinfectant must have the ability to kill:
A. bacterial spores.
B. the hepatitis B virus.
C. tuberculosis.
D. fungus.

5. Dental instruments that are used in the mouth but do not penetrate tissue or bone:
A. critical instruments.
B. semicritical instruments.
C. noncritical instruments.
D. nonsterile instruments.

6. The main disadvantage to using a dry heat sterilizer is:
A. ventilation that must be used.
B. tendency to rust instruments.
C. long cycle time.
D. inability to use cassettes.

7. Critical items must be treated with which of the following methods to prevent the spread of infection?
A. Desinfection
B. Barriers
C. Sterilization
D. Sanitation

8. Saliva ejectors and plastic high-volume evacuator tips should be:
A. disposed of after use.
B. disinfected with a chemical agent.
C. sterilized in an autoclave.
D. sterilized in a dry heat sterilizer.

9. An example of a bloodborne pathogen is:
A. hepatitis A.
B. hepatitis C.
C. tuberculosis.
D. influenza.

10. A positive biological monitoring test result indicates:
A. desinfection was achieved.
B. sterilization failed.
C. all spores were destroyed.
D. the autoclave is functioning properly.

11. Which of the following is considered regulated waste?
A. Cement mixing pads
B. Utility gloves
C. Used anesthetic needles

D. Used drinking cups

12. Destruction of all microorganisms is called:
A. cleaning.
B. sterilization.
C. desinfection.
D. sanitation.

13. A chemical labelled a disinfectant is unable to kill:
A. the HIV virus.
B. the hepatitis B virus.
C. the H1N1 virus.
D. bacterial endospores.

14. Microorganisms that produce disease in humans are known as:
A. nonpathogens.
B. pathogens.
C. microflora.
D. biofilm.

15. Which of the following tasks would require the dental assisting to wear utility gloves?
A. Disinfecting the operatory following patient care
B. Preparing the operatory for patient care
C. Taking an alginate impression
D. Retrieving instruments from a drawer during patient care

16. Which intermediate level disinfectant may contribute to staining of clinical surfaces?
A. Phenolics
B. Iodophors
C. Quaternary ammonium compounds
D. Sodium bromide

17. The patient notes on her medical history that she has active tuberculosis. She is scheduled for a crown preparation. How does her condition affect her dental treatment?
A. She should be treated like any other patient utilizing standard precautions.
B. She should be treated with double gloves and extra sterilization of the instruments used.
C. Her treatment should be postponed until her disease is no longer active.
D. She should be treated with prophylactic premedication before the procedure.

18. To properly dispose of a blood-soaked gauze square, place it in:
A. a regulated trash bag.
B. the general waste bag.
C. a leak-proof sharps container.
D. the sterilizer and then the general waste bag.

19. Overgloves should be used when:
A. disinfecting the operatory after patient care.
B. performing an intraoral examination.
C. preparing the operatory for patient care.
D. opening a drawer during patient treatment.

20. The major advantage to using liquid chemical sterilization is that:
A. sterilization is achieved in a short period of time.
B. corrosion or rusting of instruments will not occur.
C. items that would be damaged by heat can be sterilized using this method.
D. items do not require the use of pouches or bags.

21. Sodium hypochlorite is recommended as a disinfectant for:

A. clinical contact surfaces.
B. housekeeping surfaces.
C. surfaces covered by barriers.
D. surfaces that are easily stained by iodophors.

22. Which method of sterilization is recommended for items that will be used immediately after removal from the sterilizer?
A. Dry heat sterilization
B. Steam sterilization
C. Flash sterilization
D. Chemical sterilization

23. Which mode of transmission involves contact with a contaminated instrument or surface?
A. Airborne transmission
B. Droplet transmission
C. Direct contact
D. Indirect contact

24. Microorganisms that accumulate on wet surfaces, such as on the inside of dental waterline tubing, are called:
A. bioburden.
B. biofilm.
C. pathogens.
D. protozoa.

25. The MOST effective method of confirming sterilization of instruments is with:
A. chemical indicators.
B. chemical integrators.
C. bacterial spore testing.
D. physical monitoring.

26. Which of the following diseases is easily transmitted in the healthcare setting?
A. HIV/AIDS
B. Tuberculosis
C. MRSA
D. Hepatitis A

27. What is the mechanism of action of the autoclave sterilizer?
A. Dry heat
B. Steam under pressure
C. Chemical vapor under pressure
D. Chemical action

28. The first handwashing of each day should include:
A. hot water rinse.
B. soft brush to scrub nails.
C. quick cold water rinse.
D. 10-minute surgical prep.

29. According to OSHA, the Hepatitis B vaccine is to be made available to employees at risk for contamination. The employee is responsible for:
A. the cost of the vaccine only.
B. the cost of the vaccine and the office visit.
C. arriving on time for the appointment.
D. taking an immune globulin drug.

30. The main disadvantage of using a dry heat sterilizer is:
A. damage to heat-sensitive items.
B. corroding of carbon steel instruments.
C. inability to use closed containers.
D. inability to use spore testing.

31. Gauze that has had contact with bodily fluids, such as blood and/or saliva, is what type of waste?
A. Contaminated
B. Medical
C. Infectious
D. Pathogenic

32. Which of the following PPE (personal protective equipment) is used

to prevent inhalation of droplets and/or spatter?
A. Overgloves
B. Protective eyewear
C. Mask
D. Face shield

33. What is the purpose of a barrier in infection control?
A. Provide an exit portal for infectious agents
B. Disrupt the transfer of infectious agents
C. Provide a reservoir for infectious agents
D. Sterilize infectious agents

34. Used barriers and paper from the dental office are classified as what type of waste?
A. Regulated
B. Nonregulated
C. Biohazardous
D. Pathogenic

35. Which of the following may be used as a surface disinfectant in the dental office?
A. Iodophors
B. Ethyl alcohol
C. Isopropyl alcohol
D. Ammonia

36. Routine handwashing will remove:
A. resident microflora.
B. transient microflora.
C. microbial microflora.
D. resistant microflora

37. Which of the following is a pathogenic waste?
A. Mixed amalgam
B. Needles
C. Extracted teeth
D. Spore test strips

38. Any reusable item intended for patient care should be:
A. covered to prevent contamination.
B. lubricated prior to the next use.
C. wiped thoroughly with a surface disinfectant.
D. heat sterilized after use.

39. Which of the following chemicals can be used as an immersion disinfectant/sterilant for instruments?
A. Iodophor
B. Glutaraldehyde
C. Sodium hypochlorite
D. Synthetic phenols

40. What is the appropriate PPE when processing instruments in the ultrasonic cleaner?
A. Examination gloves, mask, safety glasses, and gown
B. Overgloves, mask, safety glasses, and gown
C. Utility gloves, mask, safety glasses, and gown
D. Double examination gloves, mask, safety glasses, and gown

41. A needlestick injury could transmit disease. This type of disease transmission is called:
A. enteral.
B. parenteral.
C. opportunistic.
D. vector-borne.

42. After treatment, using a low-level disinfectant-type cleaner on the bagged dental chair:
A. is not necessary.
B. results in microbial resistance.
C. provides additional asepsis.

D. requires a second disinfecting.

43. Which of the following is the best choice for cleaning the dental vacuum system?
A. Nonfoaming, enzymatic cleaner
B. Bleach solution
C. Water-based detergent
D. Chlorhexidine solution

44. Prior to placing instruments into a sterilizer, they must be precleaned in a/an
A. disinfectant.
B. autoclave.
C. ultrasonic unit.
D. holding solution.

45. Which of the following surface disinfectants is tuberculocidal?
A. Iodophor
B. Glutaraldehyde
C. Bleach
D. Quaternary ammonia

46. Which surface is likely to become contaminated in a dental operatory during a procedure?
A. Floor around the chair
B. Clinical contact surfaces
C. Patient records
D. Radiographic equipment

47. Which of the following is a noncritical instrument?
A. Amalgam condenser
B. Scalpel
C. Mouth mirror
D. X-ray tubehead

48. An example of a percutaneous injury is:
A. aerosol spatter from the high-speed handpiece.
B. a needlestick from a sharps container.
C. direct contact with an open lesion.
D. splatter of a chemical into the eye.

49. If mercury is spilled in the office, it should be cleaned up using:
A. vacuum cleaner.
B. high-volume evacuator.
C. spill kit.
D. x-ray fixer.

50. Which of the following items produces the most aerosol and splatter?
A. Saliva ejector
B. High-speed handpiece
C. Air-water syringe
D. High-volume evacuator

51. Scrap amalgam should be:
A. disposed of in the trash.
B. stored in an airtight container.
C. autoclaved prior to recycling.
D. burned in an incinerator.

52. The purpose of the ultrasonic cleaner is to:
A. disinfect instruments prior to sterilization.
B. remove debris from instruments prior to sterilization.
C. sterilize heat-sensitive instruments.
D. prevent instruments from corrosion.

53. Instruments used on amalgam restorations should be cleaned of all debris prior to autoclaving because amalgam:
A. releases free vapor when heated.
B. will bake onto the instrument when heated.
C. can cause cross-contamination.
D. can harbor microbes.

54. The last PPE put on before beginning patient treatment must be:

A. mask.
B. face shield.
C. gloves.
D. protective eyewear.
E. disposable gown.

55. The main goal of an effective infection control plan in a dental office is to:
A. reduce the number of microbes.
B. identify patients with diseases.
C. assure patients that the office is clean.
D. keep employees healthy.

56. Items that cannot be placed in the autoclave but are reusable are classified as:
A. critical items.
B. semicritical items.
C. noncritical items.
D. housekeeping items.

57. Which of the following is a required safety measure when using a curing light?
A. Face mask
B. Clear safety glasses
C. Tinted safety glasses
D. Full face shield

58. Patients who close their lips around the saliva ejector to clear their mouths run the risk of what type of contamination?
A. Staff to patient
B. Patient to staff
C. Patient to patient
D. Office to community

59. The MOST resistant form of known life is:
A. virulent fungus.
B. capsule.
C. spore.
D. anaerobe.

60. How would a dental assistant ensure that cross-contamination does not occur when a patient's denture is polished in the lab?
A. Soak the denture in a mouth rinse for 30 minutes.
B. Have the patient rinse with chlorhexidine for 30 seconds before removing denture.
C. Use only disposable or sterilized polishing materials.
D. Disinfect using the spray-wipe-spray technique.

61. How often should a face mask be replaced?
A. Between patients
B. Every 30 minutes
C. Upon completion of each procedure
D. Once a day

62. The name of the cleaning technique used at the end of a patient appointment is:
A. spray-wipe-spray.
B. spray-spray-wipe.
C. clean-wipe-disinfect.
D. disinfect-wipe-bag.

63. To maintain high filterability, a face mask that is moist from exhaled air should be replaced:
A. every 20 minutes.
B. every 30 minutes.
C. every hour.
D. when saturated.

64. Which of the following personal protective barriers should ALWAYS be put on last?
A. Gloves
B. Mask

C. Protective eyewear
D. Protective clothing

65. Which of the following is NOT recommended for use as a surface barrier?
A. Plastic-backed patient napkins
B. Paper tray liners
C. Plastic bags
D. Clear plastic wrap

66. Gloves contaminated during dental procedures should be discarded in:
A. regular waste receptacle.
B. regulated medical waste receptacle.
C. biohazard receptacle.
D. sharps container.

67. An alcohol-based hand rub should be used only:
A. when sterile gloves are to be donned immediately afterward.
B. following handwashing with another antimicrobial hand soap.
C. if there is no visible soil on the hands.
D. when the hands are visibly soiled.

68. Personal protective equipment includes all of the following EXCEPT:
A. safety glasses with eye shields or face shields.
B. masks or respirators.
C. gowns laundered at home.
D. gloves.

69. Which of the following is NOT true regarding the use of overgloves?
A. They are acceptable alone as a hand barrier for intraoral procedures.
B. They are discarded after a single use.
C. They can be worn over contaminated treatment gloves.
D. They can be used to touch a noncontaminated object.

70. When performing a thorough hand washing before gloving, you should rinse your hands with water at what temperature?
A. Cool
B. Tepid
C. Warm
D. Hot

71. OSHA requires office personnel to get which kind of immunization?
A. Hepatitis B
B. Meningitis
C. Pneumonia
D. Strep throat

72. Which of the following used items is considered regulated medical waste?
A. Clinic gowns
B. Sharps
C. Masks
D. Exam gloves

73. The most appropriate gloves to clean and process contaminated instruments are:
A. examination gloves.
B. overgloves.
C. sterile gloves.
D. utility gloves.

74.Which of the following is the BEST way to clean the high-speed handpiece after patient treatment?
A. Flush 20 to 30 seconds between patients
B. Sterilize in packaging materials
C. Place in cold sterile solution overnight
D. Wipe down with glutaraldehyde solution between patients

75. The front desk and walls of the dental office are classified as

housekeeping surfaces and should be cleaned with:
A. low-level disinfectant.
B. mid-level disinfectant.
C. high-level disinfectant.
D. liquid sterilant.

76. Improperly cleaning a dental unit after a procedure could lead to what route of cross-contamination?
A. Patient to staff
B. Staff to patient
C. Patient to patient
D. Office to community

77. A good way to reduce cross-contamination of dental materials is to use:
A. a disinfectant ahead of time.
B. disposable materials.
C. the spray-wipe-spray technique.
D. materials that have been sterilized before use.

78. The best way to minimize cross-contamination of X-ray equipment is to:
A. use the spray-wipe-spray technique.
B. double glove before touching.
C. cover the control panel with plastic.
D. take off gloves prior to exposing the film.

79. Which of the following chemicals is a high-level disinfectant?
A. Alcohol
B. Chlorine dioxide
C. Iodophor
D. Sodium hypochlorite

80. The active ingredient in chlorine compounds used in dentistry for intermediate-level surface desinfection is:
A. dimethyl benzyl ammonium chloride.
B. ethyl alcohol.
C. iodine.
D. sodium hypochlorite.

81. Which of the following is the best description of an intermediate-level disinfectant?
A. Kills most tuberculosis spores and most viruses
B. Kills all tuberculosis spores and all viruses
C. Kills some tuberculosis spores and some viruses
D. Kills all tuberculosis spores and most viruses

82. Which of the following solutions is best for cleaning the dental suction lines?
A. Bleach, detergent, and water solution
B. Nondetergent, enzymatic cleaning solution
C. Detergent, nonenzymatic cleaning solution
D. Iodophors, detergent, and water cleaning solution

83. What should you use to remove needles from reusable syringes?
A. Hemostat
B. Gloved hands
C. Recapping device
D. Retractor

84. It is important for the dental assistant to have a foundation in microbiology in order to:
A. cure disease in the dental setting.
B. prevent disease transmission in the dental setting.
C. diagnose disease transmission in the dental setting.
D. evaluate disease transmission in the dental setting.

85. Which agent is NOT recommended for surface desinfection?
A. Sodium hypochlorite
B. Ethyl alcohol
C. Phenols
D. Glutaraldehyde

86. If an employee is stuck with a needle or contaminated instrument, the employee should remove his/her gloves then:
A. place a bandage and continue working.
B. wash hands and use antibiotic ointment.
C. wash hands and inform the doctor.
D. check the patient's medical history.

87. To ensure sterilization, steam sterilizers should be loaded so that:
A. instrument packages completely fill the autoclave.
B. instrument packages are processed one at a time.
C. instrument packages are packed loosely into the autoclave.
D. instrument packages are double wrapped.

88. When evaluating the effectiveness of the sterilizer, what is used as the test medium?
A. Fungal protoplasts
B. Viral capsids
C. Bacterial endospore
D. Protozal

89. After being used for patient treatment and before being sterilized, dental instruments should be:
A. soaked in soapy water for 30 minutes.
B. scrubbed with a brush under running water.
C. placed straight into a bag and sealed.
D. placed in the ultrasonic unit or instrument washer.

90. One of the most common liquid sterilants is:
A. glutaraldehyde.
B. phenol.
C. sodium hypochlorite.
D. quaternary ammonium.

91. Which method of sterilization is used for instruments that are subject to corrosion?
A. Dry heat sterilization
B. Steam under pressure
C. Chemical vapor under pressure
D. High-level chemical desinfection

92. Sterilization is defined as:
A. the reduction of pathogenic microorganisms to a safe level.
B. the destruction of all life forms.
C. a cleaning process to enhance desinfection.
D. the destruction of all bacterial spores.

93. What is the main disadvantage of a chemical vapor sterilizer?
A. It requires 6 to 10 hours operating time.
B. It cannot sterilize plastics and fabrics.
C. It must be placed in a well-ventilated area.
D. It causes wear and tear on the instruments.

94. When the color indicator on the sterilization package changes color after processing, this indicates that the sterilizer:
A. operated for the correct time frame.
B. finished sterilizing the instruments.
C. reached the correct temperature.
D. reached the correct pressure.

95. Chemicals that are identified as a health hazard are color coded:
A. blue.
B. red.
C. yellow.
D. white.

96. Which of the following is the best description of an intermediate-level disinfectant?
A. Kills most tuberculosis spores and most viruses
B. Kills all tuberculosis spores and all viruses
C. Kills some tuberculosis spores and some viruses
D. Kills all tuberculosis spores and most viruses

97. What characteristic will a radiograph exhibit if the film was placed backward in the mouth?
A. Blurred image
B. Clear film
C. Herringbone effect
D. Dark fi lm

98. Elongation on a dental radiograph is caused by
A. too much horizontal angle.
B. too little horizontal angle.
C. too much vertical angle.
D. too little vertical angle.

99. When taking a radiograph of a 6-year-old patient, which of the following adjustments is made for the child's size?
A. Higher kilovoltage
B. Lower kilovoltage
C. Shorter exposure time
D. Longer exposure time

100. Cone cutting results when the central ray
A. is not aimed at the center of the film.
B. is aimed directly at the center of the film.
C. has too much horizontal angulation.
D. has too little vertical angulation.

101. If the distance between the tooth and the X-ray beam is decreased, the image will have
A. decreased magnification.
B. increased magnification.
C. long-scale contrast.
D. short-scale contrast.

102. Penumbra is the
A. magnification of an object.
B. negatively charged ion.
C. distortion of the image.
D. diffuse outline of the image.

103. Which of the following positioning errors results in an overlapped image?
A. Incorrect vertical angulation
B. Tubehead movement
C. Incorrect horizontal angulation
D. Patient movement

104. When using an aiming ring to align the PID (device on the X-ray tubehead that aims the X-ray beam), the rim on the open end of the tube should be
A. parallel to the ring.
B. perpendicular to the ring.
C. positively angled.
D. negatively angled.

105. Overlapping the contact areas on a bitewing radiograph is an indication that the
A. horizontal angulation is off.
B. vertical angulation is off.
C. negative angulation is off.
D. positive angulation is off.

106. Filters are used in the X-ray tubehead to reduce
A. image density.
B. exposure time.
C. the size of the beam.
D. the patient radiation dose.

107. How should film be repositioned when the third molar is not showing up on a radiograph of the mandibular molar area?
A. Lower the film
B. Raise the film
C. Move the film forward in the mouth
D. Move the film farther back in the mouth

108. The distal surface of the canine should be observed in which of the following radiograph exposures?
A. Molar bitewing
B. Premolar bitewing
C. Lateral incisor periapical
D. Central incisor periapical

109. Which of the following anatomical landmarks is not visible in the mandibular molar exposure?
A. External oblique ridge
B. Mental foramen
C. Mandibular canal
D. Mylohyoid ridge

110. The horizontal line from the top of the ear through the corner of the eye that is used for positioning a patient for a panoramic film is the
A. ala-tragus line.
B. midsagittal plane.
C. Frankfort plane.
D. transcranial line.

111. Occlusal radiographs are used to
A. diagnose dental disease.
B. look for interproximal caries.
C. look at the maxillary sinuses.
D. locate specifi c dental anomalies.

112. Extraoral radiographs are used by the dentist to identify
A. overhanging crowns or restorations.
B. both the mandible and maxilla at the same time.
C. caries in the anterior teeth.
D. decay between tooth surfaces.

113. Which of the following could result in a panoramic X-ray with a flat occlusal plane or smile line?
A. Chin tipped too low
B. Chin tipped too high
C. Chin held too far forward
D. Chin held too far back

114. Digital radiography uses less radiation than film-based radiography because
A. exposure time is increased.
B. there is no developing time with digital.
C. the sensor is larger than the film.
D. the sensor is more sensitive than film.

115. The following are ionising radiation (few answers):
a. X-rays
b. Radiowaves
c. Microwaves
d. Gamma rays
e. Cosmic rays

116. The following are everyday risks to patients in dental radiography (few answers):
a. Deterministic effects
b. Somatic stochastic effects
c. Genetic stochastic effects
d. Salivary gland cancer

e. Cataract formation

117. Lower radiation dose for a periapical radiograph can be achieved by (few answers):
a. Using a 50 kV X-ray set rather than a 70 kV X-ray set
b. Using a constant potential (DC) X-ray set rather than a pulsating potential (AC) X-ray set
c. Using a lead apron
d. Using D-speed film
e. Using a digital radiography system

ANSWERS FOR TESTS

1. Vaccination of employees against the hepatitis B virus must be offered within how many days following the start date of employment?
C. 10 days. According to the OSHA Bloodborne Pathogen Standard, employees must be offered the
hepatitis B vaccination series within 10 days following the start date of employment.
2. The MOST effective method of preventing cross-contamination in the dental office is
D. performing proper handwashing. Handwashing is an excellent prevention method for indirect transmission, because infectious agents are often transmitted on objects that are physically handled.
3. Which of the following will determine that instrument sterilization was achieved?
C. Biological monitors. Chemical indicators, physical monitors, and process integrators will identify which instruments have been processed, but they will not determine if sterilization was achieved.
4. A high-level disinfectant must have the ability to kill
C. tuberculosis. High-level disinfectants are defined as a disinfectant that kills most, but not all, of *M.tuberculosis* spores.
5. Dental instruments that are used in the mouth but do not penetrate tissue or bone are
B. semicritical instruments. Semicritical instruments are used in the mouth and touch mucous membranes, but do not penetrate soft tissue or bone. Examples include the mouth mirror, impression trays, and amalgam condenser.
6. The main disadvantage to using a dry heat sterilizer is the
C. long cycle time. A dry heat sterilizer requires a cycle time of 60–120 minutes. By contrast, a steam autoclave requires a cycle time of 15–30 minutes and a chemical vapor sterilizer requires a cycle time of 20 minutes.
7. Critical items must be treated with which of the following methods to prevent the spread of infection?
C. Sterilization. Critical items are items that penetrate skin and mucosa and must be disposed or sterilized to prevent cross-contamination.
8. Saliva ejectors and plastic high-volume evacuator tips should be
A. disposed of after use. Plastic saliva ejectors and high-volume evacuator tips are considered to be expendables/disposable for single use only and are to be discarded.
9. An example of a bloodborne pathogen is
B. hepatitis C. Hepatitis A is transmitted through contaminated food and water. Tuberculosis and influenza are airborne pathogens. Hepatitis C is transmitted through blood and body fluids.
10. A positive biological monitoring test result indicates
B. sterilization failed. Sterilization may have failed because of equipment malfunctions or operator error.
11. Which of the following is considered regulated waste?
C. Used anesthetic needles. Used anesthetic needles must be disposed of in a leak-proof sharps container with a lid. Once the sharps container is filled, it must be disposed of properly through the use of a sharps waste contractor.

12. Destruction of all microorganisms is called
B. sterilization. Sterilization destroys all microorganisms, including viruses and bacterial spores, which are the most difficult to kill.
13. A chemical labeled a disinfectant is unable to kill
D. bacterial endospores. Disinfectants are unable to kill bacterial endospores. Only sterilants have the ability to kill bacterial endospores.
14. Microorganisms that produce disease in humans are known as
B. pathogens. Pathogens are any virus, microorganism, or other substance that causes disease.
15. Which of the following tasks would require the dental assisting to wear utility gloves?
A. Disinfecting the operatory following patient care. Utility gloves will eliminate contact with chemicals during desinfection.
16. Which intermediate level disinfectant may contribute to staining of clinical surfaces?
B. Iodophors. Iodophors may contribute to staining clinical surfaces due to the iodine found in the solutions.
17. The patient notes on her medical history that she has active tuberculosis. She is scheduled for a crown preparation. How does her condition affect her dental treatment?
C. Her treatment should be postponed until her disease is no longer active.
Standard precautions do not protect the dental healthcare worker against transmission of tuberculosis, so no dental treatment should take place until the disease is no longer in an active phase.
18. To properly dispose of a blood-soaked gauze square, place it in
A. a regulated trash bag. A blood-soaked gauze square is regulated medical waste and must be disposed of in a biohazard or regulated trash bag.
19. Overgloves should be used when
D. opening a drawer during patient treatment. Overgloves will prevent cross-contamination between contaminated exam gloves and the contents of the drawer.
20. The major advantage to using liquid chemical sterilization is that
C. items that would be damaged by heat can be sterilized using this method. The disadvantages to this type of sterilization technique are the long exposure time required, which can range from6–10 hours, and the effectiveness of sterilization cannot be verified
21. Sodium hypochlorite is recommended as a disinfectant for
B. housekeeping surfaces. Because sodium hypochlorite is not an EPA-registered disinfectant, it is no longer recommended as an intermediate disinfectant for clinical contact areas.
22. Which method of sterilization is recommended for items that will be used immediately after removal from the sterilizer?
C. Flash sterilization. Items that will be used immediately after removal do not need to be bagged; therefore, they require a shorter sterilization time.
23. Which mode of transmission involves contact with a contaminated instrument or surface?

D. Indirect contact. Indirect contact occurs when the infectious agent is transferred to a second surface and then transmitted from there to a new host.
24. Microorganisms that accumulate on wet surfaces, such as on the inside of dental waterline tubing, are called
B. biofilm. Biofilm is of concern in the dental profession because it may contain a variety of disease causing pathogens.
25. The MOST effective method of confi rming sterilization of instruments is with
C. bacterial spore testing. Bacterial spore testing is most effective for confi rming sterilization.
Chemical indicators, chemical integrators, and physical monitoring only indicate that an item was exposed to heat.
26. Which of the following diseases is easily transmitted in the healthcare setting?
C. MRSA. MRSA, or methicillin-resistant *Staphylococcus aureus*, is a strain of bacteria that is resistant to traditional antibiotics and is a common infection transmitted in the healthcare setting. HIV/AIDS and tuberculosis usually require prolonged exposure to the pathogen, and hepatitis A is transmitted through contaminated food and water.
27. What is the mechanism of action of the autoclave sterilizer?
B. Steam under pressure. Sterilization by the autoclave occurs when steam reaches high pressure, destroying the pathogens.
28. The fi rst handwashing of each day should include a
B. soft brush to scrub nails. At the beginning of each day, clinical staff members should wash thoroughly including the use of a soft scrub brush to clean around fi ngernails.
29. According to OSHA, the Hepatitis B vaccine is to be made available to employees at risk for contamination. The employee is responsible for
C. arriving on time for the appointment. According to OSHA standards, the employer is responsible for all costs associated with the immunization process. It is the staff member's obligation to show up on time for the immunization appointment.
30. The main disadvantage of using a dry heat sterilizer is the
A. damage to heat-sensitive items. The very high heat of the dry heat sterilizer can melt or damage some items like plastics and paper. Dry heat does not corrode metal, and both closed containers and live spore testing may be used with this method of sterilization.
31. Gauze that has had contact with bodily fl uids, such as blood and/or saliva, is what type of waste?
C. Infectious. Infectious waste is any waste that has the ability to transmit disease. This is also known as regulated waste.
32. Which of the following PPE (personal protective equipment) is used to prevent inhalation of droplets and/or spatter?
C. Mask. Masks cover the nose and mouth to prevent inhalation of droplets and/or spatter.
33. What is the purpose of a barrier in infection control?
B. Disrupt the transfer of infectious agents. The purpose of infection control is to erect barriers that cause disruptions in the transfer of infectious agents.

34. Used barriers and paper from the dental offi ce are classifi ed as what type of waste?
B. Nonregulated. Most of the waste produced by the dental offi ce is considered nonregulated waste.
Only those items that are saturated with blood or body fl uids or that are from living tissue are considered regulated waste.
35. Which of the following may be used as a surface disinfectant in the dental office?
A. Iodophors. Iodophors and synthetic phenol compounds are accepted for surface desinfection. Ethyl alcohol and isopropyl alcohol are not effective in the presence of bioburden such as blood and saliva. The ADA, CDC, and OSAP do not recommend alcohol as an environmental surface disinfectant.
36. Routine handwashing will remove
B. transient microflora. The resident microflora are the normal microbial inhabitants of the skin and are not considered to be harmful. Transient microflora are the microbes picked up by touching surfaces and are not only most likely to cause disease but they are easily removed by thorough handwashing.
37. Which of the following is a pathogenic waste?
C. Extracted teeth. Teeth and other waste tissues are infectious pathogenic waste and must be disposed of in a leak-proof container or biohazard bag.
38. Any reusable item intended for patient care should be
D. heat sterilized after use. Covering a reusable item will not prevent contamination. All instruments that are not heat sensitive must be processed in a sterilizer. Heat-sensitive items must be soaked in a liquid sterilant for the time recommended by the manufacturer.
39. Which of the following chemicals can be used as an immersion disinfectant/sterilant for instruments?
B. Glutaraldehyde. Glutaraldehydes are high-level disinfectants/sterilants designed for immersion for long periods (6–10 hours). Iodophors, sodium hypochlorite, and synthetic phenols are intermediate level surface disinfectants and are not intended for immersion.
40. What is the appropriate PPE when processing instruments in the ultrasonic cleaner?
C. Utility gloves, mask, safety glasses, and gown. Processing contaminated instruments in the ultrasonic bath carries a strong risk of accidental puncture for the dental assistant. Use of heavy-duty utility gloves, as well as full PPE, offers more protection than examination, food handler, or double examination gloves.
41. A needlestick injury could transmit disease. This type of disease transmission is called
B. parenteral. Parenteral transmission is through the skin, such as with a needlestick. Enteral transmission is transmission through the gastrointestinal track. An opportunistic infection takes advantage of the weakened immune status of the patient to cause disease, and a vector-borne transmission usually involves an insect.
42. After treatment, using a low-level disinfectant-type cleaner on the bagged dental chair
C. provides additional asepsis. Using a bag to cover the dental chair during treatment will assist in reducing the bioburden on the chair; however, once the bag is removed, the chair should be sprayed with a low-level disinfectant to begin killing existing microbes.

43. Which of the following is the best choice for cleaning the dental vacuum system?
A. Nonfoaming, enzymatic cleaner. The suction system in a dental office is contaminated with protein residues from blood and saliva that can be broken down by the enzymatic component of the cleaner. Foaming agents could clog the lines and should be avoided. Bleach can damage the metal components of the unit.
44. Prior to placing instruments into a sterilizer, they must be precleaned in a/an
C. ultrasonic unit. The first step in the sterilization procedure is to preclean the instruments, which typically includes ultrasonic cleaning. An FDA instrument dishwasher may also be used.
45. Which of the following surface disinfectants is tuberculocidal?
A. Iodophor. Iodophors are approved as intermediate-level surface disinfectants that include tuberculocida action. Glutaraldehyde is not a surface disinfectant, and neither bleach nor quaternary ammonias are accepted as tuberculocidal agents.
46. Which surface is likely to become contaminated in a dental operatory during a procedure?
B. Clinical contact surfaces. The surfaces most likely to be contaminated during patient care include the headrest, chair controls, counter tops, light handles, handpieces, hoses, and other items touched by gloved hands or aerosol from the procedure.
47. Which of the following is a noncritical instrument?
D. X-ray tubehead. The x-ray tubehead is a noncritical instrument because it does not go into the oral cavity and only touches intact skin.
48. An example of a percutaneous injury is
B. a needlestick from a sharps container. A needlestick is a percutaneous injury. Percutaneous means “through the skin.”
49. If mercury is spilled in the office, it should be cleaned up using a/an
C. spill kit. Every office that uses amalgam should have an emergency spill kit. The individual cleaning up the spill should wear PPE and not handle the material with bare hands or use a vacuum cleaner to pick up the spill.
50. Which of the following items produces the most aerosol and splatter?
B. High-speed handpiece. The combination of water spray with the high-speed rotations of the handpiece spreads large amounts of splatter and aerosols into the air around the treatment zone.
51. Scrap amalgam should be
B. stored in an airtight container. Mercury is a toxic metal that, when mixed with dental alloy, must be disposed of aseptically. Amalgam containing mercury should be stored in an airtight container under water or in a special chemically treated receptacle.
52. The purpose of the ultrasonic cleaner is to
B. remove debris from instruments prior to sterilization. The ultrasonic cleaner removes debris or bioburden from instruments so sterilization can be effective. It is a cleaning step, but not a disinfecting or sterilization step.
53. Instruments used on amalgam restorations should be cleaned of all debris prior to autoclaving because amalgam

A. releases free vapor when heated. Because the heating of amalgam can cause free vapor, operatories and sterilization areas should be well ventilated. All residual amalgam should be removed from the instruments and stored aseptically.

54. The last PPE put on before beginning patient treatment must be the

C. gloves. Gloves are put on last in order to avoid contaminating them before they are used in the patient's mouth.

55. The main goal of an effective infection control plan in a dental office is to

A. reduce the number of microbes. Effective infection control reduces the number of microbes in the office by the use of barriers, PPE, disposable items, and adequate desinfection and sterilization techniques.

56. Items that cannot be placed in the autoclave but are reusable are classified as

B. semicritical items. Whenever possible, items that cannot be heat sterilized should be disposed of.

An instrument that can be harmed by heat should be placed in a liquid sterilization solution for 6 to 10 hours.

57. Which of the following is a required safety measure when using a curing light?

C. Tinted safety glasses. The visible light spectrum of the curing light is damaging to the eyes. Tinted safety lenses or a shield on the unit should be used to protect both staff and patient.

58. Patients who close their lips around the saliva ejector to clear their mouths run the risk of what type of contamination?

C. Patient to patient. Research has shown that if a patient closes their mouth around the saliva ejector, there can be a reverse flow in the vacuum line.

59. The MOST resistant form of known life is a/an

C. spore. Spores can survive extremes of heat and dryness and even the presence of disinfectants and radiation.

60. How would a dental assistant ensure that cross-contamination does not occur when a patient's denture is polished in the lab?

C. Use only disposable or sterilized polishing materials. Laboratory items such as burs and handpieces should be sterilized between patients. Pumice and rag wheels should either be disposed of or sterilized after use.

61. How often should a face mask be replaced?

A. Between patients. Because the outer surface of the face mask becomes contaminated during dental procedures with droplets created by sprays from patient fluids and dental handpieces, the face mask should always be changed between patients and during patient treatment if the mask becomes wet.

62. The name of the cleaning technique used at the end of a patient appointment is the

A. spray-wipe-spray. Spray-wipe-spray technique recommends that, at the end of patient care, bags should be removed and discarded, the unit be sprayed with a surface disinfectant and wiped down vigorously, then sprayed and allowed to stay wet for 10 minutes. After 10 minutes, wipe away any remaining disinfectant and rebag the unit.

63. To maintain high filterability, a face mask that is moist from exhaled air should be replaced

A. every 20 minutes. When a face mask becomes wet, it should be replaced every 20 minutes to maintain its high filterability.

64. Which of the following personal protective barriers should ALWAYS be put on last?

A. Gloves. The sequence (first to last) in which personal protective barriers should be put on prior to patient treatment is protective clothing, mask, protective eyewear, and gloves.

65. Which of the following is NOT recommended for use as a surface barrier?

B. Paper tray liners. Surface barriers must be resistant to fluids. Paper products, such as paper tray liners, should not be used as a surface barrier because they are not fluid resistant.

66. Gloves contaminated during dental procedures should be discarded in the

A. regular waste receptacle. Unless gloves are dripping wet with blood or saliva, they can be routinely disposed of by placing them in the regular waste receptacle.

67. An alcohol-based hand rub should be used only

C. if there is no visible soil on the hands. Alcohol-based hand rub agents should only be used when there is no visible soil present on the hands. The alcohol in the product kills infectious organisms and then quickly evaporates.

68. Personal protective equipment includes all of the following EXCEPT:

C. gowns laundered at home. Personal protective equipment (PPE) includes barriers to protect the dental assistant from occupational exposure to potentially infectious splash and splatter. Safety glasses, masks, gloves, and gowns are all PPE; however, gowns worn in the treatment setting should be laundered at the office or sent to commercial cleaners, never at home.

69. Which of the following is NOT true regarding the use of overgloves?

A. They are acceptable alone as a hand barrier for intraoral procedures.
Overgloves are not medical-quality gloves and are not acceptable alone as a hand barrier or for intraoral procedures.

70. When performing a thorough hand washing before gloving, you should rinse your hands with water at what temperature?

A. Cool. Following washing, the hands should be rinsed with cool water because cool water closes the pores.

71. OSHA requires office personnel to get which kind of immunization?

A. Hepatitis B. According to OSHA, all employees must be offered the hepatitis B vaccination within
10 days of starting employment.

72. Which of the following used items is considered regulated medical waste by OSHA?

B. Sharps. Any materials that require special handling in order to dispose of are considered regulated medical waste, including sharps.

73. The most appropriate gloves to clean and process contaminated instruments are

D. utility gloves. Utility gloves are heavy, thick gloves that provide more physical protection than either sterile gloves or examination gloves and should always be used when contaminated instruments are being cleaned to avoid occupational exposure.

74. Which of the following is the BEST way to clean the high-speed handpiece after patient treatment?
B. Sterilize in packaging materials. Handpieces are considered critical items due to their ability to penetrate tissue and must be sterilized after each use.
75. The front desk and walls of the dental office are classified as housekeeping surfaces and should be cleaned with a
A. low-level disinfectant. There is no evidence that housekeeping surfaces pose a risk to patient contamination, so they should be cleaned periodically with soap and warm water or a low-level disinfectant.
76. Improperly cleaning a dental unit after a procedure could lead to what route of cross-contamination?
C. Patient to patient. If the dental unit, instruments, handpieces, and attachments are not properly processed after contamination, the opportunity for patient-to-patient transfer increases.
77. A good way to reduce cross-contamination of dental materials is to use
B. disposable materials. Cross-contamination of dental materials could occur during patient care when multiple-dose containers are used. Many of the materials used today come in single-dose packaging to help reduce cross-contamination.
78. The best way to minimize cross-contamination of X-ray equipment is to
C. cover the control panel with plastic. Control panels, knobs, and buttons often have different shapes and designs. It is best to cover these items with plastic to prevent cross-contamination.
79. Which of the following chemicals is a high-level disinfectant?
B. Chlorine dioxide. Chlorine dioxide is a high-level disinfectant and sterilant. It can be used as a rapid-acting surface disinfectant (3 minutes of contact) or a slower-acting sterilant (6 hours of contact).
80. The active ingredient in chlorine compounds used in dentistry for intermediate-level surface desinfection is
D. sodium hypochlorite. Chlorine compounds used as intermediate-level surface disinfectants in dentistry contain either sodium hypochlorite or chlorine dioxide as the active ingredient.
81. Which of the following solutions is best for cleaning the dental suction lines?
B. nondetergent, enzymatic cleaning solution. Dental suction lines require proper cleaning to prevent clogging. Use of a nondetergent, enzymatic vacuum cleaning solution will not cause suds and the enzymes will break down the proteins in blood and saliva.
82. Which of the following solutions is best for cleaning the dental suction lines?
B. nondetergent, enzymatic cleaning solution. Dental suction lines require proper cleaning to prevent clogging. Use of a nondetergent, enzymatic vacuum cleaning solution will not cause suds and the enzymes will break down the proteins in blood and saliva.
83. What should you use to remove needles from reusable syringes?
A. Hemostat. To prevent occupational needlestick, the only safe method of removing a needle is with a hemostat or a special instrument designed for that purpose.

84. It is important for the dental assistant to have a foundation in microbiology in order to

B. prevent disease transmission in the dental setting. The study of microbiology is important for the dental assistant so that he or she will understand the nature of pathogens and understand how to prevent disease transmission in the dental office.

85. Which agent is NOT recommended by the CDC for surface desinfection?

B. Ethyl alcohol. Alcohols evaporate quickly. It would be difficult to keep a surface wet long enough with ethyl alcohol in order to be successful.

86. If an employee is stuck with a needle or contaminated instrument, the employee should remove his/her gloves then

C. wash hands and inform the doctor. If an employee is stuck with a contaminated instrument, he/she should stop working, remove gloves, squeeze the area gently to make it bleed, and wash with an antimicrobial soap. The doctor and/or exposure control officer should be informed and an accident report filed.

87. To ensure sterilization, steam sterilizers should be loaded so that

C. instrument packages are packed loosely into the autoclave. Loosely packing the autoclave will allow steam to access all package surfaces to ensure sterilization.

88. When evaluating the effectiveness of the sterilizer, what is used as the test medium?

C. Bacterial endospore. The bacterial endospore is the hardest microorganism to kill and is used as the test standard.

89. After being used for patient treatment and before being sterilized, dental instruments should be

D. placed in the ultrasonic unit or instrument washer. Ultrasonic cleaners and instrument washers use special cleaners to remove bioburden from contaminated instruments.

90. One of the most common liquid sterilants is

A. glutaraldehyde. Liquid chemical sterilant/high-level disinfectants used in dental offices include glutaraldehyde, glutaraldehyde-phenate, special hydrogen peroxide, and hydrogen peroxide-peracetic acid. These are used for instruments that would be damaged by heat sterilization.

91. Which method of sterilization is used for instruments that are subject to corrosion?

A. Dry heat sterilization. Corrosion is caused by moisture. Because dry heat sterilization does not produce moisture, this makes it ideal for dental instruments with moving parts such as orthodontic pliers.

92. Sterilization is defined as

B. the destruction of all life forms. Sterilization is the destruction of all microorganisms, including spores, and is the standard infection control protocol for dental instruments and handpieces.

93. What is the main disadvantage of a chemical vapor sterilizer?

C. It must be placed in a well-ventilated area. Chemical vapor sterilizers can cause eye irritation when vented. The chemicals also have a strong unpleasant odor. Good ventilation is essential.

94. When the color indicator on the sterilization package changes color after processing, this indicates that the sterilizer

C. reached the correct temperature. Color indicators on bags, strips, and tape show that, at some point, the sterilizer reached the designated temperature. It does not mean that the optimum time was met or that instruments are sterile.

95. Chemicals that are identified as a health hazard are color coded

A. blue. Blue is given to materials that, upon a very short exposure, could cause death or injury requiring medical attention.

96.Which of the following is the best description of an intermediate-level disinfectant?

C. kills some tuberculosis spores and some viruses. An intermediate-level disinfectant kills some but not all *M. tuberculosis* spores and some viruses.

97. What characteristic will a radiograph exhibit if the film was placed backward in the mouth?

C. Herringbone effect. A herringbone pattern across the surface of the radiograph means that the film was reversed in the patient's mouth during exposure. The herringbone pattern is created by the embossed lead foil backing on the film. These films are also significantly underexposed. To correct this, make sure that the film is facing the correct way, with the tube side toward the teeth and X-ray beam.

98.Elongation on a dental radiograph is caused by

D. too little vertical angle. Elongation results from insufficient vertical angulation in the bisecting technique.

99.When taking a radiograph of a 6-year-old patient, which of the following adjustments is made for the child's size?

C. Shorter exposure time. Exposure time is reduced to compensate for the smaller bone mass and tissue density of a child.

100. Cone cutting results when the central ray

A. is not aimed at the center of the film. In order for the entire film to be exposed, the PID is placed so that it completely covers the film on all sides. The central ray, an imaginary line through the center or the PID, should strike in the middle of the film.

101. If the focal-film distance, or FFD, is increased and the mA remains the same, the image will have

A. decreased magnification. Film magnification causes image distortion, and the goal is to decrease it as much as possible. Placing the film as close as possible to the tooth (or target) reduces magnification and increases image sharpness.

102. Penumbra is the

D. diffuse outline of the image. Penumbra is a partial shadow around an object.

103. Which of the following positioning errors results in an overlapped image?

C. Incorrect horizontal angulation. Overlapped images result when the central beam fails to pass directly through the interproximal spaces of the teeth in the horizontal plane.

104. When using an aiming ring to align the PID, the rim on the open end of the tube should be

A. parallel to the ring. Using the paralleling technique, the alignment ring, the open end of the PID, and the sensor should all be parallel to each other.

105. Overlapping the contact areas on a bitewing radiograph is an indication that the

A. horizontal angulation is off. Proper horizontal angulation of an exposure will project the central ray through the contacts of the teeth in the film. If horizontal angulation is off, then the contacts will appear overlapped and the film will not be diagnostic.

106. Filters are used in the X-ray tubehead to reduce

D. the patient radiation dose. Aluminum filters are used to remove low energy, long wavelength X-rays from the beam. These X-rays are harmful to the patient and not useful in exposing the image.

107. How should film be repositioned when the third molar is not showing up on a radiograph of the mandibular molar area?

D. Move the film farther back in the mouth. The film needs to be positioned farther back in the mouth (moved distally), so that the image of the third molar will be included on the film.

108. The distal surface of the canine should be observed in which of the following radiograph exposures?

B. Premolar bitewing. When the film is properly placed, the distal of the canine should appear on the premolar periapical or the premolar bitewing.

109. Which of the following anatomical landmarks is not visible in the mandibular molar exposure?

B. Mental foramen. The mental foramen is visible near the apices of the mandibular first and second premolar and will not be visible in the molar exposure.

110. The horizontal line from the top of the ear through the corner of the eye that is used for positioning a patient for a panoramic fi lm is the

C. Frankfort plane. The Frankfort plane is determined by visualizing a line from the top of the patient's ear horizontally through the corner of the eye. In order to line a patient up properly for a quality panoramic exposure, the Frankfort plane should be parallel to the floor.

111. Occlusal radiographs are used to

D. locate specific dental anomalies. The occlusal exposure is used to visualize large areas of the arches to identify the location of different anomalies, such as supernumerary teeth, fractures, pulp stones, and areas of clefting.

112. Extraoral radiographs are used by the dentist to identify

C. caries in the anterior teeth. The purpose of the extraoral exposure, such as the panoramic, is to allow the dentist to view the entire dentition and surround structures.

113. Which of the following could result in a panoramic X-ray with a fl at occlusal plane or smile line?

B. Chin tipped too high. The chin should be positioned so that the ala-tragus line is parallel with the floor

114. Digital radiography uses less radiation than fi lm-based radiography because

D. the sensor is more sensitive than film. The digital sensor is much more sensitive to radiation than film. It takes less than one quarter of the amount of radiation to take a digital exposure than to take a film-based exposure.

115. a. True. These are produced by bombarding a positively charged target with electrons.

b. False. Low frequency and, therefore, have insufficient energy to ionise atoms.
c. False. Low frequency and, therefore, have insufficient energy to ionise atoms.
d. True. Naturally occurring radiation from radioactive materials.
e. True. Cosmic rays come from outer space but contribute a substantial part of our natural background radiation. All of these radiations are electromagnetic (EM) radiation. EM radiation exists as photons, tiny packets of energy with a waveform (they have a frequency and a wavelength). The higher the frequency, the greater the energy in each photon. Xrays, gamma rays and cosmic rays are all high frequency EM radiation and can ionise atoms.
116. a. False. These effects have threshold doses considerably higher than that which might be received during dental radiography. They may, however, occur during radiotherapy.
b. True. These effects (tumour induction) have no threshold dose. However, the risk is believed to be directly related to the dose. With low doses associated with dental radiography, the risk is low.
c. False. It is generally accepted that gonadal doses in dental radiography are so low as to be negligible. This is particularly plausible when considering panoramic radiography (the beam is highly collimated and is angled slightly upwards) and intra-oral radiography using film holders (paralleling techniques) and rectangular collimation.
d. True. There is published evidence of an association between dental radiography and salivary gland (and brain) tumours. However, this work refers back to a time of higher radiation doses and it must be remembered that the risks are small.
e. False. Cataract formation is a deterministic effect that should never occur as a consequence of dental radiography.
117.a. False. Lower voltages give a higher proportion of weaker X-rays. Weak X-rays are more likely to undergo absorption (photoelectric interactions) in the patient's tissues.
b. True. A 'DC' X-ray set produces a smaller proportion of weak X-rays.
c. False. Using standard 'good practice' technique (paralleling technique and rectangular collimation) none of the primary beam should be directed towards the trunk of the patient. Scattered radiation is principally internal and would be unobstructed by a lead apron.
d. False. This is the slower of the two intra-oral film speeds usually available.
e. True. Both types of digital intra-oral system (CCD-based and photostimulable phosphors) can produce a periapical radiograph using a substantially lower X-ray exposure.

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