OPIS PRZYPADKU
CASE REPORT

TREATMENT ALGORITHMS OF PATIENTS WITH IMPACTION OF MAXILLARY CENTRAL INCISORS CAUSED BY SUPERNUMERARY TEETH

ALGORYTMY POSTĘPOWANIA U CHORYCH Z ZATRZYMANYMI PRZYŚRODKOWYMI ZĘBAMI SIECZNYMI SZCZĘKI Z POWODU OBECNOŚCI ZĘBÓW NADLICZBOWYCH

Maryna I. Dmytrenko, Olena V. Gurzhiy
HIGHER STATE EDUCATIONAL ESTABLISHMENT OF UKRAINE, UKRAINIAN MEDICAL STOMATOLOGICAL ACADEMY, POLTAVA, UKRAINE

ABSTRACT

Introduction: Supernumerary teeth, like etiological factor of impaction, occur in 7,05% of patients, are usually located in anterior maxillary region – 93,2%.

The aim of the study is to develop an algorithm of treatment of patients with impaction of permanent maxillary central incisors, caused by supernumerary teeth, during periods of mixed and permanent dentition by processing our own approaches to treatment.

Materials and methods: Treatment results of seven patients (6, 7 (2 patients), 8, 9, 10 and 15 years old) with delay in eruption of maxillary central incisors were analyzed. According to the results of clinical and additional examination methods (photometric examination of face, study of diagnostic models of jaws and orthopantomograms, 3D computed tomography), impacted central incisors, supernumerary teeth, blocking their eruption, were diagnosed.

Results: Clinical experience of treatment of patients with impacted teeth caused by presence of supernumerary teeth in the jaws, allowed us to propose algorithms of providing complex treatment in such cases, depending on physiological state of occlusion - mixed or permanent, and depth of supernumerary tooth location.

Conclusions: If there are no central incisors in the dental arch after the term of their physiological eruption, orthopantomogram must be taken to confirms or reject tooth impaction, and then 3D computed tomography should be done to show accurate localization of the tooth and only after these stages it is possible to choose the treatment plan. Patients with impacted maxillary central incisors caused by supernumerary teeth should undergo orthodontic treatment in several stages.

KEY WORDS: Impaction of permanent teeth, impaction of central incisors, supernumerary teeth, surgical-orthodontic treatment, treatment algorithms

Wiad Lek 2018, 71, 4, 922-932

INTRODUCTION

Prevalence of impaction of permanent maxillary central incisors among other orthodontic pathologies is low – 0,04% -2,20% [5, 9, 10]. Supernumerary teeth, like etiological factor of impaction, occur in 7,05% of patients, are usually located in anterior maxillary region – 93,2% [4]. In accordance with current studies this pathology is diagnosed more often in males than in females [1, 4]. Etiology of supernumerary teeth can be explained by phenomenon of atavism – since distant ancestors of a human had six incisors. Among other theories there is a morphological explanation of supernumerary teeth formation. It is due to splitting of dental lamina in embryonic period into a larger number of dental germs. V.P. Nespryadko (1985) suggests that supernumerary teeth are a manifestation of congenital pathology, the cause of which is difficult to reveal [3]. The theory of hyperactivity of dental lamina as a result of hereditary and unfavorable external factors action is considered as the most probable [11].

Clinical and radiological examinations [4, 13] give grounds to reveal impacted permanent incisors. Missing tooth in dentition, presence of a temporary tooth, which has not exfoliated (Fig. 1), lack of mobility of deciduous tooth, over height of the alveolar process above the missing tooth can indicate impaction of central incisors during clinical examination.

Sometimes impacted teeth, being in depth of jaw bones, can cause neuralgic pains, they can become the factors of inflammation of the maxillary sinuses, periostitis, complications of blastomatous nature [2, 7].

Orthodontic treatment of patients with impacted teeth caused by presence of supernumerary teeth, is complex and lengthy one (average duration of treatment is 21,6 ± 8,7 months) [6]. Choice of treatment plan depends on the patient's age, number of impacted teeth , their angulation and depth of tooth location, as well as an adequate space for them in dentition and degree of root formation. Provision of complex orthodontic management involves individual comprehensive multidisciplinary approach with combination of surgical, instrumental, functional and prosthetic methods [1, 8]. That is why a search of ways to reduce timing of orthodontic treatment to eliminate this pathology is an urgent problem of orthodontics.

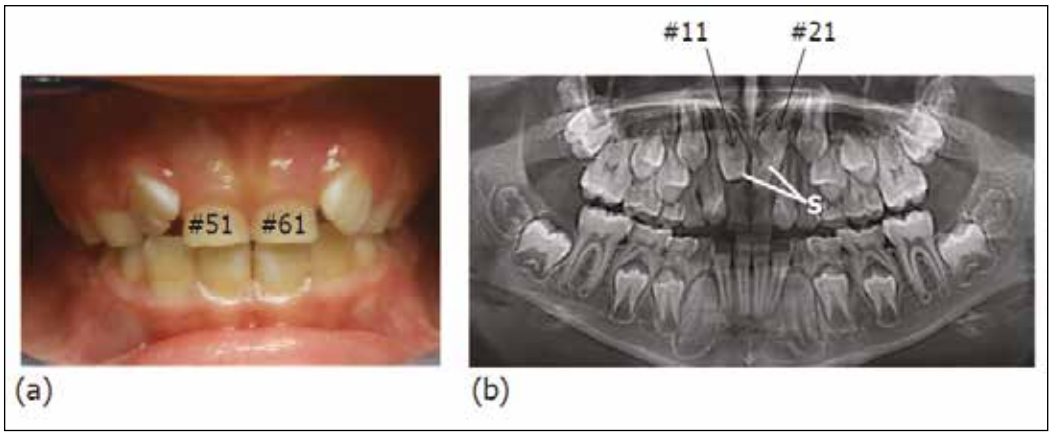

Figure 1. Clinical appearance of patient C., 8 years.
(a) Intraoral photograph (temporary 51, 61 teeth).
(b) Pretreatment orthpantomogram showing 11 and 21 impacted teeth, supernumerary (S) teeth, 51,61 persistant teeth.

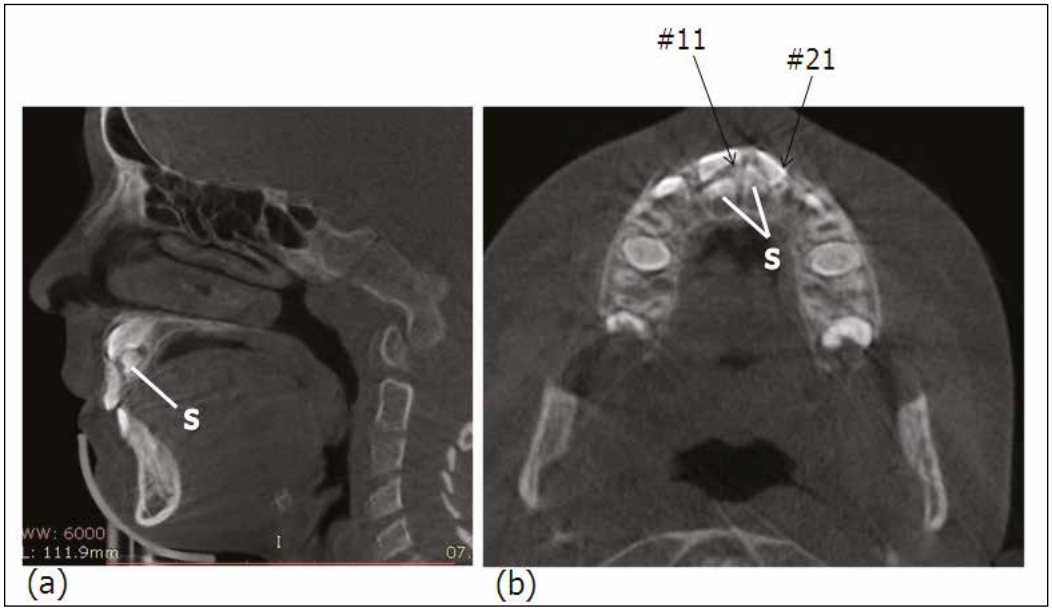

Figure 2. CBCT of patient C. (8 years).
(a, b) Showing impacted 11, 21 and supernumerary (S) teeth.

THE AIM

The aim of the study is to develop an algorithm of treatment of patients with impaction of permanent maxillary central incisors, caused by supernumerary teeth, during periods of mixed and permanent dentition by processing our own approaches to treatment.

MATERIALS AND METHODS

Treatment results of seven patients (6 , 7 (2 patients), 8, 9, 10 and 15 years old) with delay in eruption of maxillary central incisors were analyzed. According to the results of clinical and additional examination methods (photometric examination of face, study of diagnostic models of jaws and orthopantomograms, 3D computed tomography), impacted central incisors, supernumerary teeth, blocking their eruption, were diagnosed.

Angulation of impacted incisors and level of supernumerary teeth location: superficial (I,II) and deep (III, IV) were marked by method on orthopantomogram image [1].

Cone-beam computed tomography (CBCT) made it possible to determine reliably the state of the crown and roots of impacted and adjacent teeth, presence, size and location of supernumerary teeth, cysts, neoplasms, and to plan a proper method of treatment (Fig. 2).

Tomography findings has shown that a clinician could confidently perform surgical and orthodontic measures in a complex treatment of patients with impacted teeth and achieve positive results.

Orthodontic treatment was carried out with various designs of orthodontic appliances - prosthetic appliances with screws, vestibular arches with hooks, clasps, artificial central incisors. Additionally, in four patients (8, 9, 10 and

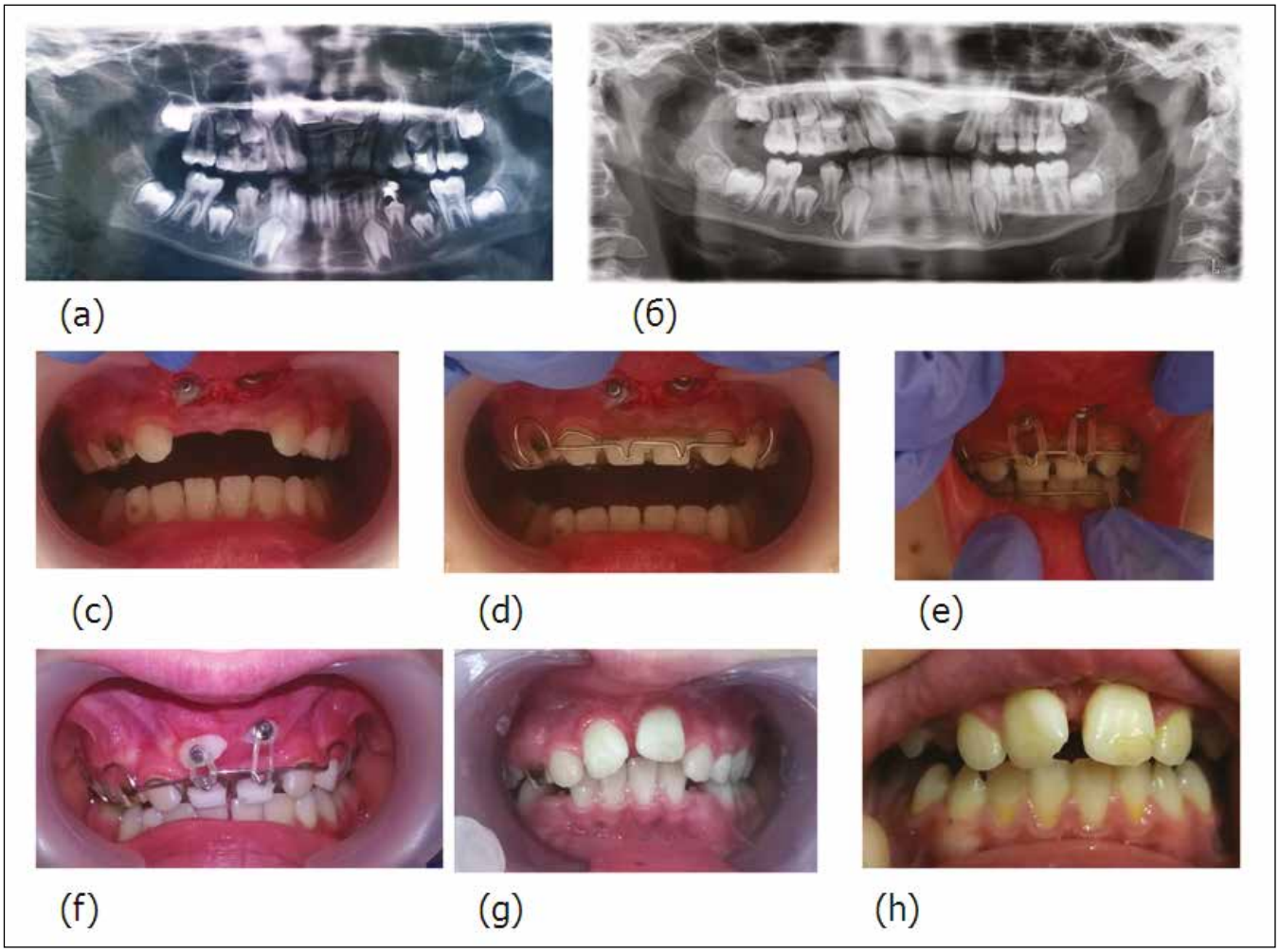

Figure 3. Orthpantomogram and intraoral photographs of Patient T.
(a) Pretreatment orthpantomogram showing 11 and 21 impacted teeth, supernumerary teeth; 51,61 persistant. (b) Orthopantomogram after extraction of 51,61 and supernumerary teeth.
(c, d, e, f, g, h) Intraoral photographs after surgical treatment (bonding of orthodontic attachments, fixing of elastic ligaments to hooks of vestibular ach of orthodontic appliance and clinical appearance after alignment of impacted teeth).

15 years) surgical exposure of impacted teeth crowns was performed , attachments were bonded on their surface and process of orthodontic traction with elastic threads was initiated . In all cases, access to the central incisors was fulfilled from vestibular side of the alveolar process.

At the second stage of treatment, removable orthodontic appliances were used in mixed dentition to align central incisors in the dental arch and bracket- system was used in permanent dentition.

RESULTS AND DISCUSSION

Clinical studies showed that the results of surgical-orthodontic treatment were positive in six patients. Impacted teeth spontaneously erupted in two 7-year-old patients – the girl's 11 tooth erupted after 1 month of using removable orthodontic appliance; the boy's 21 tooth erupted after 8 months. The period of orthodontic traction to the dental arch of central incisors was as follows: in a 7-year-old boy – 4 months (21 teeth); in 8-year-old girl – 3 months (21 tooth); in boys: 9 years – 3 months (21 tooth), 10 years – 9 months (11, 21 teeth) and 15 years – 14 months (11 tooth).

12 months after the removal of impacted supernumerary teeth, a 6-year-old patient continues active orthodontic treatment with prosthetic appliance with screw that stimulates eruption of 21 tooth

CASE 1

Patient T., a 10-year-old child, referred with complain about missing of maxillary central incisors. Diagnostic models were made , X-ray images were analyzed. Impacted 11, 21 teeth, supernumerary teeth on the path of 11, 21 teeth eruption, persistent 51, 61 teeth were revealed. 51, 61 teeth and supernumerary $1^{1}1$, $2^{1}1$ teeth were surgically removed and orthodontic treatment with removable orthodontic prosthetic appliance with screw, vestibular arch with hooks, clasps, artificial central incisors was planned. Six months later the crowns of impacted

Figure 4. Case 1. Patient T .
(a, b) Orthopantomogram during orthodontic treatment.11, 21 teeth are aligned.

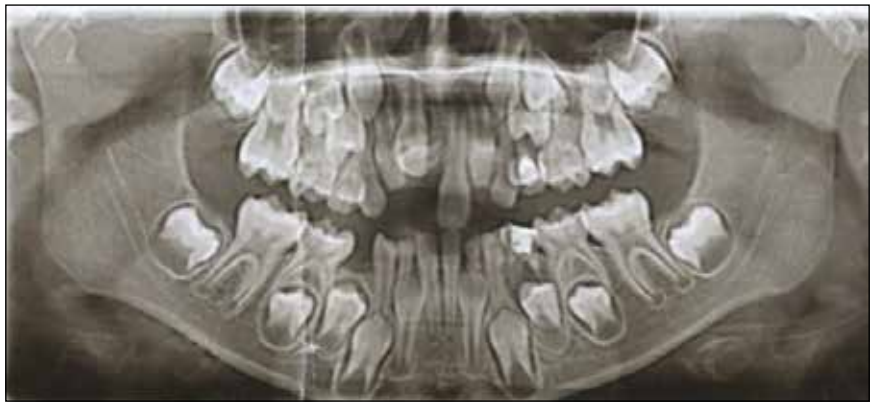

Figure 5. Patient G. pretreatment orthopantomogram showing impacted 11 and supernumerary 111.

11, 21 were exposed, with subsequent fixing of orthodontic attachments to tract them into dentition (Fig. 3).

After 9 months of treatment, impacted 11, 21 has been placed into dental arch, but they were rotated and in a state of vestibular supra occlusion. At the second stage of treatment, a new removable orthodontic appliance with a srew and vestibular arch with horizontal bending and clasps was used to provide correct positioning of incisors (Fig. 4).

CASE 2

Patient G., A. 7- year-old girl presented with complain of eruption delay of right maxillary central incisor, which had resulted in an unaesthetic appearance. Orthopantomogram showed presence of impacted 11 and supernumerary $1^{1}1$. Two weeks after removal of supernumerary tooth, orthodontic treatment was initiated. A month later tooth 11 spontaneuosly erupted and in 3 months was aligned into dental arch (Fig. 5).

CASE 3

Patient K, a 15-year-old boy expressed concern about unaesthetic appearance due to missing of the right central incisor. After examination of orthopantomogram, impacted 11 and supernumerary $1^{1}1$ were revealed. Supernumerary tooth was surgically removed and at the same time crown of impacted 11 was exposed, followed by bonding of orthodontic attachment to tract tooth into dentition. At the first stage of orthodontic treatment, a removable orthodontic prosthetic appliance was used, and at the second - bracket-technique. Duration of impacted 11 tooth traction was 14 months (Fig. 6, 7).

CASE 4

Patient A. A 9-year-old male, complained of unaesthetic appearance, presence of "atypical" tooth in the left maxillary anterior area . After clinical and radiological examination there were revealed tuberculate-shaped supernumerary $1^{1}1$,

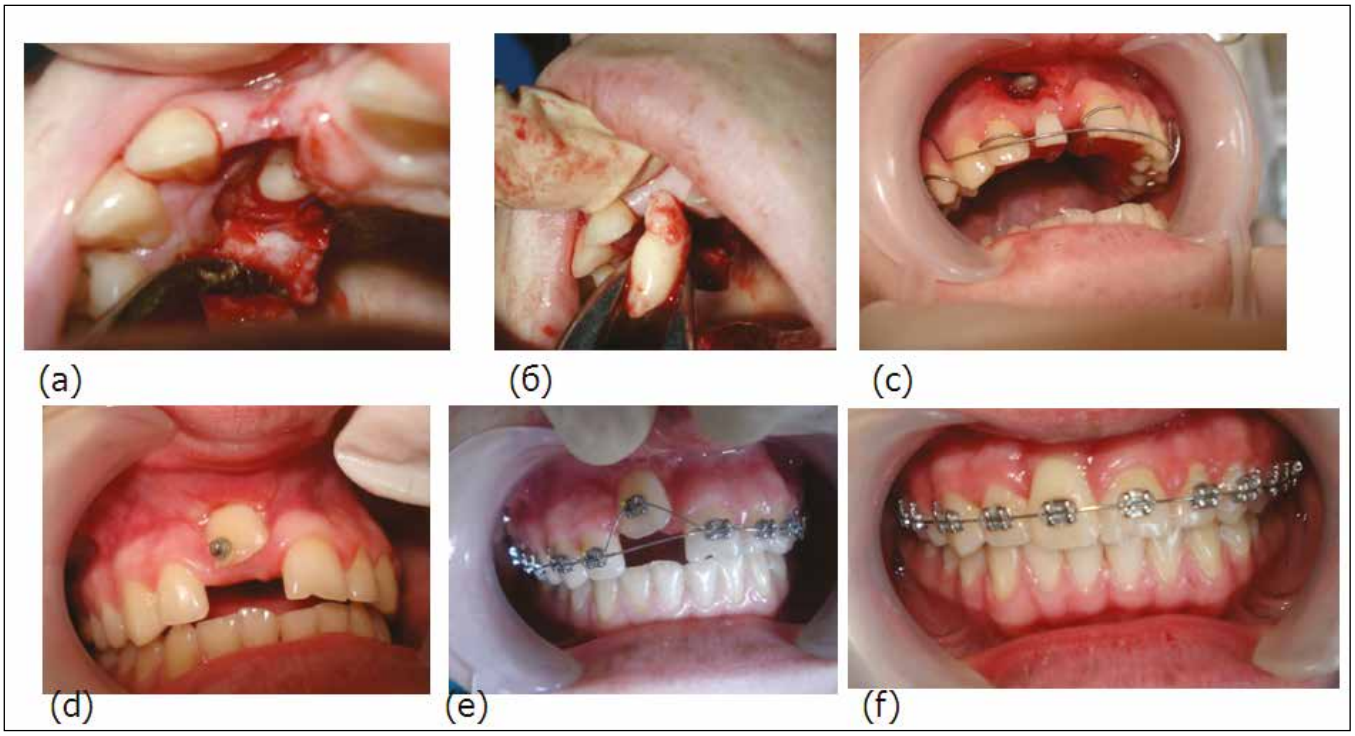

Figure 6. Patient K., 15 years.
(a, b, c, d, e, f) Clinical appearance. Phases of surgical and orthodontic treatment.

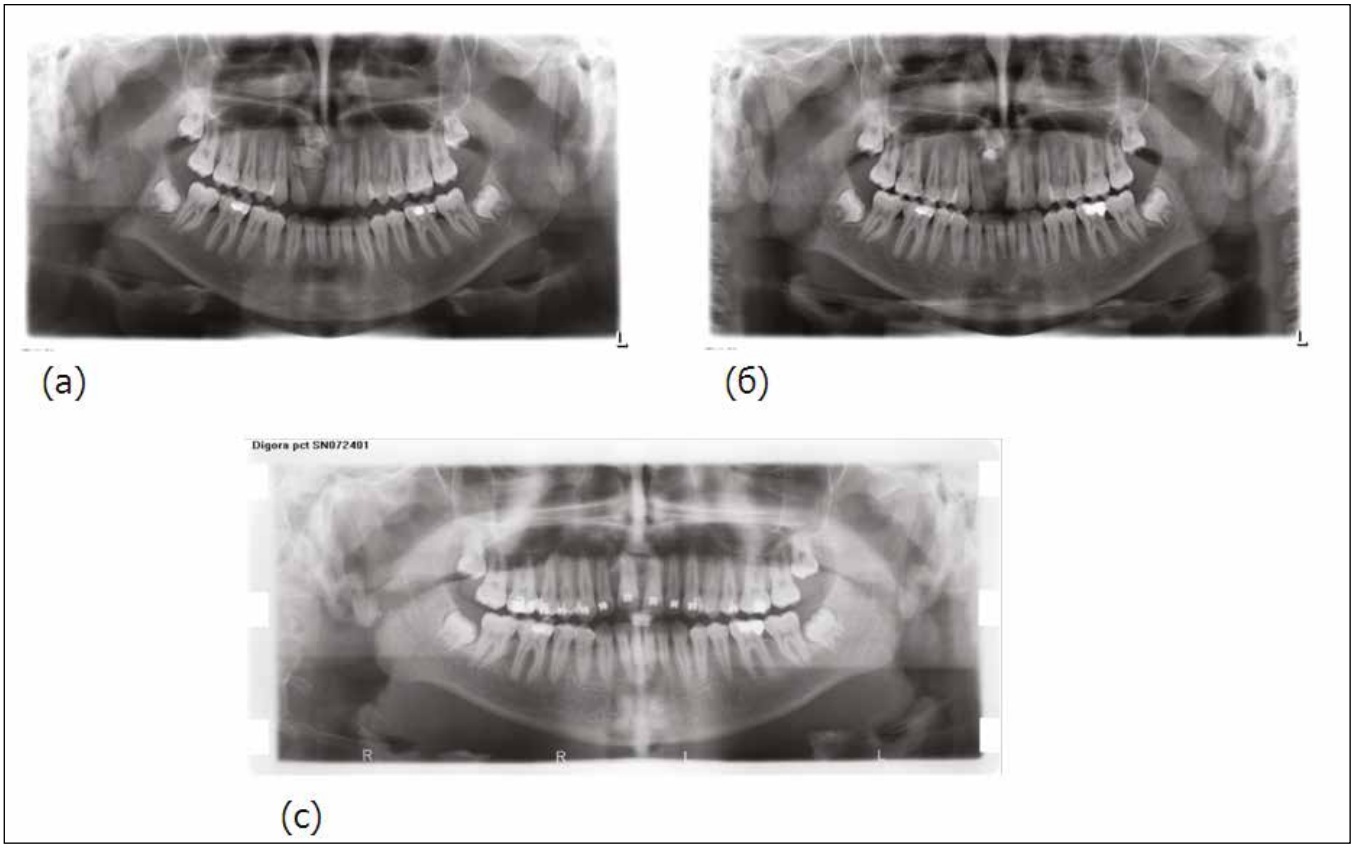

Figure 7. Patient K., orthopantomograms.
(a) Pretreatment orthopantomogram showing impacted 11, supernumerary 111.
(b) After extraction of supernumerary 111.
(c) Final phase of orthodontic treatment.

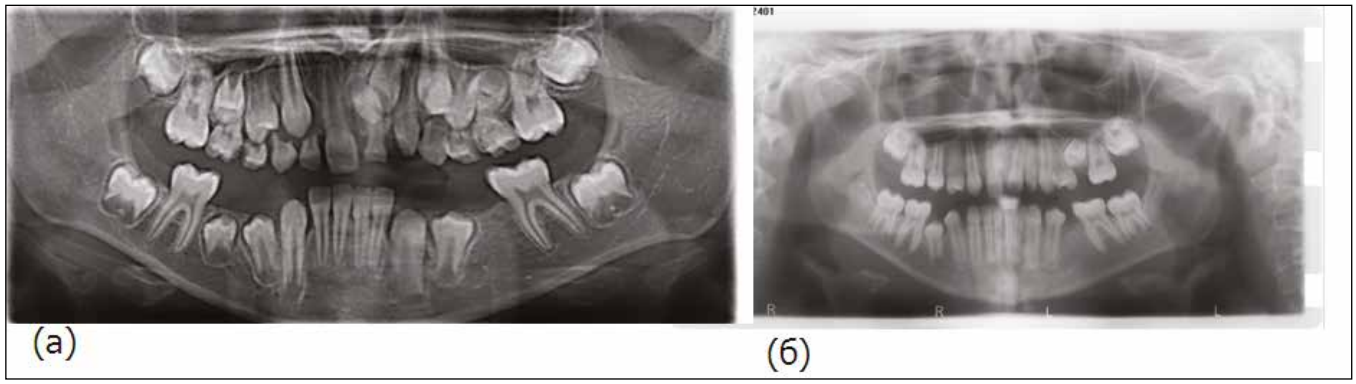

Figure 8. Patient A. orthopantomogram.
(a) Pretreatment orthopantomogram showing erupted supernumerary 111, impacted 11, impacted supernumerary 111.
(b) Orthodontic treatment after extraction of two supernumerary teeth. Stages of orthodontic treatment.

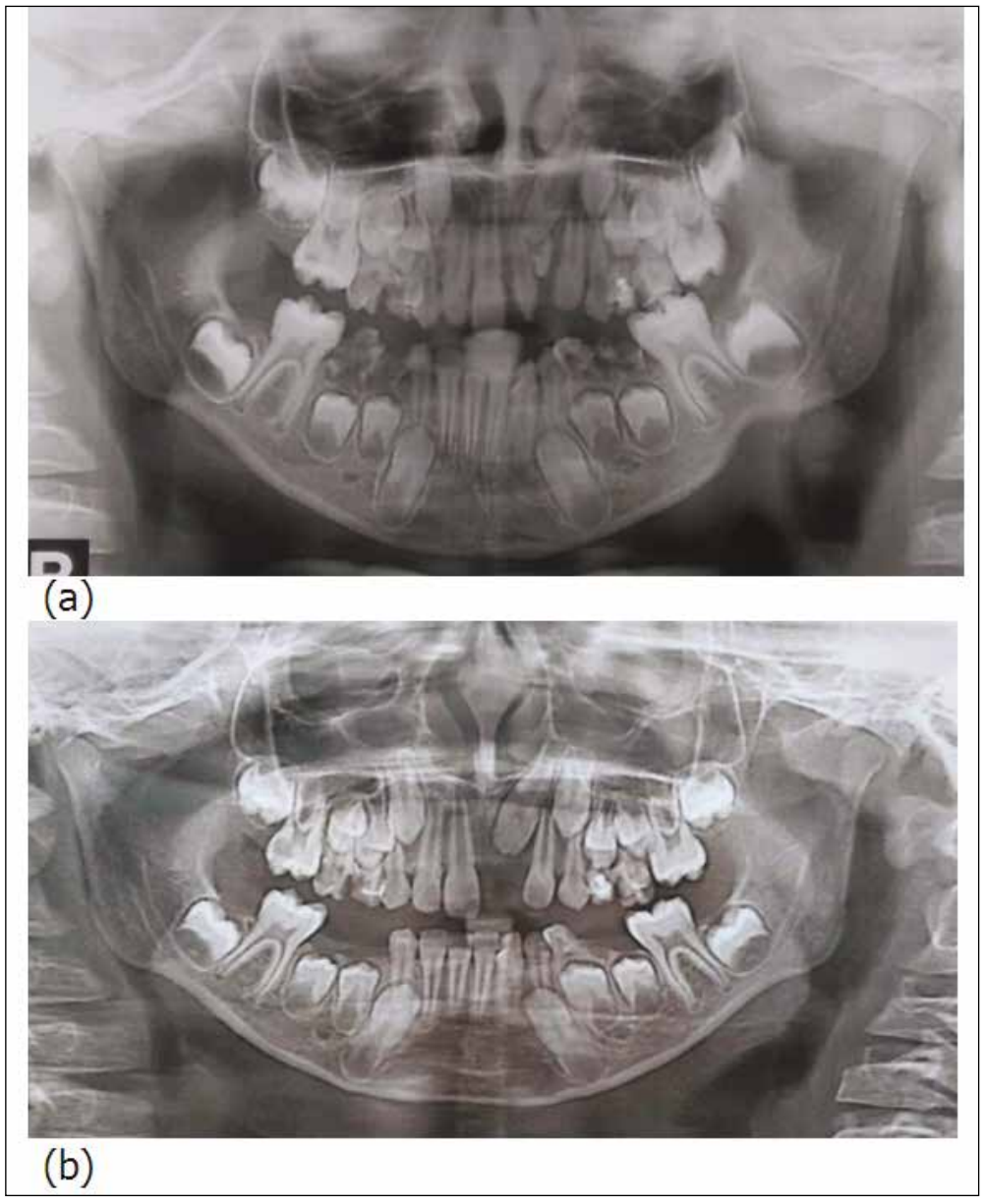

Figure 9. Patient A., 9-years (a, b, c, d, e) Clinical appearance during surgical-orthodontic treatment.

impacted 21 and impacted supernumerary 1[1]1. After surgical removal of supernumerary teeth, orthodontic treatment with a removable orthodontic prosthetic appliance was started. Six months later, crown of the impacted 21 was exposed with further bonding of attachment . In this case, the term of alignment of impacted 21 was 3 months (Fig. 8, 9).

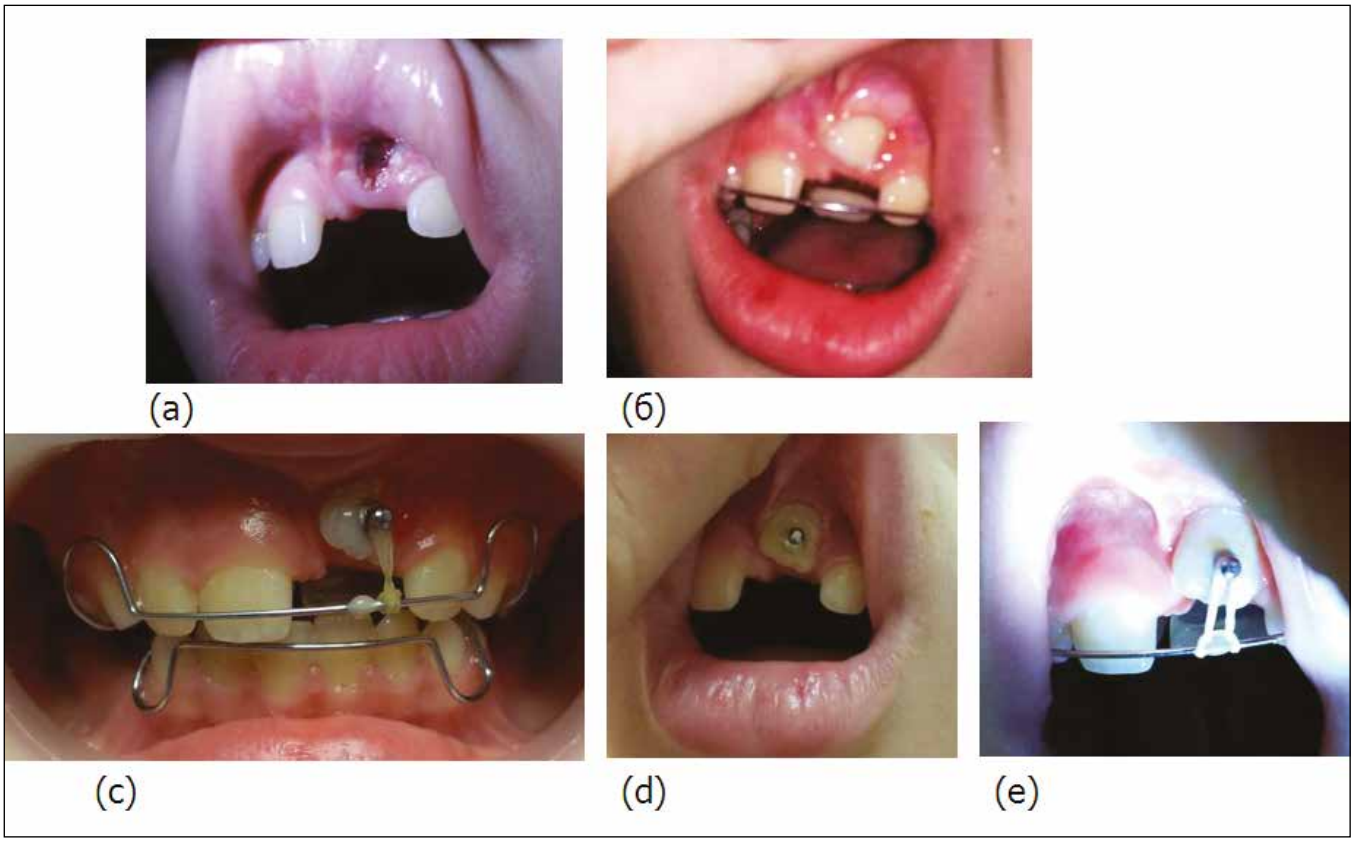

Figure 10. Patient O. orthopantomograms.
(a) Pretreatment orthopantomogram showing impacted 21, supernumerary 211, persistant 61.
(b) After extraction of 61 tooth and supernumerary 211.

CASE 5

Patient O, an 8- year- old female, complained of delay in the eruption of left maxillary central incisor and unaesthetic appearance. Tooth 61 is determined in maxillary anterior area. Analysis of orthopantomogram showed the presence of impacted 21 and supernumerary $2^{1}1$. In this case, the surgical procedure was carried out in stages. Aftter 61 tooth extraction orthodontic treatment was started using removable orthodontic prosthetic appliance with acrylic resin baseplate, retaining clasps, vestibular arch and artificial tooth 21. A month later, the crown of impacted tooth 21 was exposed, followed by bonding of orthodontic eyelet. In the process of orthodontic treatment, supernumerary tooth moved closer to the edge of alveolar process and erupted palatally after a month and was removed, what resulted in less trauma of bone. In this case, term of impacted 21 traction 21 into dental arch was 3 months (Fig. 10, 11).

CASE 6

Patient B, a 6-year-old male, complained of unaesthetic appearance, presence of "atypical" tooth in the left maxillary anterior region. Tubeculate-shaped supernumerary tooth $1^{1}1$, impacted 21, impacted supernumerary $1^{1}1$ were revealed after clinical and x-ray examination. After extraction of supernumerary teeth, orthodontic treatment by a removable orthdontic prosthetic appliance was initiated (Fig. 12).

CASE 7

Patient P, a 7- year- old child reffered with complain of unaesthetic appearance, presence of "atypical" tooth in the left maxillary anterior area on. According clinical and radiological findings, tuberculate-shaped supernumerary $1^{1}1$ and impacted 21 were diagnosed. After removal of supernumerary tooth, orthodontic treatment with a removable orthodontic prosthetic appliance was started. Tooth 21 erupted after 8 months of treatment by the removable orthodontic appliance (Fig. 13).

The approach to treatment of patients with abnormalities of teeth eruption should be complex and combine orthodontic treatment and surgical procedure to eliminate the cause of pathology, namely supernumerary tooth [9,12]. Tkachenko Yu.V. [4] based on examination and treatment of patients with abnomalities of teeth position caused by supernumerary teeth, has found the following pattern: the degree of abnormality severity and difficulty of treatment increases with an age. The most favorable period for correction of these abnomalities is the age of 7-8 years. At the age group older than 13 years, metabolic processes in bone tissue lose their intensity, thus special attention is payed to stimulation therapy (helium-neon laser therapy, lidazum laserphoresis, dosed vacuum, etc.) at this group. In permanent dentition to accelerate orthodontic of impacted teeth

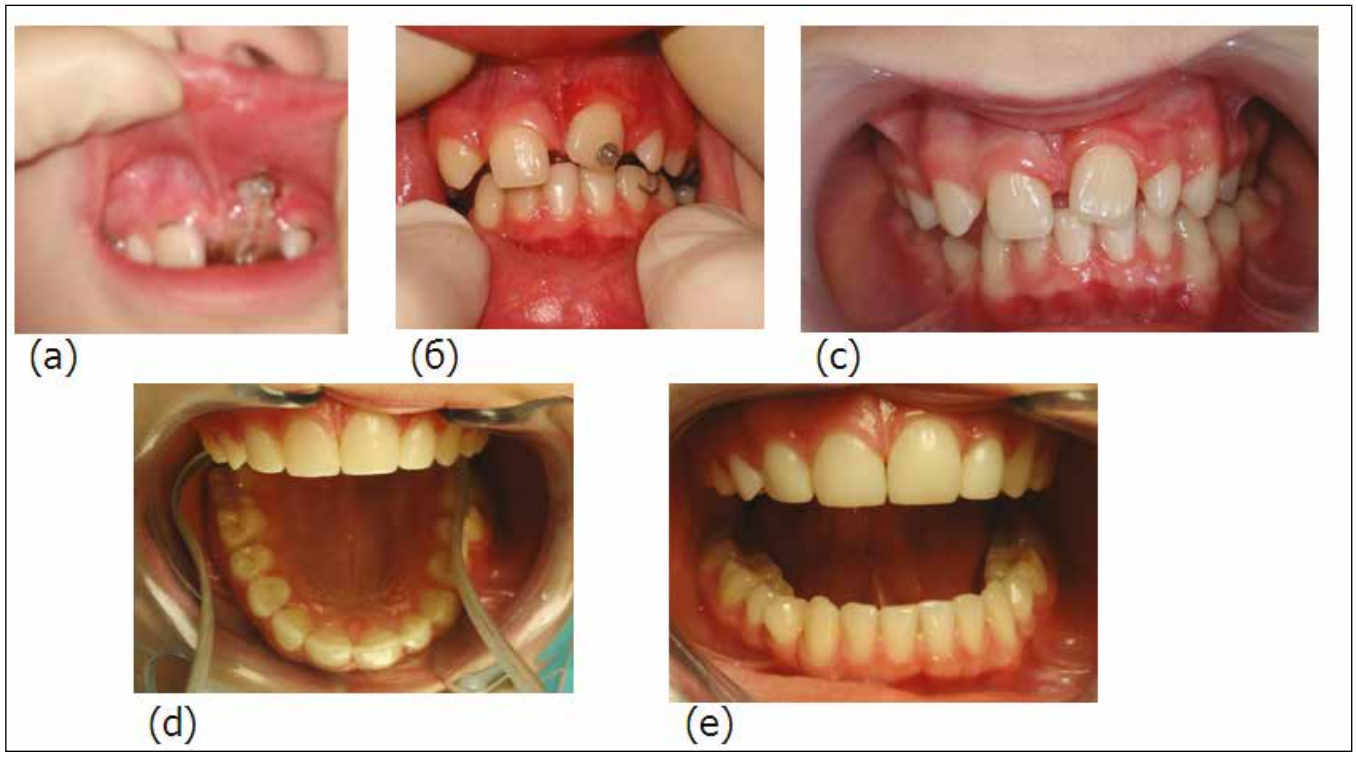

Figure 11. Case 5 .Photographs of patient 0 oral cavity
(a, b, c) 11 tooth during orthodontic traction.
(d, e) Occlusion after five years of treatment.

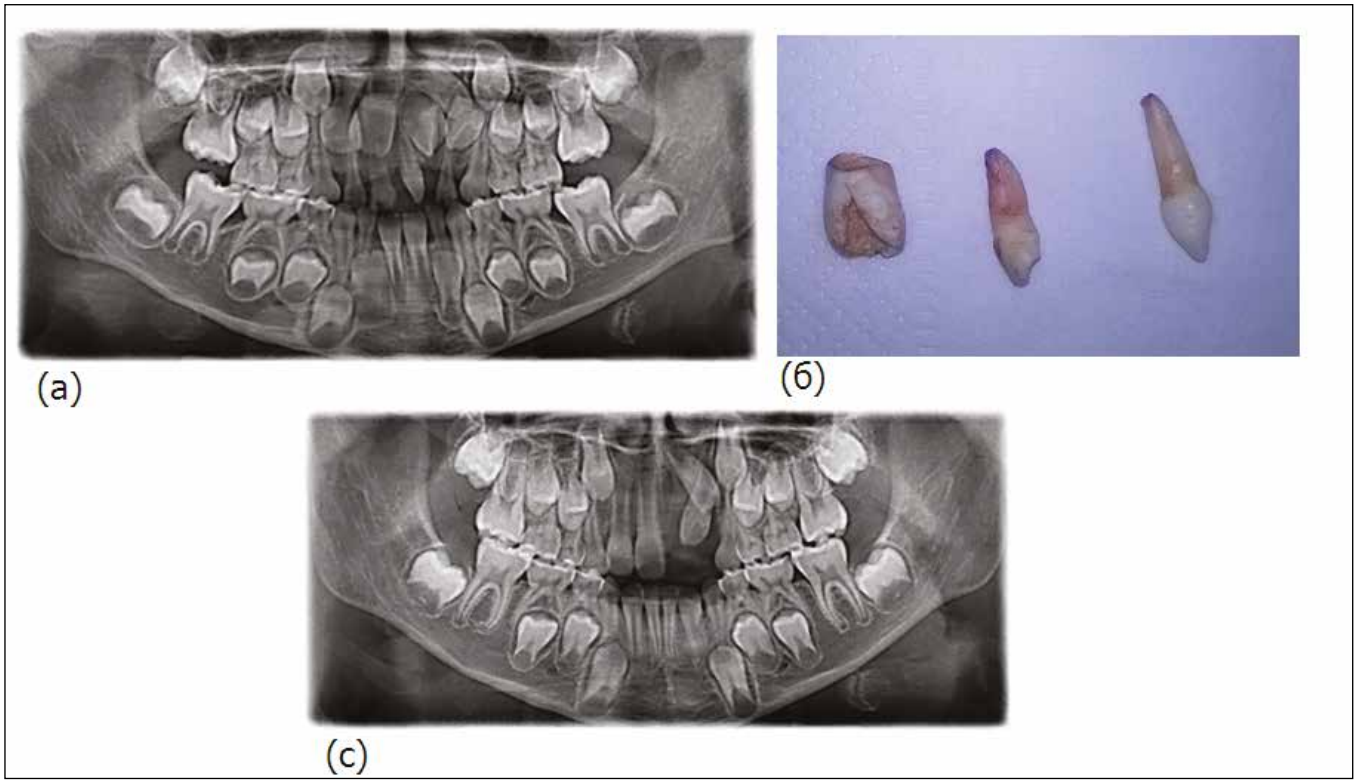

Figure 12. Case 6.
(a) Pretreatment orthopantomogram showing erupted supernumerary 111, impacted 11, impacted supernumerary 111.
(b) After extraction of deciduous 62 tooth and supernumeraries.
(c) Orthopantomogram after 10 months of treatment with removable orthodontic prosthetic appliance.

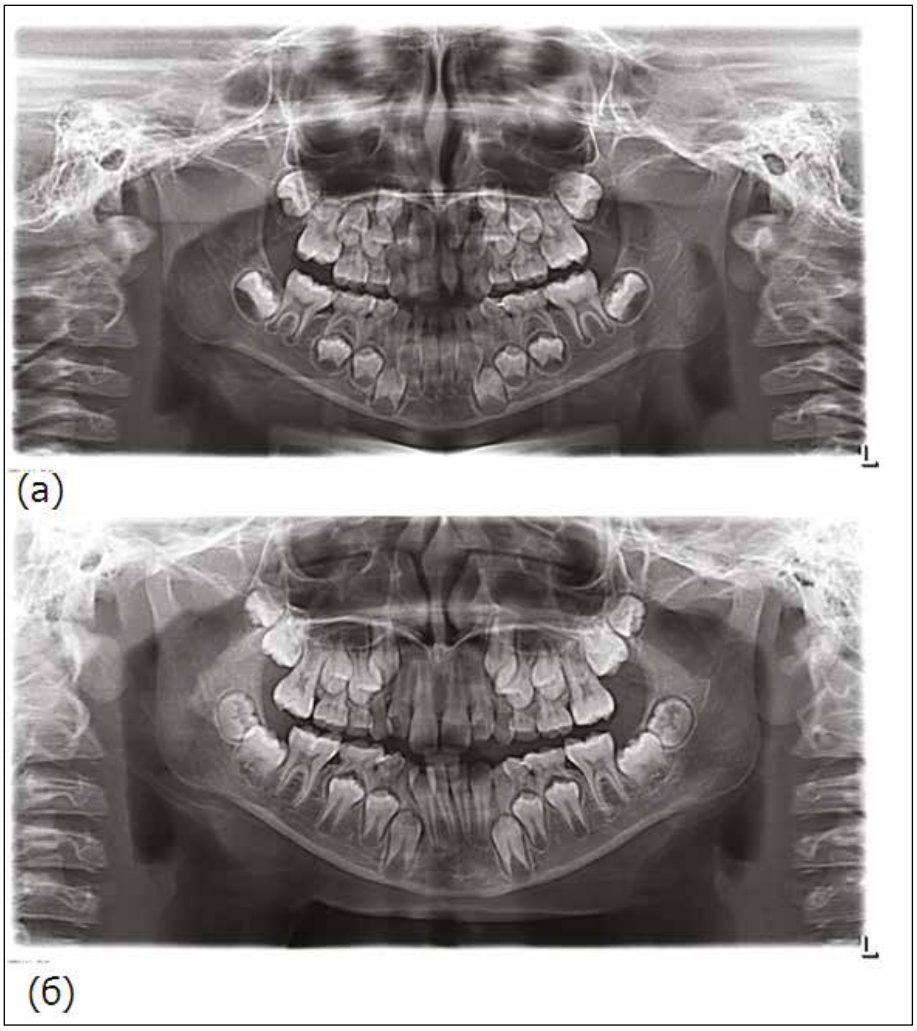

Figure 13. Case 7.
(a) Pretreatment orthopantomogram showing erupted supernumerary 111 and impacted 11 .
(b) Orthopantomogram after 4 years of orthodontic treatment. 11 tooth is aligned into dental arch.

mini-implants, mini- plates, gold and steel chains are used together with bracket- system [12].

Clinical experience of treatment of patients with impacted teeth caused by presence of supernumerary teeth in the jaws, allowed us to propose algorithms of providing complex treatment in such cases, depending on physiological state of occlusion - mixed or permanent, and depth of supernumerary tooth location (Figure 12).

If in mixed dentition the impacted tooth and supernumerary one were superficial, supernumerary tooth was removed and spontaneous eruption of impacted tooth with adequate space for it in the dental arch has been expected. In case of eruption delay , a stimulating plate was used. In deep location of impacted tooth and supernumerary tooth in patients with mixed dentition, the supernimerary tooth was removed and surgical exposure of the impacted tooth crown was postponed until movement of impacted tooth closer to the edge of alveolar process.

In a permanent dentition with superficial and deep location of impacted tooth and supernumerary tooth, the supernumerary tooth was removed, crown of the impacted tooth was exposed and orthodontic treatment was initiated, the plan of which depended on adequate space for impacted tooth in dentition. If there was a large socket in a jaw bone after extraction of supernumerary tooth, a dental sponge "Stimul-Oss" was applied.

CONCLUSIONS

If there are no central incisors in the dental arch after the term of their physiological eruption, orthopantomogram must be taken to confirms or reject tooth impaction, and then 3D computed tomography should be done to show accurate localization of the tooth and only after these stages it is possible to choose the treatment plan. Early detection and removal of supernumerary teeth, causing impaction of maxillary central incisors, allows to avoid many complications and significantly shorten duration of surgical-orthodontic treatment. An important factor in success of this treatment is the determination of location of impacted tooth with the aim of better method of its surgical exposure and orthodontic traction and alignment. Patients with impacted maxillary central incisors caused by supernumerary teeth should undergo orthodontic treatment in several stages. And the term of orthodontic traction is much less in patients treated in early period of mixed dentition. The analysis of the results of the carried out researches made it possible to recommend the developed pattern of treatment algorithms to clinical application (Fig. 14).

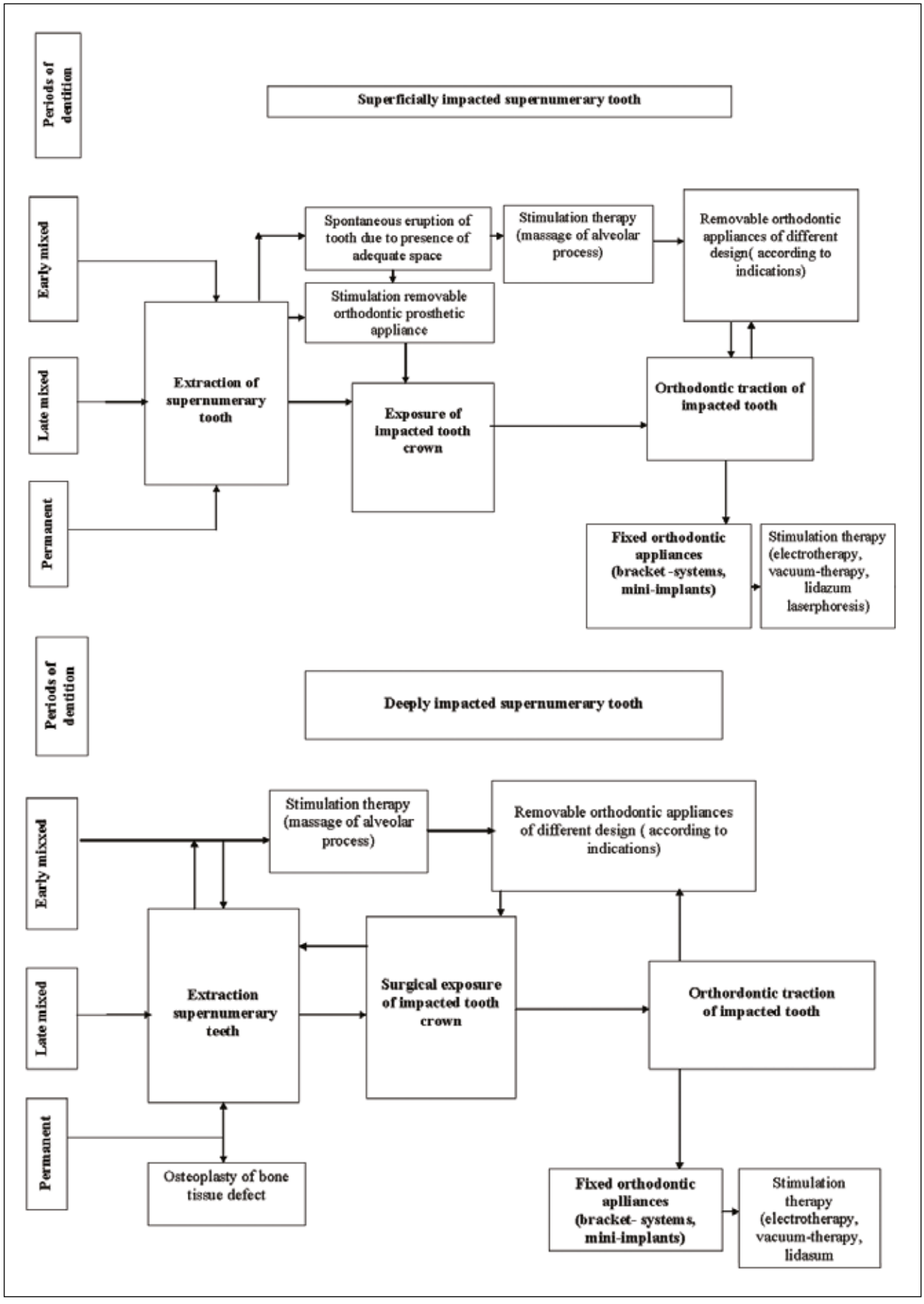

Figure 14. Treatment algorithm of patients with impacted maxillary central incisors caused by supernumerary teeth.

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The work was carried out within framework of research at the department of postgraduate education of dentists "Restoration of dental health in patients with major dental diseases and their rehabilitation", state registration number 0116 U004191

Conflict of interest:
The Authors declare no conflict of interest

ADDRESS FOR CORRESPONDENCE
Maryna I. Dmytrenko
Higher State Educational Establishment of Ukraine,
Ukrainian Medical Stomatological Academy,
23 Shevchenko str, 36000 Poltava, Ukraine
tel: +380506324055
e-mail: dmitrenko25@ukr.net

Received: 16.01.2018
Accepted: 29.05.2018