

**P.I. Tkachenko, S.O. Bilokon, N.M. Lohmatova, Y.V. Popelo, O.B. Dolenko,  
N.M. Korotych, N.P. Bilokon<sup>1</sup>**  
**Poltava State Medical University, Poltava; <sup>1</sup>Dental office "Classic Dent", Poltava**

## **RESULTS OF COMPLEX TREATMENT OF MAXILLOFACIAL HEMANGIOMAS IN CHILDREN**

e-mail: s.o.bilokon@gmail.com

In recent years, the incidence of hemangiomas of the maxillofacial area in Ukrainian children has increased significantly. In order to determine the effectiveness of their comprehensive treatment, the content of 32 inpatient case histories and 47 outpatient cards of thematic children were summarized. Capillary hemangiomas were diagnosed in 20 % of cases (in 19 % in the form of wine spots). In 25 % of cases, they were independently reduced within 7–12 months. Minor tumours in volume and depth (56 % of cases) were eliminated by diathermocoagulation or local administration of small doses of prednisone. Fractional laser therapy was used to eliminate "large spots". Cavemous hemangiomas were diagnosed in 23 % of cases. 72 % of patients were treated with diprosan in the form of four infiltrates on the periphery of the formation. In 23% of cases, percutaneous stitching of the tumour, puncture of the neoplasm was performed, followed by administering a 70 % alcohol solution into the cavities. Mixed hemangiomas (46 % of patients) were treated with anaprilin. In 33 % of patients, pyogenic granuloma was removed by radical surgery, and in 67 % – by diathermocoagulation. Upon completion of hemangioma treatment, all children underwent a course of rehabilitation measures.

**Key words:** children, maxillofacial area, hemangioma, laser therapy, surgery, diprosan, anaprilin.

**П.І. Ткаченко, С.О. Білоконь, Н.М. Лохматова, Ю.В. Попело, О.Б. Доленко,  
Н.М. Коротич, Н.П. Білоконь**

## **РЕЗУЛЬТАТИ КОМПЛЕКСНОГО ЛІКУВАННЯ ГЕМАНГІОМ ЩЕЛЕПНО-ЛИЦЕВОЇ ДІЛЯНКИ У ДІТЕЙ**

За останні роки частота виявлення гемангіом щелепно-лицевої ділянки у дітей в Україні значно збільшилась. З метою визначення ефективності їх комплексного лікування узагальнено зміст 32 стаціонарних історій хвороб та 47 амбулаторних карт тематичних дітей. Капілярні гемангіоми діагностовано у 20 % випадків (у 19 % у вигляді винних плям). В 25 % спостережень вони самостійно редукувалися протягом 7-12 місяців. Незначні за обсягом і глибиною пухлини (56 % випадків) ліквідовано діатермокоагуляцією чи місцевим введенням малих доз преднізолону. Для усунення «великих плям» застосовувалась фракційна лазеротерапія. Кавернозні гемангіоми діагностовано в 23 % випадків. У 72 % пацієнтів проведено лікування дипроспаном у вигляді чотирьохразової інфільтрації по периферії утворення. У 23 % спостережень проводилось черезшкірне прошивання пухлини, пункція новоутворення з подальшим введенням в порожнини 70 % розчину спирту. Змішані гемангіоми (46 % пацієнтів) лікували застосуванням анаприліну. У 33 % пацієнтів піогенну гранульому видалено радикальним хірургічним втручанням, а у 67 % – діатермокоагуляцією. По завершенню лікування гемангіом всі діти пройшли курс реабілітаційних заходів.

**Ключові слова:** діти, щелепно-лицева ділянка, гемангіома, лазеротерапія, хірургічне втручання, дипроспан, анаприлін.

*The study is a fragment of the research project "Complex differentiated treatment and prevention of surgical diseases of the maxillofacial area in children", state registration No. 0121U113454.*

According to statistics, the incidence of hemangiomas in Ukrainian children has increased significantly in recent years. In 80 % of cases, they are congenital dysontogenetic formations and arise from hyperplasia of vascular endothelium. Hemangiomas are primarily localized on the facial area and the head. This situation determines the urgency of the problem for maxillofacial surgery in general and pediatric surgical dentistry. This applies to in-depth studies related to identifying potential etiological factors, mechanisms of pathogenesis, features of clinical manifestations, treatment methods, morphological differences, patient's rehabilitation and prevention of possible complications of this pathological condition at all stages of observation [1, 3, 12].

At present, it is common to distinguish malformations and pediatric hemangiomas on biological grounds. According to most modern classifications, they belong to benign neoplasms formed from certain species' blood vessels and different calibres. Directly for pediatric hemangiomas, there is a specific sequence of development of characteristic features and staged course. In contrast, a distinctive feature of malformations is the lack of proliferation of structural components of the endothelial lining of blood vessels [5, 9, 10].

To plan a rational, pathogenetically sound treatment strategy, it is necessary to have a clear idea of the nosological form of vascular neoplasms. With the provision of modern, highly informative diagnostic measures, this does not pose significant difficulties in compliance with the classical rules of the algorithm of examination of this category of patients. Such a balanced approach to this issue allows establishing the

exact topographic and anatomical location of hemangiomas, their relationship with adjacent tissues, size and prevalence. This allows us to determine the scope and prerogative of treatment choice and predict the risks of unforeseen situations or complications, especially during large-scale surgical interventions in cases involving several anatomical sites in the pathological process [3, 8].

In everyday clinical practice, the definition of treatment tactics depends on the type of hemangioma. Conservative and surgical methods are most often used, but in some cases, there is an urgent need for their consistent use and a combination of several techniques. Because the maxillofacial area has significant anatomical and physiological differences and features associated with natural openings, keloid and hypertrophic scars can form in the postoperative period due to rough scarring, which distort the face, causing significant suffering to both children and their relatives [4, 7].

In such cases, the provision of highly qualified medical care, rehabilitation measures and social adaptation of patients come to the fore, determining the quality and comfort of their life, which is the relevance of this scientific work.

**The purpose** of the study was to analyze the effectiveness of complex treatment of various nosological forms of maxillofacial hemangiomas in children.

**Materials and methods.** We have summarized the content of 32 medical records of thematic patients of the surgical department of the municipal enterprise “Children's City Clinical Hospital of Poltava City Council” and 47 outpatient cards for children treated at the municipal enterprise “Children's City Clinical Dental Clinic of Poltava City Council” from 2014 to 2021. This applied to persons aged from birth to 17 years, treated directly by the Department of Pediatric Surgical Dentistry of Poltava State Medical University staff. All patients underwent standard clinical and laboratory tests, and if necessary, consultations of related specialists were scheduled.

General clinical methods of examination involved a thorough history of life and disease. Considerable attention was paid to studying the features of the antenatal and early postnatal periods of child development and establishing elements of heredity. During the visual and palpatory examination of anatomical areas where hemangiomas were located, we paid attention to the colour of the skin or mucous membrane above them, evaluated the shape and size of formations, the clarity of the contours of hemangiomas with a comparison of their relationship with surrounding tissues and relatively large vessels, determined the presence of “symptom of devastation”, drew attention to the reaction of regional lymph nodes. In case of the deep location of tumours or in doubtful cases, the diagnostic puncture was additionally performed to establish a clinical diagnosis and determine the strategy of therapeutic tissue, ultrasound, CT or MRI, angiography and dopplerography of the vessels of the corresponding area were used. In all patients, the amount of treatment was designed depending on the nosological conditions of the condition presented in the type given by Kharkiv L.V. et al. (2015) [9].

All methods of examination and planning of treatment measures were carried out with the permission of the Ethics Commission without harm to the child's health after the consent of the parents. The recommendations of the Helsinki World Medical Association and the Geneva Supplements were followed.

Digital data were processed using variational statistical analysis. The significance of differences was determined by Student's t-test using Microsoft Excel 2003 and SPSS for Windows. Release 13.0 and considered reliable at  $p \leq 0.05$ . Non-parametric methods of standard software packages (STATISTICA) were also used [2].

Table 1

**Localization of soft tissue hemangiomas in children**

No.	Anatomical area	Number of cases	
		Abs.	%
1	Lower lip	16	20
2	Cheek	12	15
3	Upper lip, nose	10	13
4	Submandibular area, neck	9	11
5	Forehead, scalp	8	10
6	Orbit and brow ridge	7	9
7	Tongue	6	8
8	Parotid-masticatory area	6	8
9	Multiple anatomical areas	5	6
10	Total	79	100

**Results of the study and their discussion.** A summary analysis of the content of medical histories and outpatient charts revealed that soft tissue hemangiomas took second place with a rate of 26 % (307/79) and with a predominance of localization in the structure of benign tumours of the maxillofacial area (MFA), presented in table 1.

The distribution of patients by sex showed that 54 % were girls (43/79) and 46 % were boys (36/79). In 46 % of cases (36/79), it concerned the group of infants. The age period from 1 to 3 years accounted for 22 % (17/79), from 3 to 7 years – 16 % (13/79), from 7 to 12 years – 10 % (8/79), from 12 to 17 years – 6 % (5/79).



Fig. 1. View of patients with capillary hemangiomas of various localization (a-e).

In the presence of capillary hemangiomas, which were diagnosed in 20 % of cases (16/79), complaints of relatives were reduced to stating the fact of red spots in a particular anatomical area, which increase in proportion to the child's growth and do not protrude above the surface of the surrounding skin (fig. 1).

Clinical manifestations of hemangiomas were mainly due to the colour of the skin and mucous membranes, the nature of blood vessels and their calibre and depth, but in all cases was a positive “symptom of devastation”.

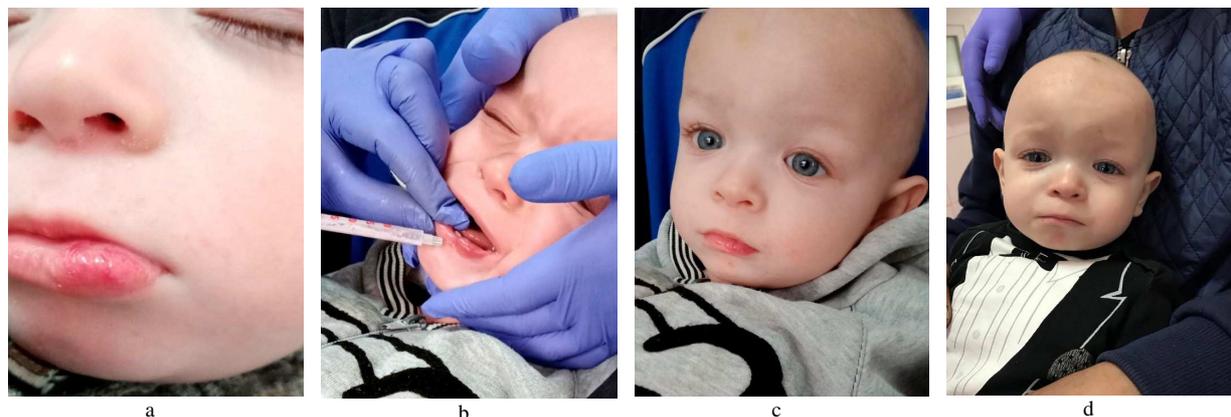


Fig. 2. View of a patient with cavernous hemangioma at the stages of diprosan treatment

At tension of the child, crying, lowering of the head, and ambient temperature changes, the degree of colouring expressiveness changed in all children. Of these, 19 % (3/16) patients had tumours in the form of wine spots. It should be noted that in 25 % of cases (4/16), capillary hemangiomas were independently reduced within 7–12 months. Minor capillary neoplasms, which occurred in 56 % of cases (9/16), were eliminated by diathermocoagulation or local administration of small doses of prednisone, which has proven itself well in clinical practice in this situation (in all cases, a positive effect was achieved). To eliminate “large spots” (in 3 patients out of 16), fractional laser therapy was used, which in 2 cases gave good results, and in one patient, we could not achieve true success.

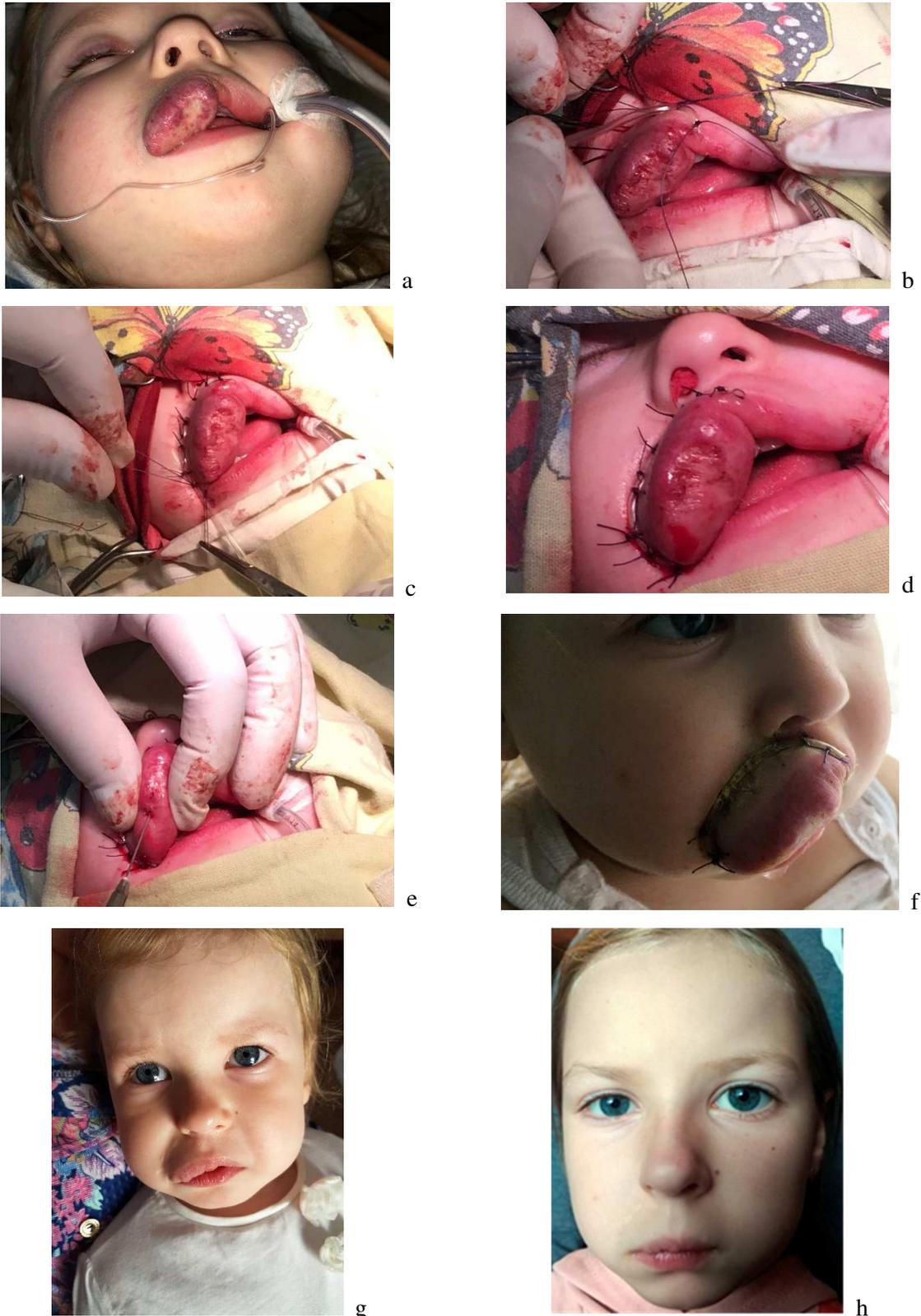


Fig. 3. Facial appearance of a patient with progressive cavernous hemangioma at the stages of combined treatment.

Cavernous hemangiomas were clinically diagnosed in 23 % of children (18/79). In all cases, their topographical and anatomical localization and size differed. To varying degrees, tumours caused soft tissue deformation and functional disorders when the formations were located near natural openings and in the oral cavity. If the cavernous hemangioma had a deep localization (33 % – 6/18), an increase in the vascular pattern on the skin was the characteristic sign. In the other 67 % of cases (12/18), with the superficial location of hemangioma, the skin was red or bluish, and the expressiveness of colour changed with “emptying – filling”. 72% of patients in this group (13/18) underwent conservative treatment with diprospan, which was administered on the periphery of the formation in the form of four infiltrates. Using this technique with an interval of 1 time per month allowed to achieve an excellent cosmetic effect in 50 % of cases (9/18), and 22 % of children (4/18) also underwent surgical correction of residual effects. At the same time, special attention was paid to the involvement of related specialists to establish contraindications to corticosteroid therapy (fig. 2).



Fig. 4. Type of patients: a-d) with mixed hemangiomas during the stages of treatment with anaprilin; e-f) with pyogenic granuloma.

When hemangiomas of this type actively progressed and were located on the lips, in the buccal or parotid areas, around the nasal passages, which was found in 23 % of cases (5/18), there was a need for a combined approach to treatment. In such cases, we began work on the percutaneous stitching of the tumour with Krogius sutures. To prevent the eruption of sutures with the subsequent formation of rough scars on the skin and create favourable conditions for remediation, we proposed using a polyethylene catheter, cut in half lengthwise. After suturing through its surface at intervals of 2–2.5 cm from each other and isolating the vessels that supply blood to the hemangioma, the tumour was punctured from different poles, thereby evacuating the blood. The number of punctures depended on the size of the hemangioma. In the cavities of the caverns resulting from this manipulation, a 70 % alcohol solution was injected, if possible by reverse aspiration, the content of which was negligible. An aseptic dressing was applied and medical support was prescribed according to the clinical situation. Sutures were removed after two weeks. At the end of this stage, additional surgical correction was performed in the presence of scar tissue or remnants of altered areas. This methodological approach made it possible to achieve an excellent cosmetic effect in all cases (fig. 3).

We also observed 46 % of patients (36/79) with mixed forms of hemangiomas. The complaints of parents and relatives of the child were reduced to the presence of a tumour-like formation, which spread to several anatomical areas. In 78 % of cases (28/36), it was covered with coloured skin of different colours. In the other 22 % of cases (8/36) with deep hemangioma, the skin was not changed over the area of tumour projection. In all cases, it was characterized by rapid progressive growth, a significant increase in size with the child's tension, and a change in the inclination of the head, accompanied by an increased tone of colour and contouring of the hilly surface.

Recently, scientific publications have been actively covering the issues of the high efficacy of selective  $\beta$ -blockers in the treatment of hemangiomas of this species. In 86 % of patients (31/36), after a comprehensive clinical examination, consultation with specialists in related fields and in the absence of contraindications, we eliminated them using anaprilin. In 14 % of children (5/36), such hemangiomas were eliminated by performing both sclerosis and additional surgical correction of residual effects (fig. 4 a-f).

Pyogenic granuloma with predominant localization on the lips and oral mucosa was diagnosed in 11 % of cases (9/79). The complaints were reduced to the presence of formation in one or another specified anatomical area, which occurred 1.5–3 months after injury or a bad habit of the child to bite his lips. Visually, it was defined as a red domed papule on a wide or narrow stalk, on the surface of which there were always crusts, and around the site of fixation was followed by perifocal infiltration. To prevent relapse with significant pyogenic granuloma sizes, 33 % of patients (3/9) underwent radical surgical removal under local or general anaesthesia. In 67 % (6/9), with small sizes, we limited ourselves to diathermocoagulation to achieve an excellent cosmetic effect (fig. 4 e-f).

Upon completion of comprehensive treatment of hemangiomas, all children, according to the individual plan, underwent a course of rehabilitation measures, the amount and type of which depended on the clinical situation in each case. It should be noted that when comparing the clinical diagnosis of different nosological forms of hemangiomas, and data obtained from morphological verification of biopsies sent after surgery, their discrepancy was found in 22 % (17/79) of cases. This may be due to the high probability of combination or prevalence of certain types of the vascular component in the structural elements, which requires further clarification.

Periodicals constantly publish materials indicating an increase in the number of children with tumors of dysembryonic origin, which are formed precisely from blood and lymphatic vessels [10, 14, 15]. According to the statistical data derived from our study, hemangiomas account for 26 % of congenital tumours of the maxillofacial area, and mixed nosological forms predominate. This is partly in line with the results obtained by other scientists [9, 12], but they do not make a clear differentiation in terms of the possibility of taking into account the indications for the use of therapeutic measures in outpatient or inpatient settings. From a clinical point of view, the diagnosis of hemangiomas does not cause significant difficulties in their superficial localization. At profound occurrence with the involvement of several topographic and anatomical areas, without modern research methods, it is impossible to differentiate [6, 9, 13], which is confirmed by us. Unfortunately, the clinical diagnosis does not always correspond to the morphological verification of the type of hemangioma, which does not allow to determine the choice of the optimal method of treatment in the prehospital stage, and to plan its scope directly during surgery, because vascular formations can create “surprise” situations. Therefore, in the postoperative period, due to the direct or indirect impact of these inconsistencies, there may be certain complications and dissatisfaction with cosmetic and functional components, which significantly affect the quality of life of children and the effectiveness of their social adaptation [5, 7, 11].

### Conclusion

The obtained statistical data indicate that the proportion of hemangiomas in children is 26 % of all benign dysontogenetic tumours of the maxillofacial area. The use of highly informative additional research methods allows determining the optimal treatment option for vascular neoplasms in each case. This methodological approach makes it possible to successfully perform surgery, sclerosing, drug therapy, apply a hardware method of influence or use a combination. Due to a very similar structural organization of different nosological forms of hemangiomas with their characterological manifestations, the discrepancy between clinical diagnosis and morphological verification is 22 %, making it impossible to entirely objectively determine tactical approaches to planning the scope of specialised care at the prehospital stage. Therefore, there is an urgent need for further widespread introduction into everyday clinical practice of the latest diagnostic components that would ensure low-traumatic surgical interventions, achieve good functional results, which significantly affects the final cosmetic effect, improves the quality of life of children and creates favorable conditions for their social adaptation.

*Further research aims to expand the indications for using an arsenal of new drugs that allow successful conservative treatment of hemangiomas.*

### References

1. Belokon SA. Gemangiomy myagkikh tkaney chelyustno-litsevoy oblasti u detey: kliniko-morfologicheskaya kharakteristika. Zhurnal Grodnenskogo gosudarstvennogo meditsinskogo universiteta. 2014; 4(48): 98–102. [in Russian]
2. Vukolov EA. Osnovy statisticheskogo analiza. Praktikum po statisticheskim metodam i issledovaniyu operatsiy s ispolzovaniem paketov Statistica i Excel. Uchebnoe posobie. 2-e izd. M.:Forum; 2008. 464 s [in Russian]
3. Kotlukova NP, Belysheva TS, Valiev TT, Konstantinova NK, Telezhnikova ND, Lavrova TR. Interdisciplinary approach to the treatment of infant hemangioma. *Pediatrics*. Journal n.a. G.N. Speransky. 2021;100(3):174–182. doi: 10.24110/0031-403X-2021-100-3-174-182. [in Russian]
4. Perminov OB, Chumachenko OV, Lisovska IU. Likuvannya dobroyakisnih sudynnykh novoutvoren myakykh tkanyn shchelepno-litsevoy dilyanky iz zastosuvannyam himichnoyi koagulyaciyi. Novi tehnologiyi v khirurhichniy stomatolohiyi i shchelepno-litsevyi khirurhiyi. Materialy nauk.-prakt. konf., prisvyachenoyi 100-richchyu z dnya narodzhennya prof. G.I Semenchenka. Odesa; 2014, s. 91–2 [in Ukrainian]
5. Polyayev YuA, Mylnikov AA, Garbuzov RV. Mnogoletniy opyt lecheniya infantilnykh gemangiom u detey. *Pediatrics*. Zhurnal im. G.N. Speranskogo. 2017; 96(4):102–9 [in Russian]. doi: 10.24110/0031-403X-2017-96-4-102-109 [in Russian]
6. Roiko NI, Filenko BM, Nikolenko DYe, Mamai IO. Patologiya mitoziv pry pukhlinakh riznoyi lokalizatsiyi. *Svit medicini ta biologiyi*. 2013; 2(38): 213–5 [in Ukrainian]
7. Tetryeva NA, Timoshenko AV, Golubchenko OI. Retrospektyvnyi ohlyad rezultativ likuvannya propranololom infaltnykh gemangiom shchelepno-litsevoy dilyanky u ditey. *Desyatirichnyi dosvid. Materialy VII Zyizdu Ukrayinskoyi asociaciyi cherepno-shchelepno-litsevykh khirurgiv*. Kyiv; 2021, s. 97-8. [in Ukrainian]
8. Tkachenko PI, Starchenko II, Bilokon SO. *Novoutvorenniya shchelepno-litsevoy dilyanky u ditey*. Poltava; 2018. 191s. [in Ukrainian]
9. Kharkov LV, Yakovenko LM, Chehova IA. *Khirurgichna stomatolohiya ta shchelepno-litseva khirurhiya dityachoho viku*. Kyiv:Medytsyna; 2015.496 s. [in Ukrainian].
10. Ding Y, Zhang JZ, Yu SR, et al. Risk factors for infantile hemangioma: a meta-analysis. *World J Pediatr*. 2020;16(4):377–384. doi: 10.1007/s12519-019-00327-2.
11. Hoeger PH, Harper JL, Baselga E, Bonnet D, Boon LM, Ciofi Degli Atti M et al. Treatment of infantile haemangiomas: recommendations of a European expert group. *Eur J Pediatr*. 2015;174(7):855–65. doi: 10.1007/s00431-015-2570-0.
12. Johnson EF, Davis DM, Tollefson MM, Fritchie Karen, Gibson LE. Vascular Tumors in Infants: Case Report and Review of Clinical, Histopathologic, and Immunohistochemical Characteristics of Infantile Hemangioma, Pyogenic Granuloma, Noninvoluting Congenital Hemangioma, Tufted Angioma, and Kaposiform Hemangioendothelioma. *Am J Dermatopathol*. 2018;40(4):231–9. doi: 10.1097/DAD.0000000000000983.
13. Krowchuk DP, Frieden IJ, Mancini AJ, Darrow DH, Blei F, Greene AK et al. Clinical practice guideline for the management of infantile hemangiomas. *Pediatrics*. 2019;143(1):e20183475. doi: 10.1542/peds.2018-3475.
14. Putra J, Al-Ibraheemi A. Vascular Anomalies of the Head and Neck: A Pediatric Overview. *Head Neck Pathol*. 2021;15(1):59–70. doi: 10.1007/s12105-020-01236-x
15. Rotter A, de Oliveira ZNP. Infantile hemangioma: pathogenesis and mechanisms of action of propranolol. *J Dtsch Dermatol Ges*. 2017; 15(12):1185–90. doi: 10.1111/ddg.13365

Стаття надійшла 10.02.2021 р.