ORIGINAL ARTICLE

CONTENTS

Osteomas in pediatric oral surgery practice

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ABSTRACT

Aim: To present the findings of our own research regarding the frequency, clinical and morphological characteristics, and treatment strategies for osteomas of the maxillofacial region in children.

Materials and Methods: The study is based on the analysis of outpatient records and inpatient medical histories of 17 children who underwent examination and treatment for osteomas over a 10-year period. To establish a preliminary diagnosis, general clinical and additional diagnostic methods were used, including radiography and computed tomography. The microscopic structure of the postoperative material was examined using histological slides.

Results: It was established that among the 17 patients, there were 10 boys (58.8%) and 7 girls (41.2%), and the highest number of diagnosed cases were observed in the older age group (12 patients (70.6%)). The course of the disease was predominantly asymptomatic; in some cases, complaints were limited to the presence of painless hard protrusions on the vestibular surface of the mandible, which, even when small in size, caused some facial asymmetry. Radiological diagnostic methods enabled the confirmation of the diagnosis. The microscopic structure of the postoperative material fully corresponded to the morphological features of osteomas described in adult patients. The treatment strategy was determined based on the patient's complaints and the clinical symptoms in each individual case.

Conclusions: 1. Osteomas of the maxillofacial region in children are most commonly observed in the older school-age group, with the most frequent localization being the body of the mandible and the area of the paranasal sinuses. Inflammatory processes and trauma against a background of hereditary predisposition are among the provoking factors for their development. 2. The clinical presentation and morphological structure of osteomas in children do not significantly differ from those in adults. The generally accepted treatment approach, namely, dynamic monitoring of small-sized tumors and complete surgical removal in cases of disease progression or the development of deformities is fully justified. 3. Not with standing the advancements in scientific and technological progress and improved diagnostic capabilities, the issues of the etiology, pathogenesis and nosological classification of osteoid osteomas remain debatable and require further in-depth investigation.

KEY WORDS: children, benign tumors, osteoma, osteoid osteoma, maxillofacial region

Wiad Lek. 2025;78(8):1584-1592. doi: 10.36740/WLek/209511 DOI

INTRODUCTION

Osteomas (OS) are neoplasms composed of mature bone tissue, detected in 2.73% of patients with benign tumors of the maxillofacial region (MFR) and occur 2–3 times more frequently in males. Depending on the type of bone tissue from which the tumor is formed, compact and cancellous (spongy) forms of solid osteomas are distinguished, along with a mixed variant. Many researchers also classify osteoid osteoma (soft osteoma) as a separate type [1–3].

According to statistical data, with a general population prevalence of 1%, osteomas in the jaws and cranial bones are diagnosed in 80–96% of cases in the mandible and sinonasal region, particularly involving the frontal sinuses. In 2–5% of cases, these tumors are located directly in the maxillary sinuses [4–6].

Osteomas can develop at any age; however, the risk of their occurrence is highest in young individuals, particularly during periods of active bone tissue growth. In the maxillofacial region, this is explained by the traumatic-infectious and embryonic theories of origin of OS. According to these theories, such tumors arise either as a result of bone tissue remodeling in response to trauma or inflammation, or due to bone proliferation at the junction of the bones [7–9].

The first mention of an osteoma dates back to 1506 (Viega), while it was Vallisnieri who first described it as a tumor composed of bone tissue in 1733 [10]. Since then, the symptomatology of OS has been studied in considerable detail. In 4–10% of all cases, osteomas of various localizations show no distinct clinical manifestations, and at the early stages, the disease is typically asymptomatic. However, as the tumor grows, with an average growth rate of 0.44–6 mm per year, the clinical symptoms may vary depending on the size of the

Table 1. Localization of MFR osteomas in children

No.	Anatomical areas	Number of cases	
		abs	%
1	Body of the mandible	3	17.7
2	Nasal bones and accessory sinuses	3	17.7
3	Various anatomical areas of the maxilla	2	11.8
4	Frontal bone	2	11.8
5	Alveolar process of the mandible	1	5.8
6	Submental region	1	5.8
7	Other bones of the facial skull	5	29.4
Total		17	100

Source: compiled by the authors of this study

neoplasm and the involvement of adjacent anatomical structures. In the MFR, depending on the osteoma's localization, this may lead to jaw and cranial bone deformities, headaches, dental pain, sinusitis and symptoms of ophthalmologic or neurologic origin [6, 11, 12].

In clinical practice, the diagnosis and differential diagnosis of osteomas usually pose no difficulties, and they are often discovered incidentally during radiological examinations conducted for other reasons [2, 9, 13].

However, despite the awareness among a broad range of healthcare professionals regarding the prevalence and clinical features of this pathology in the MFR, diagnostic errors still occur [5, 14]. Partially, this is exacerbated by the fact that not all clinically and morphologically confirmed cases of osteomas can be explained by the aforementioned theories of their origin.

Therefore, in our opinion, comparing the results of our own observations at this stage of medical development with the generalized literature data on MFR osteomas in children is relevant and serves as an important reminder to the medical community that in pediatric practice, there are no secondary issues.

AIM

To present the findings of our own research regarding the frequency, clinical and morphological characteristics, and treatment strategies for osteomas of the maxillofacial region in children.

MATERIALS AND METHODS

The study is based on the analysis of outpatient records and inpatient medical histories of 17 children who underwent examination and treatment for osteomas over a 10-year period at the clinic of the Department of Pediatric Oral Surgery of Poltava State Medical University, affiliated to CE "City Children's Clinical Dental Polyclinic" and "Children's City Clinical Hospital" of the Poltava City Council.

10 boys (58.8%) and 7 girls (41.2%) have been involved into the study.

To establish a preliminary diagnosis, general clinical and additional diagnostic methods were used, including radiography and computed tomography.

Six children (35.3%) underwent tumor removal in a hospital setting based on indications, while dynamic observation continues for 11 children (64.7%).

The microscopic structure of the postoperative material was studied on 6 histological slides, prepared using standard techniques, which allowed for the final diagnosis to be determined.

To ensure confidentiality and protect patient identity, personal data and any identifying information were excluded from the analysis. These data are standardized and stored in an electronic format with restricted access. The study was conducted in accordance with the principles of the Helsinki Declaration.

RESULTS

The highest number of the 17 diagnosed cases of osteomas occurred in 12 children (70.6%) of the older school-age group (ages 15 to 17). Table 1 shows the distribution of the anatomical areas of localization of the neoplasms, which indicates that they were most commonly found in the mandible and in the nasal area and its accessory sinuses.

When collecting the medical history, it was established that the children's relatives were unaware of the presence of the tumor, as in all cases, the tumor grew very slowly, and they did not pay attention to it. In 5 cases (29.4%), the existence of the osteoma was unknown, and its growth activation was attributed to previous inflammatory processes in the periapical tissues of the tooth, caused by both complicated dental caries and other odontopathologies. In 2 cases (11.8%),

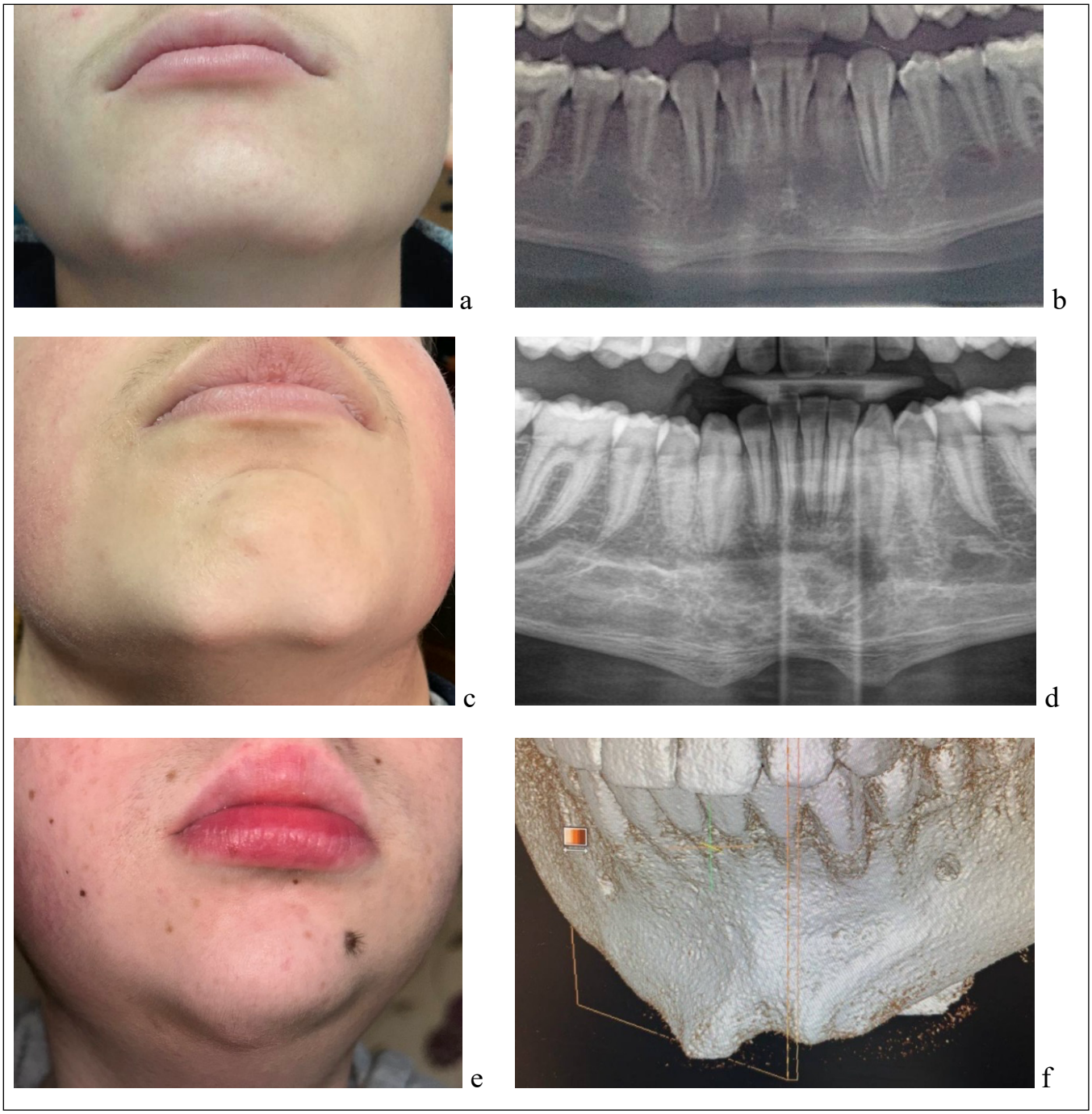

Fig. 1. Overall appearance (a, c, e) and fragments of orthopantomograms (b, f) and computed tomography with 3D visualization (f) of children with "bony spurs." The "extraoral protrusions" in the submental area and the corresponding bone changes in the mandible region are clearly visible
Picture taken by the authors

the growth was believed to have been provoked by traumatic facial injuries. In the remaining 10 patients (58.8%), no provoking cause was identified, and the presence of the tumor in the bone tissue of various anatomical areas was discovered during radiological examinations, which were most often conducted for orthodontic purposes.

The parents of 4 children (23.5%) reported a history of this pathology in family members.

In 3 cases (17.7%), the complaints were limited to the presence of painless hard protrusions on the vestibular surface of the mandible. Even with small sizes, these protrusions caused some facial asymmetry.

We also classified 4 cases (23.5%) as "bony spurs" (Fig. 1), although some researchers consider the classification of these as osteomas to be debatable [13-15].

In all cases, one of the types of radiological examination was used; however, the most commonly

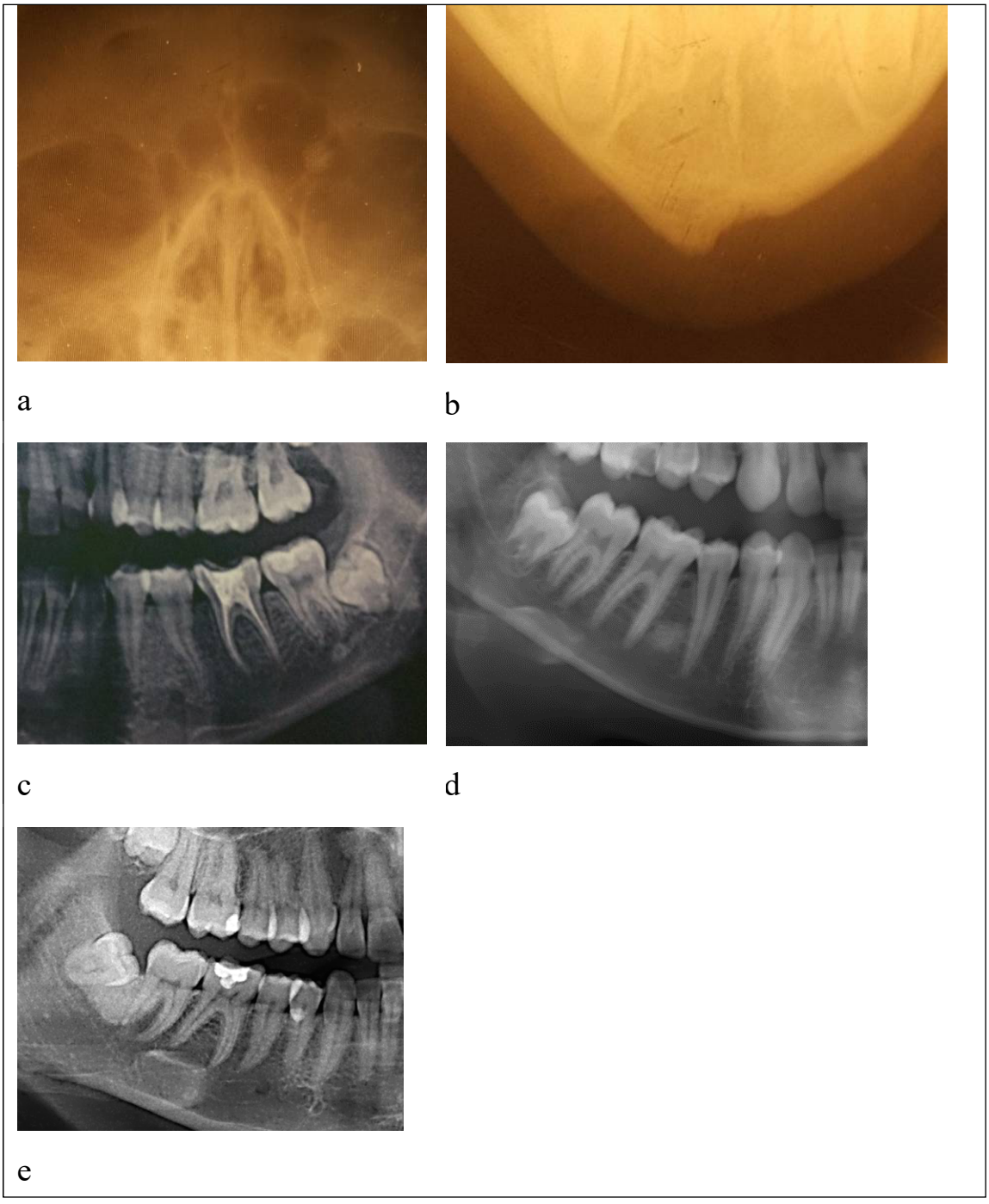

Fig. 2. Radiological images of osteomas (in the area of the medial wall of the orbit and the frontal sinus on the left (a); in the submental region (b); in the body of the mandible in the area of tooth 37 (c); in the body of the mandible in the area of teeth 45 and 46 (d); in the body of the mandible in the area of tooth 48 (e), which fully correspond to the description presented in the text
Picture taken by the authors

employed were orthopantomography and computed tomography. These methods revealed a homogeneous mass with clear borders, significantly denser than the adjacent bone tissue. A distinct "plus-tissue" symptom was typically observed. This radiological picture is characteristic of solid compact osteomas (Fig. 2).

No radiological signs of cancellous osteomas were observed.

We observed 2 cases of asymptomatic course of osteoid osteomas (soft osteomas), which were radiologically identified as a defined zone of radiolucency at the periphery with increased radiolucency in the central part of the tumor (Fig. 3), and the diagnosis was confirmed morphologically.

Based on the recommendations of the researchers [1, 4, 5-7, 15-19], the differential diagnosis of oste-

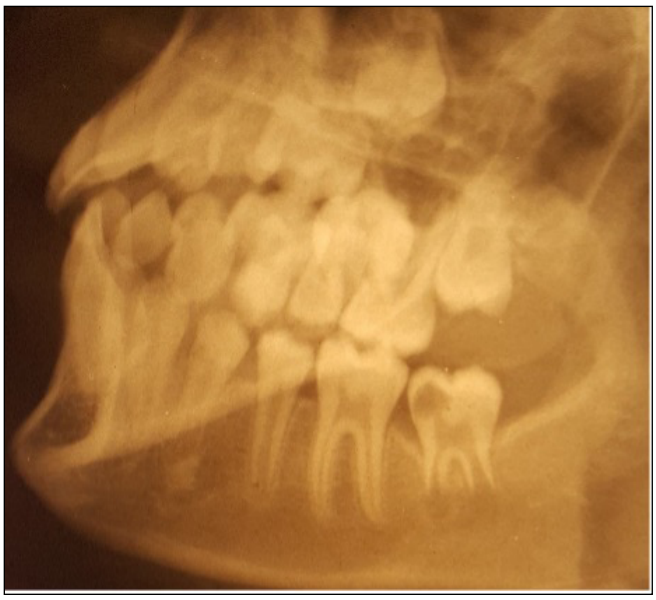

Fig. 3. Radiological image of an osteoid osteoma of the maxilla in the area of teeth 25 and 26. The mass shows a "layered cake" pattern
Picture taken by the authors

omas was carried out with other benign processes that localize in bone tissue and have similar clinical symptoms (osteoblastoclastoma, solid ameloblastoma, bone dysplasias, osteophytes, exostoses, chronic periostitis, etc.).

11 children (64.7%), in whom the asymptomatic course of the disease was not accompanied by functional disorders or cosmetic defects, underwent dynamic observation.

In another 6 patients (35.3%), radical surgical removal of the tumor was performed under general anesthesia in a hospital setting (Fig. 4).

No complications were observed during the surgical intervention or in the postoperative period. The wounds healed with primary tension.

The postoperative material was sent for histological examination, which revealed that microscopically, solid compact osteomas differed from normal compact bone by disrupted architecture and narrow vascular channels (Fig. 5).

The morphological signs of cancellous osteomas were not observed in any case, but according to researchers, they consist of spongy, porous bone tissue [20], which should be noted, as they can behave differently prognostically [14].

Osteoid osteomas macroscopically appeared as soft tissue mass of red color with a zone of ossification in the center and surrounding sclerotic white tissue, and microscopically (Fig. 6) they consisted of osseous substance characterized by large bone marrow cavities, which aligns with the description of their histological structure in the publications [20].

DISCUSSION

The analysis of the presented findings shows that, similar to other researchers, we consider the mandible as the "preferred" localization of osteomas. However, the literature sources report numerous cases of osteomas located on the inner wall of the maxillary sinus, in the nasal cavity, and even within the parotid salivary gland [5, 10, 12].

The findings of the study also confirm the researchers' opinion that the provoking factors for the growth of osteomas include traumatic injuries, inflammatory processes, hypothermia and the impact of infectious agents against the background of genetic predisposition. The likely sources of their development are remnants of embryonic cartilage or the periosteum of mature bone [1, 2, 4, 21, 22].

Taking into account the research data on the size variations of osteomas ranging from 2 to 30 mm, their predominant localization along the bony edge, and the absence of malignancy and metastasis (we did not find the description of any cases) [10, 12, 17], summarizing the findings of our own studies and material presented in other scientific sources, we can distinguish a general symptom complex characteristic of these tumors when located directly in the MFR:

- localization on the surface of the jaw and skull bones and in the walls of the nasal sinuses;
- density and immobility;
- density and smooth surface with clear borders;
- painlessness upon palpation.

Considering the asymptomatic course of the disease observed in our patients, it should not be forgotten that publications report complaints of patients caused by the anatomical localization and size of osteomas, as well as the specifics of the clinical situation. For example, osteomas developing within the body of the mandible can cause neuralgia of the inferior alveolar nerve and asymmetry of the lower half of the face; those localized on the coronoid process may gradually restrict movement of the mandible; and those growing into the nasal cavity can lead to breathing difficulties. Tumors that grow into the maxillary sinus typically manifest later, gradually filling and taking its anatomical shape. In such cases, the tumor is often detected incidentally during radiological examination of the nasal or maxillary sinuses due to the gradual onset of facial asymmetry or development of lower jaw contracture caused by deformation and outward displacement of the upper jaw ridge. Additionally, large tumors can also cause displacement of the eyeball [1, 4, 7, 8, 11].

The primary diagnostic method for osteomas, as in our study, is undoubtedly radiography. It is considered that for very small OS, conventional radiological

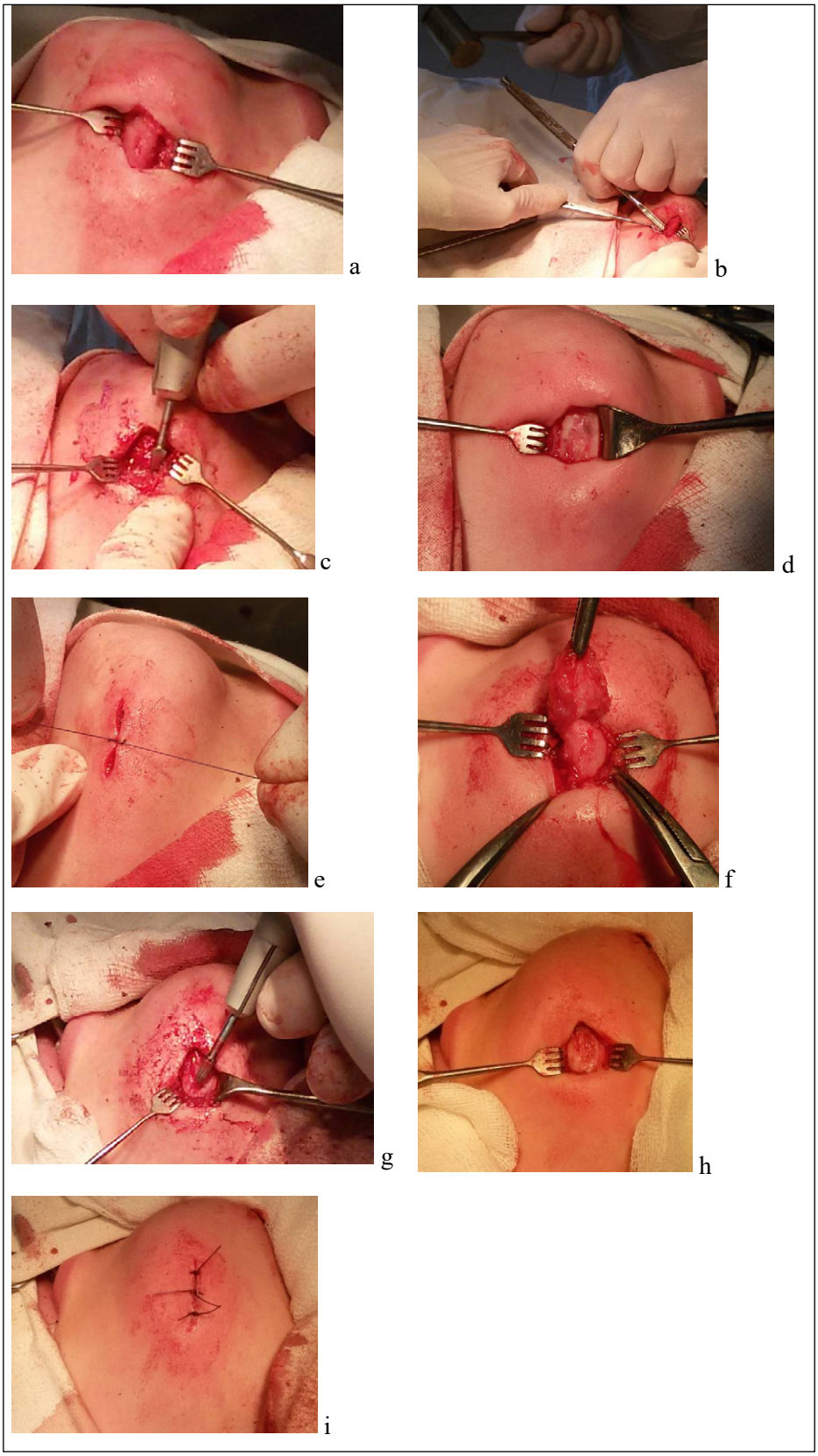

Fig. 4. Stages of surgical treatment of a patient with "bony spurs," presented in Fig. 1a, b. The surgical intervention was performed simultaneously and step-by-step from the left (a-e) and right (f-i) sides
Picture taken by the authors

examination is of limited informative value, which is why, to clarify certain parameters, the cutting edge high-information techniques such as computed tomography should be more widely used. This method allows for visualizing even the smallest details of the tumor structure and determining the extent of bone tissue destruction [6, 13].

A debatable issue remains the classification of osteoid-osteoma as an osteoma, which occurs in only 0.5% of patients with tumors, more commonly in individuals

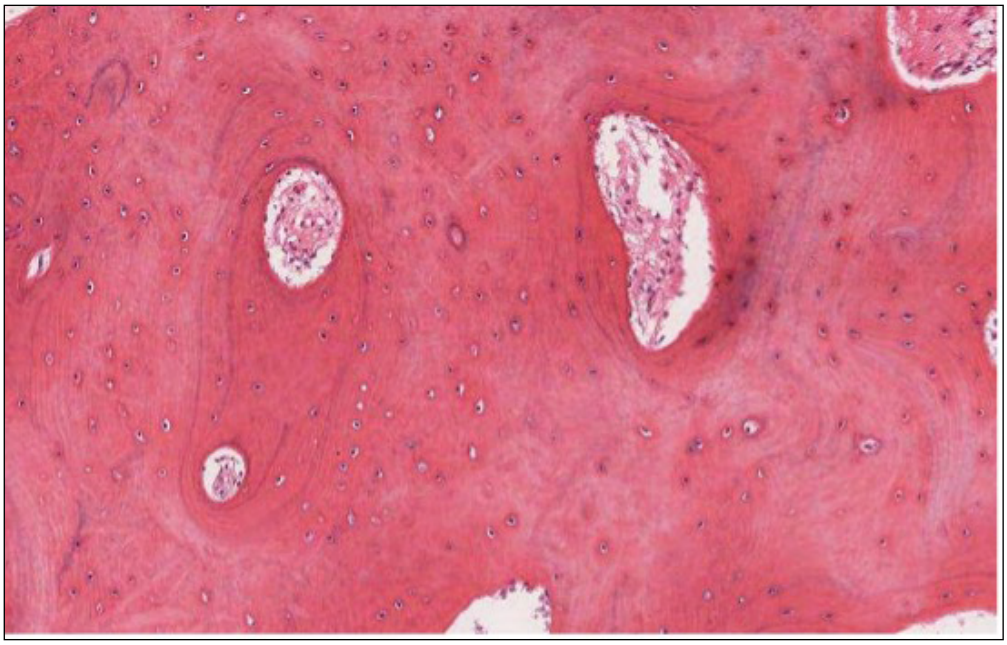

Fig. 5. Microscopic structure of compact osteoma. H&E stain. Objective lens: 10×magnification; Ocular lens: 7×magnification. Disruption of bone tissue structure is observed
Picture taken by the authors

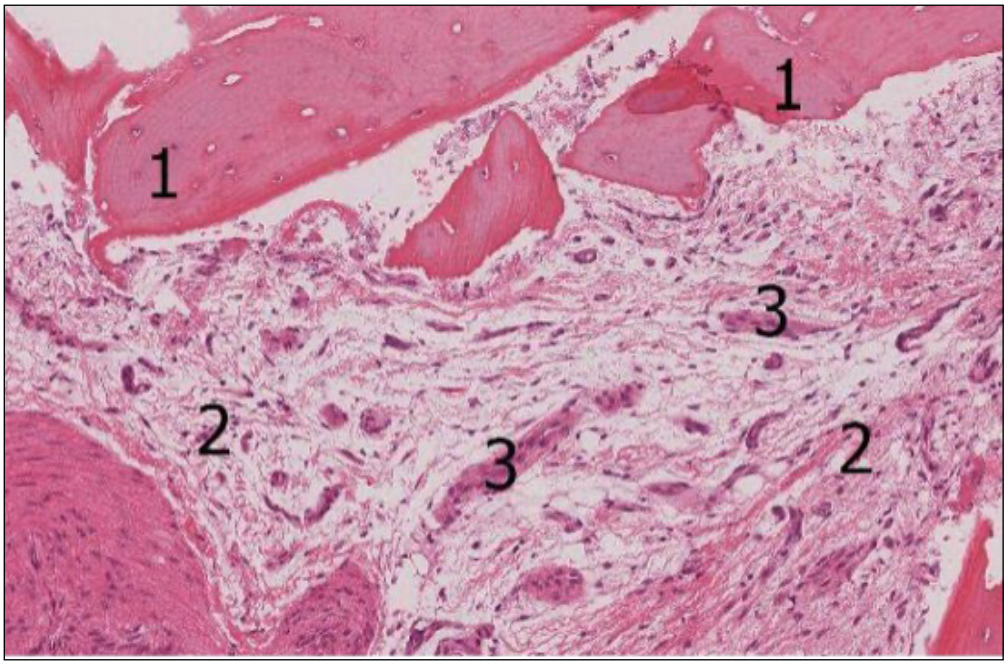

Fig. 6. Microscopic structure of osteoid osteoma. H&E stain. Objective lens: 10×magnification; Ocular lens: 7×magnification
1 – bone trabeculae;
2 – fibrous (osteogenic) tissue;
3 – blood microvessels
Picture taken by the authors

aged 20-30 years (with isolated cases reported in children). It typically localizes in the spongy or compact bone tissue or subperiosteally, with variable sizes ranging from 5 to 20 mm in diameter [5, 8].

Some researchers argue that osteoid-osteoma should not be classified as a true tumor but rather as a manifestation of reactive inflammation. They support this view with the clinical feature of osteoid-osteoma, which involves aching pain that periodically intensifies, especially at night, and is relieved by aspirin, as well as its radiological characteristics mentioned earlier [9, 14].

However, we believe that this issue requires further in-depth study, considering that in our two observations (a number that is certainly insufficient to draw any significant conclusions), the asymptomatic course of the disease in morphologically confirmed cases of osteoid-osteoma did not significantly differ from that in diagnosed cases of hard osteomas.

The treatment strategy applied to our patients fully aligns with the opinion of most other researchers, who suggest that in the case of small, asymptomatic osteomas, a wait-and-see approach should be adopted, with periodic monitoring of the tumor's condition. The only definitive treatment for osteomas remains their surgical removal, with follow-up care to prevent both general and local complications [23-28].

Relapses of tumors occurs rarely, with a relatively long development period, averaging 5-8 years, and is usually associated with incomplete removal of the tumor. In most cases, this concerns osteoid-osteoma, which

makes careful scraping of the tumor quite important [2, 6, 8, 9, 14].

Available literature sources do not provide data on the long-term outcomes of osteoma treatment, not only in children but also in adults. Therefore, we plan to continue long-term monitoring of the results of surgical interventions for the removal of these tumors, paying attention to patient age, the anatomical location of the formation, surgical access, as well as the extent and technique of surgical intervention.

CONCLUSIONS

1. Osteomas of the maxillofacial region in children are most commonly observed in the older school-age group, with the most frequent localization being the body of the mandible and the area of the paranasal sinuses. Inflammatory processes and trauma against a background of hereditary predisposition are among the provoking factors for their development.
2. The clinical presentation and morphological structure of osteomas in children do not significantly differ from those in adults. The generally accepted treatment approach, namely, dynamic monitoring of small-sized tumors and complete surgical removal in cases of disease progression or the development of deformities is fully justified.
3. Not with standing the advancements in scientific and technological progress and improved diagnostic capabilities, the issues of the etiology, pathogenesis and nosological classification of osteoid osteomas remain debatable and require further in-depth investigation.

REFERENCES

1. Zelenskij VA, Muhoramov FS. Detskaja hirurgicheskaja stomatologija i cheljustno-licevaja hirurgija [Paediatric surgical dentistry and maxillofacial surgery]. Moskva. 2008, p.206. (Russian)
2. Tkachenko PI, Starchenko II, Bilokon SO et al. Novoutvorennia shchelepno-lytsevoi dilianky u ditei [Neoplasms of the maxillofacial area in children]. Poltava. 2018, p. 191. (Ukrainian)
3. Tkachenko PI, Bilokon SO, Lokhmatova NM et al. Dytyacha khirurhichna stomatolohiya. Ambulatorne likuvannya: Navchal'nyy posibnyk PHMU. [Pediatric surgical dentistry. Outpatient treatment: Training Manual PSMU]. Lviv: Magnolia 2006. 2023, p.145. (Ukrainian)
4. Garg RK, O'Connor MK, Sterling DA et al. Pediatric Odontogenic and Maxillofacial Bone Pathology: A Global Analysis. J Craniofac Surg. 2022;33(3):870-874. doi: 10.1097/SCS.0000000000008201. DOI
5. Malanchuk VO, Konchak AV. Dobroiakisni pukhlyny ta pukhlynopodibni urazhennia shchelepno-lytsevoi dilianky ta shyi [Benign tumours and tumour-like lesions of the maxillofacial region and neck]. Kyiv: Askaniia. 2008, p.320. (Ukrainian)
6. Tymofieiev OO. Shchelepno-lytseva khirurhiia [Oral and maxillofacial surgery]. Kyiv: Medytsyna. 2022, p.792. (Ukrainian)
7. Topol'nickij OZ. Stomatologija detskogo vozrasta. Hirurgija [Paediatric dentistry. Surgery]. Moskva: GJeOTAR-Media. 2016, p.311. (Russian)
8. Kharkov LV, Yakovenko LM, Chehova IA. Hirurgichna stomatologiya ta shelepno-liceva hirurgiya dityachogo viku [Surgical dentistry and maxillofacial surgery in childhood]. Kiyiv: Medicina. 2015, p.496. (Ukrainian)
9. Malanchuk VO. Khirurhichna stomatolohiia ta shchelepno-lytseva khirurhiia [Surgical dentistry and maxillofacial surgery]. T. 1. Kyiv: Lohos. 2011, p.669. (Ukrainian)
10. Perich B. Osteomas of the nose and paranasal sinuses: A review of literature. RussRhinol. 2016;24(2):50-4. doi:10.17116/rosrino201624250-54. DOI
11. Holcomb GW, Murphy JP. Ashkraft's Pediatric Surgery. 5th ed. Philadelphia: Saunders Elsevier. 2010, p.1101.
12. Klimenko KE, Borisova IB, Shemyakin SO, Kryukov AI. Current surgical approaches to frontal ethmoid osteoma. Review of literature and own experience. Med Council. 2015;(3):65-71. doi:10.21518/2079-701X-2015-3-65-71. DOI
13. Arzhantsev AP. Benign tumours of the jaws and their radiological manifestations. REJR. 2020;10(1):27-42.doi:10.21569/2222-7415-2020-10-1-27-42.
14. Tkachenko PI, Starchenko II, Bilokon SO et al. Dobroiakisni novoutvorennia kistok shchelepno-lytsevoi dilianky u ditei. [Benign neoplasms of maxillofacial bones in children]. Poltava. 2016, p.85. (Ukrainian)
15. Tkachenko PI, Starchenko II, Bilokon SO et al. Osteoblastoklastoma shchelep u ditei: kliniko-morfolohichna kharakterystyka [Osteoblastoclastoma of jaw in children: clinical and morphological characteristic]. Svit medytsyny ta biolohii. 2016;2(56):95-99. (Ukrainian)
16. Tkachenko PI, Starchenko II, Bilokon SO et al. Kliniko-morfolohichni aspekty anomalii rozvytku zubiv [Clinical and morphological aspects of dental developmental anomalies]. Poltava. 2014, p.80. (Ukrainian)
17. Tkachenko PI, Starchenko II, Belokon SA et al. Clinical and tactical approaches in the diagnosis of malignant tumors of maxillofacial area in children. The new armenian med J. 2016;10(3):27-33.
18. Tkachenko PI, Starchenko II, Bilokon SO et al. Osoblyvosti perebihu, klinichna ta morfolohichna kharakterystyka ameloblastomy ta fibroznoyi dysplaziyi u ditey. [Features of the course, clinical and morphological characteristics of ameloblastoma and fibrous dysplasia in children]. Svit medytsyny ta biolohii. 2021;2(76):148-152. doi: 10.26724/2079-8334-2021-2-76-148-152. (Ukrainian) DOI

19. Belokon SA, Starchenko II, Dobroskok VA et al. Benign soft tissue tumors of maxillofacial region in children: Incidence, structure, clinicodiagnostic features. New Armenian Med J. 2017;11(3):30-36.
20. Pal'cev MA, Anichkov NM. Atlas patologii opuholej cheloveka [Atlas of human tumour pathology]. Moskva: Medicina. 2005, p.424. (Russian)
21. Gemonov VV, Lavrova JeN, Falin LI. Razvitie i stroenie organov rotovoj polosti i zubov [Development and structure of oral organs and teeth]. Moskva: GOU VUNMC MZ RF. 2002, p.256. (Russian)
22. Avetikov DS, Buchanhenko OP, Shlykova OA et al. Presence of type 1 collagen alpha-2 (COL1A2) (rs42524) gene polymorphism and scar tissue formation in different areas of head and neck. Presqui Bras Odontopediatria Clin Integr. 2020;20:e4422. doi:10.1590/pboci.2020.031. DOI
23. Bilokon SO, Hurzhii OV. Rana shchelepno-lytsevoi dilianky u ditei [Wound of the maxillofacial area in children]. Poltava. 2006, p.72. (Ukrainian)
24. Tkachenko PI, Bilokon SO, Lokhmatova NM et al. Statistical information about the inflammatory processes of the jaw-facial part in children. Wiad Lek. 2018;71(3):621-624.
25. Tkachenko PI, Starchenko II, Bilokon SO et al. Insect bites as the cause of infectious and allergic inflammatory processes of the maxillofacial area in children. Wiad Lek. 2019;72(5):950-955.
26. Tkachenko PI, Lokhmatova NM, Bilokon SO et al. Effectiveness of correction of psycho-emotional stress in children with traumatic injury to soft tissues and facial bones. Wiad Lek. 2021;74(6):1463-1468. doi: 10.36740/WLek 202106132. DOI
27. Lokes K, Kiptilyi A, Skikevych M et al. Microbiological substantiation of the effectiveness of quercitin and its combination with ethylmethylhydroxypyridine succinate in the complex treatment of odontogenic phlegmon and maxillofacial abscesses. Front Oral Health. 2024;5:1338258. doi: 10.3389/froh.2024.1338258. DOI
28. Avetikov D, Loza K, Starchenko I et al. Experimental-morphological substantiation of expediency to use the skin glue "Dermabond" for postoperative wound closure. Georgian Med News. 2015;(244-245):90-3.

The work was performed as part of a basic study: "Complex differentiated treatment and prevention of surgical diseases of the maxillofacial area in children" State registration number of the topic: No. 0121U113454.

CONFLICT OF INTEREST

The Authors declare no conflict of interest

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A – Work concept and design, B – Data collection and analysis, C – Responsibility for statistical analysis, D – Writing the article, E – Critical review, F – Final approval of the article

RECEIVED: 18.03.2025
ACCEPTED: 20.07.2025