ISSN 2181-337X

EURASIAN JOURNAL OF OTORHINOLARYNGOLOGY - HEAD AND NECK SURGERY

Volume 4 • Issue 1

2025

EJOHNS

ejohns.scinnovations.uz

SCIENTIFIC INNOVATIONS

https://doi.org/10.57231/j.ejohns.2025.4.1.021

ANALYSIS OF THE RESULTS OF MORPHOLOGICAL EXAMINATION OF SURGICAL SAMPLES IN TYMPANOSCLEROSIS

Ergashev U.M. [1], *Allayorov S.M.*[1]

[1] Republican Specialized Scientific and Practical Medical Center of Otorhinolaryngology and Head and Neck Diseases (Tashkent, Uzbekistan)

Abstract. In our study, we performed histological examinations on fragments of pathological bone tissue removed during surgery from patients with tympanosclerosis, aged 18 to 60 years, who were treated in the adult ENT department of the Tashkent Medical Academy. The examinations were primarily conducted on samples from the horizontal part of the facial nerve canal, which exhibited typical hyaline and calcified foci of tympanosclerosis. In all cases, these individual fragments of pathological tissue with bone-like density were relatively easily separated from the inferior bone of the medial wall of the tympanic cavity as a single block (layer). Only microsurgical needles, hooks, and microclamps were used for their removal, without the need for chisels or milling cutters. These fragments often resemble normal bone tissue in appearance.

Keywords: Tympanosclerosis, cholesteatoma, tympanic cavity, morphology.

For citation:
Ergashev U.M., Allayorov S.M. Analysis of the results of morphological examination of surgical samples in tympanosclerosis. ***Eurasian Journal of Otorhinolaryngology - Head and Neck Surgery.*** 2025;4(1):120–124. https://doi.org/10.57231/j.ejohns.2025.4.1.021

TIMPANOSKLEROZ KASALLIGIDA JARROHLIK NAMUNASINING MORFOLOGIK TEKSHIRISH NATIJALARI TAHLILI

Ergashev U.M. [1], *Allayorov S.M.*[1]

[1] Respublika ixtisoslashtirilgan otorinolaringologiya va bosh-bo'yin kasalliklari ilmiy-amaliy tibbiyot markazi (Toshkent, O'zbekiston)

Annatatsiya. Tadqiqotimiz davomida TTA Kattalar LOR bo'limida davolangan timpanoskleroz bilan og'rigan 18 yoshdan 60 yoshgacha bo'lgan bemorlarda jarrohlik paytida olib tashlangan patologik suyak to'qimalar bo'lagi gistologik tekshiruvdan o'tkazildi, asosan burun va yuz nervi kanalining gorizontal qismida tipik gialinli va petrifikatsiyalangan timpanoskleroz o'choqlari bilan birga olindi. Barcha holatlarda suyak zichligiga ega bo'lgan patologik to'qimaning ushbu yagona bo'laklari nog'ora bo'shlig'i medial devorining pastki suyagidan yagona blok (qatlam) bilan nisbatan oson ajratildi, ya'ni ularni olib tashlash uchun faqat mikrojarrohlik ignalari, ilgaklar va mikroqisqichlardan foydalanildi, iskana yoki frezalar qo'llanilmadi. Bunday bo'laklar ko'pincha oddiy suyak to'qimasiga o'xshab ko'rinadi.

Kalit so'zlar: Timpanoskleroz, xolesteatoma, nog'ora bo'shlig'i, morfologiya.

Iqtiboslik uchun:
Ergashev U.M. , Allayorov S.M. Timpanoskleroz kasalligida jarrohlik namunasining morfologik tekshirish natijalari tahlili. ***Eurasian Journal of Otorhinolaryngology - Head and Neck Surgery.*** 2025;4(1):120–124. https://doi.org/10.57231/j.ejohns.2025.4.1.021

RELEVANCE OF THE PROBLEM

Due to the detection of pathology in the form of fixation or destruction of the incus due to tympanosclerosis, cholesteatoma, or carious-granulation processes, 84 incus samples removed during 300 surgical interventions were subjected to histological examination. Macro- and microscopic examination of pathological tissue fragments with bone density, exhibiting typical hyaline and petrified foci of tympanosclerosis, removed during the operation, was conducted.

MATERIALS AND METHODS OF THE STUDY

The obtained tissue fragments were fixed in a 10% buffered neutral formalin solution, then decalcified in a 10% nitric acid solution. After washing and dehydration, the fixed and decalcified fragments were embedded in paraffin using the standard method, then paraffin sections with a thickness of 2-5 µm were prepared. The sections were adhered to degreased slides and subsequently stained with hematoxylin and eosin or Van Gieson stain [3,4]. The study and microscopic analysis of the

preparations were carried out using a Nikon Eclipse 80i microscope equipped with a visualization and archiving system.

Macroscopically, such fragments often resemble simple bone tissue, dense in consistency, gray in color, with uneven edges (Fig. 1).

Upon microscopic examination of the surgical material, in individual studies, in most cases, the structure of bone fragments was characterized by dystrophic changes and foci of necrosis, formation of sequestra with perifocal fibrosis, destruction of bone tissue with pronounced mineralization and pronounced lymphoplasmacytic infiltration (Fig. 2). However, bone fragments containing normal bone tissue with all elements preserved, including osteocytes, were also encountered.

Characteristic morphological features of sequestration are the absence of osteocytes, empty.

Haversian canals, uneven thickness of bone trabeculae, and characteristic dentation of the edges along the line of separation from the main bone mass. Targeted histological examination of bone sequestra revealed the presence of focal necrosis and necrobiosis of bone tissue at various stages of progression with fragmentation and uneven mineralization of bone trabeculae (Fig. 3).

In these areas, necrotic bone fragments were surrounded by fibrous tissue, composed mainly of lymphocytes and plasma cells, as well as a small number of eosinophilic leukocytes and fibroblasts. Signs of lysis, uneven mineralization with destruction and infiltration of bone trabeculae were observed,

Figure 1. A piece of pathological tissue with bone density removed during surgery (operative material).

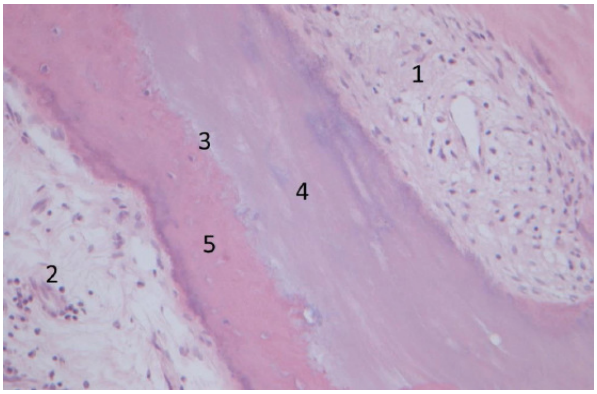

Figure 3. Necrotic bone plaque, where: 1 - coarse fibrosis; 2 - fine fibrosis; 3 - the boundary between destruction and normal bone tissue with carved edges; 4 - sequestrum; 5 - normal bone tissue (osteocytes). Staining with hematoxylin and eosin. Obj. 40x. Oc. 20x.

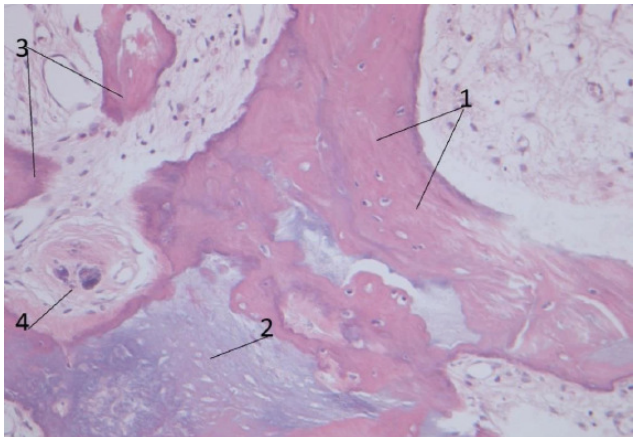

Figure 2. Morphological changes in bone tissue, where: 1 - bone tissue with dystrophic changes; 2 - clearly mineralized foci of destruction; 3 - small sequestra; 4 - focal lysis of the necrotized bone plates, expressed by perifocal fibrosis. Staining with hematoxylin and eosin. Ob. 20. White. 10.

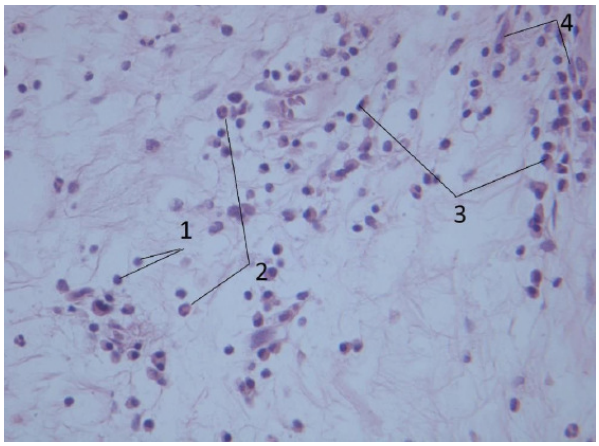

Figure 4. Focal inflammatory infiltration, where: 1 - lymphocytes; 2 - eosinophilic leukocytes; 3 - plasma cells; 4 - fibroblasts. Stained with hematoxylin and eosin. Obj. 40x. Oc. 20x.

Table 1

Distribution of incus samples depending on the nature of pathological changes in the middle ear

Groups (according to the nature of pathological changes in the middle ear)	Sample number	
	Abs.	%
1. Tympanosclerosis	46	54.7
2. Cholesteatoma	16	19.0
3. Carious-granulation process	14	16.7
4. Mixed changes without tympanosclerosis	8	9.6
Total	84	100.0

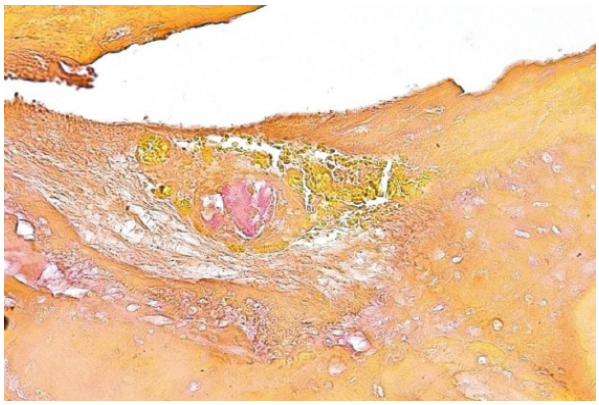

Figure 5. Calcaneal bone tissue. Sample from the "Tympanosclerosis" group; Van Gieson staining with picrofuchsin. Mag. 20x. Oc. 10x.

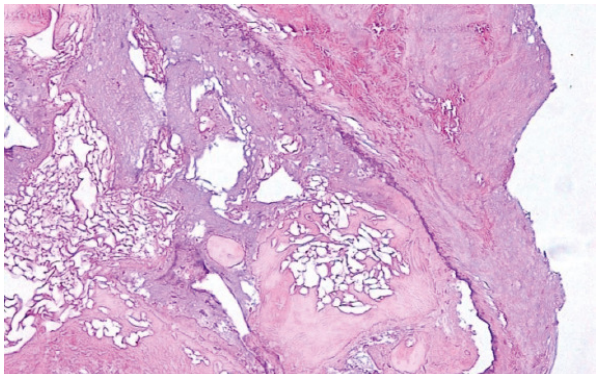

Figure 6. Calcaneal bone tissue. Sample from the "cholesteatoma" group; Staining with hematoxylin and eosin. Mag. 20x. Oc. 10x.

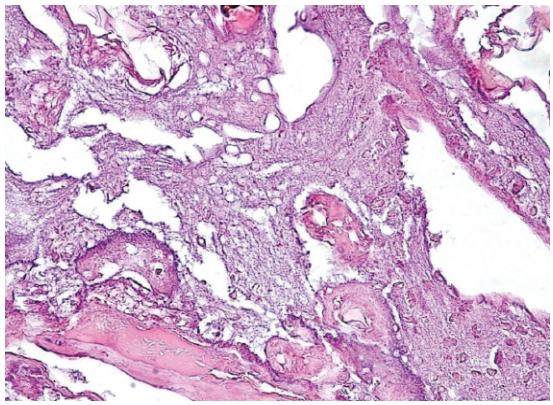

Figure 7. Calcaneal bone tissue. Sample from the "carious-granulation process" group; Staining with hematoxylin and eosin. Mag. 20x. Oc. 10x.

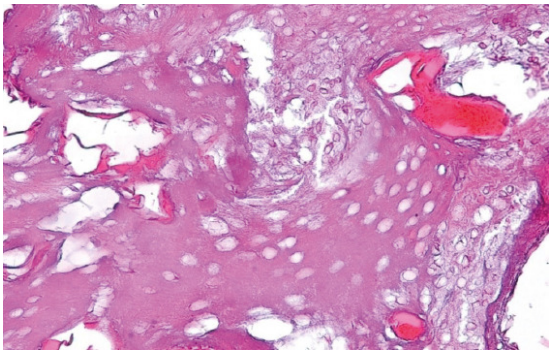

Figure 8. Calcaneous bone tissue sample from the group "mixture changes without tympanosclerosis"; Staining with hematoxylin and eosin. Magnification: 20x objective, 10x eyepiece.

indicating the presence of chronic inflammation (Fig. 4).

Histological analysis data confirm that relatively easily removed bone tissue fragments, along with typical foci of tympanosclerosis, are fragments of necrotized bone tissue freely lying between "living" structures, which fully corresponds to the definition of bone sequestration [1,3].

In both cases, it was not possible to identify signs of osteogenic transformation and osteogenesis of the intercellular substance. Only mature bone tissue in the stages of dystrophy and necrotic changes was found. That is, during their research, no data was obtained to reliably confirm the formation of

new bone tissue as a result of connective tissue metaplasia in foci of tympanosclerosis with bone density [2,6].

Histological analysis data confirm that relatively easily removed bone tissue fragments, along with typical foci of tympanosclerosis, lie freely among the "living" structures of the necrotic bone, which fully corresponds to the definition of bone sequestration [3]. Overall, the results of the study showed that the necrotic changes in the bone formations of the middle ear that occur in tympanosclerosis are associated with sequestration processes without reparative changes, accompanied by interstitial, perifocal coarse fibrous fibrosis. Further organization of necrotic foci and their subsequent encapsulation with the absorption of sequestra should serve as secondary prevention of the development of new necrotic foci in the bone structures of the middle ear. The presence of an incomplete inflammatory process in the area of the sequestra and signs of complete bone tissue regeneration should apparently be attributed to dystrophic changes [5].

Pathomorphological changes in the bone tissue of the incus in patients with tympanosclerosis were studied and compared with changes in cholesteatoma and carious-granulation processes observed in the middle ear in chronic otitis. Depending on the pathological changes in the middle ear, 84 samples identified during surgical interventions were divided into 4 groups (Table 1).

Histological examination of surgical material in all cases revealed a picture of chronic inflammation, areas of destruction with pronounced mineralization of bone tissue, infiltration of the tissue with lymphocytes, plasma cells, and a small number of eosinophilic leukocytes. The conducted research made it possible to identify the specific features of changes in the bone tissue [1,6].

In samples of the "tympanosclerosis" group, areas of petrification with mature fibrous tissue were detected. Symptoms of hyalinosis of the stromal component with small fragments of bone tissue, as well as pronounced dystrophic changes, foci of resorption, and uneven calcium deposition were revealed (Fig. 5).

Histological examination of samples from the "cholesteatoma" group revealed bone tissue fragments surrounded by fibrous tissue infiltrated with numerous lymphocytes and showing epidermization, as well as signs of necrosis, sequestration, and uneven basophilia of bone tissue. Basophilia indicates calcification of the bone's intercellular substance and reflects a severe degree of dystrophic changes. Additionally, small fragments of destroyed bone tissue were observed, without inflammatory infiltration but with areas of fatty degeneration (Fig. 6).

Samples from the "carious-granulation process" group were histologically characterized by the predominance of connective tissue at various stages of formation, mostly represented by granulations with small fragments of bone tissue, showing signs of dystrophy and including small foci of necrosis. The changes in bone tissue were uneven dystrophic alterations accompanied by eosinophilia and basophilia. Areas of preserved architecture, as well as microfoci of necrosis and focal formations of richly vascularized granulation tissue, were observed (Fig. 7).

Upon examination of samples from the "mixture changes without tympanosclerosis" group, areas of epidermis and bone tissue fragments with dystrophic changes were observed in the preparations. These areas exhibited identical tinctorial properties when combined with foci of basophilia and eosinophilia. Destructive microfoci, surrounded by granulation and vascularized tissue, were noted, characterized by a predominance of thin-walled vessels and superficial coverage by stratified squamous epithelium (Fig. 8).

CONCLUSION

In chronic purulent otitis media, regardless of the nature of the pathological process in the middle ear, morphological examination of all anvil specimens revealed foci of bone tissue destruction, fibrosis, and signs of chronic inflammation with lymphocytic infiltration of the stromal component. It has been demonstrated that changes in the bone tissue of the anvil in cholesteatoma are characterized more by fibrosis and lysis of the stroma with the presence of dystrophic and degenerative processes. In the case of carious-granulation processes, the formation of granulation tissue, replacing the bone tissue of the anvil, predominated. The features of morphological changes in the anvil in patients with tympanosclerosis indicated bone tissue destruction with the predominance of sclerotic processes and

the absence of signs of progression.

CONFLICT OF INTERESTS

The authors declare the absence of obvious and potential conflicts of interest related to the publication of this article.

SOURCES OF FUNDING

The authors state that there is no external funding for the study.

AVAILABILITY OF DATA AND MATERIALS

All data generated or analysed during this study are included in this published article.

AUTHORS' CONTRIBUTIONS

All authors contributed to the design and interpretation of the study and to further drafts. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

CONSENT FOR PUBLICATION

Not applicable.

PUBLISHER'S NOTE

Journal of *"Eurasian Journal of Otorhinolaryngology - Head and Neck Surgery"* remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Article received on 24.03.2025

Accepted for publication on 28.03.2025

КОНФЛИКТ ИНТЕРЕСОВ

Авторы заявляют, что данная работа, её тема, предмет и содержание не затрагивают конкурирующих интересов.

ИСТОЧНИКИ ФИНАНСИРОВАНИЯ

Авторы заявляют об отсутствии финансирования при проведении исследования.

ДОСТУПНОСТЬ ДАННЫХ И МАТЕРИАЛОВ

Все данные, полученные или проанализированные в ходе этого исследования, включены в настоящую опубликованную статью.

ВКЛАД ОТДЕЛЬНЫХ АВТОРОВ

Все авторы внесли свой вклад в подготовку исследования и толкование его результатов, а также в подготовку последующих редакций. Все авторы прочитали и одобрили итоговый вариант рукописи.

ЭТИЧЕСКОЕ ОДОБРЕНИЕ И СОГЛАСИЕ НА УЧАСТИЕ

Были соблюдены все применимые международные, национальные и/или институциональные руководящие принципы по уходу за животными и их использованию.

СОГЛАСИЕ НА ПУБЛИКАЦИЮ

Не применимо.

ПРИМЕЧАНИЕ ИЗДАТЕЛЯ

Журнал *"Евразийский журнал оториноларингологии - хирургии головы и шеи"* сохраняет нейтралитет в отношении юрисдикционных претензий по опубликованным картам и указаниям институциональной принадлежности.

Статья получена 24.03.2025 г.

Принята к публикации 28.03.2025 г.

ЛИТЕРАТУРА / REFERENCES

1. Mann, W., Beck C., Schaefer H. E. The significance of calcium antagonist in rat experimental tympanosclerosis / W. Mann, C. Beck, H.E. Schaefer // Arch Otorhinolaryngol. - 1987. - Vol.243. - P. 382-386.
2. Middle Ear and Mastoid Microsurgery / M. Sanna [et al.]. Thieme. p. 437.
3. Morgan, W.C. Jr. Tympanosclerosis / W.C. Jr. Morgan // Laryngoscope. - 1977. - Vol. 87, No. 11. - P.1821-1825.
4. Nadol, J. B. Surgery of the Ear and Temporal Bone / J. B. Nadol, M. J. McKenna. Lippincott Williams & Wilkins.
5. Ossiculoplasty with a cartilage-connecting hydroxyapatite prosthesis for tympanosclerotic stapes fixation. / H. Kawano [et al.] // Eur Arch Otorhinolaryngol. - 2010. - Vol. 267, No. 6. - P. 873-876.
6. Palacios, E. Tympanosclerosis / E. Palacios, G. Valvassori // Ear, Nose & Throat Journal. - 2000. - Vol. 79, No. 1. - P. 17.