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MINIMALLY INVASIVE SURGICAL TREATMENT OF LARGE MAXILLARY CYSTS

323.01 - STOMATOLOGY

Summary of Doctor of Medical Sciences Thesis

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CONTENT

INTRODUCTION

Relevance and importance of the research topic. The hard tissues of the oro-maxillofacial region are frequently affected by intraosseous cystic lesions lined by an epithelial membrane and containing liquid, semisolid, or gaseous material [12,53]. Their development is primarily attributed to the presence of epithelial cells within the cancellous bone of the jaws [1,6,12,83,84]. The origin of these cells may be either odontogenic or non-odontogenic (epithelial cysts). In addition to these cavitary lesions, there are also cysts that lack an epithelial lining (non-epithelial cysts).

According to data reported in the specialized literature, maxillary cysts account for approximately 80% to 85% of all tumors and pseudotumors of the jaws [12,13,22,25,36,67], representing up to 14.4% of the entire spectrum of maxillofacial pathology. More than 95% of these lesions are represented by radicular cysts [9,13,22,25,36,67]. Thus, cystic lesions generally develop as a consequence of persistent chronic infection through the proliferation of epithelial rests of Malassez within the inflamed apical periodontal tissues [12].

Several therapeutic approaches may be employed in the management of patients with jaw cysts. In order to provide specialized medical care, cystectomy [11,26,37] or cystotomy and its subsequent modifications [23,24,72] are commonly performed. The treatment of choice for jaw cysts is cystectomy (Partsch II), which consists of complete enucleation of the cystic membrane followed by wound closure using sutures [11,26,37,41,57,70].

Although this technique is widely used, it presents several disadvantages: it is traumatic, carries an increased risk of damage to adjacent anatomical structures (mandibular canal, maxillary sinus, nasal cavity) or to the neurovascular bundles of teeth adjacent to the lesion, and its use is limited in patients with decompensated chronic systemic diseases. Therefore, in cases of large or extensive cysts (greater than 2.5 cm), marsupialization or cystotomy (Partsch I) is frequently performed. This procedure consists of opening the cystic cavity and converting it into an accessory cavity communicating with an anatomical cavity (oral cavity, maxillary sinus, or nasal cavity), while the remaining cystic lining is left in situ [29,31,33]. Another treatment modality for jaw cysts is decompression, which involves creating a window between the cystic lesion and the oral cavity using special devices such as tubes or stents [3,8,23,27,28,42,48,51]. Tube decompression is easier to perform and more conservative than marsupialization [5,8,23,27,52]. Furthermore, according to N. Nakamura [58] and Y. Kubota [55], in the case of large cystic lesions (>2.5 cm), decompression results in a more rapid reduction in cyst size compared with smaller lesions.

In recent years, considerable interest has been directed toward the investigation of treatment modalities for large jaw cysts [5,8,15,19,23,27,33,39,44]. This interest is largely due to ongoing controversies regarding both the selection of treatment methods and the relatively high recurrence rates reported in the literature [34,47,56,62,66,85], which, according to some authors [4,10,38,40], range from 24% to 56%. Controversies also concern the management of teeth adjacent to the cystic lesion as well as neighboring anatomical structures such as the maxillary sinus and nasal floor. Consequently, there is a need for studies aimed at identifying the optimal treatment modality for patients with large jaw cysts, which would contribute both to reducing treatment duration and to facilitating early rehabilitation. Therefore, the development and implementation of minimally invasive treatment methods for large jaw cysts using decompression devices capable of promoting bone apposition without damaging critical

anatomical structures, while ensuring a reliable therapeutic outcome, are of particular importance.

Aim of the study

To analyze minimally invasive treatment methods in order to improve the effectiveness of medical care provided to patients with large jaw cysts.

Objectives of the study

1. To perform a retrospective analysis of morbidity among patients presenting with cystic lesions of the jaws.
2. To comparatively evaluate postoperative recovery in the studied patients.
3. To determine pre- and postoperative variations in pulp sensitivity of teeth adjacent to the cystic lesion according to the therapeutic method and anatomical location of the lesion.
4. To comparatively assess bone and tissue density according to the type of treatment and anatomical location of the cystic lesion.
5. To compare the pre- and postoperative effectiveness of decompression and marsupialization in reducing the morphological parameters of large jaw cysts.

Research hypothesis

The following research hypotheses were formulated:

Null hypothesis (H0): Volume reduction does not differ between the population treated by marsupialization and the population treated by decompression.

Alternative hypothesis (H1): Volume reduction differs between the population treated by marsupialization and the population treated by decompression.

General research methodology

To accomplish the aim and objectives of the study, a prospective controlled clinical study was conducted on a cohort of 66 patients presenting with various large cystic lesions of the jaws, focusing on minimally invasive treatment methods for large jaw cysts. Two therapeutic approaches were investigated: decompression and marsupialization. Two study groups, each comprising 33 participants, were established according to predefined inclusion and exclusion criteria. The study group included 33 patients treated by decompression, whereas the control group consisted of 33 patients treated by marsupialization.

This multicenter study was carried out between 2014 and 2025 in the Department of Oral and Maxillofacial Surgery of the Emergency Medicine Institute (1 Toma Ciorbă Street) and at the "Family Dentistry" Dental Clinic (15 Alecu Russo Street) in Chișinău.

Scientific novelty and originality of the obtained results: Minimally invasive treatment methods for patients with large jaw cysts were investigated, compared, and optimized. The obtained results will serve as a theoretical and methodological basis for improving clinical diagnostic and treatment protocols and standards.

Theoretical significance and practical value of the study: The application of minimally invasive methods in the treatment of patients with large jaw cysts will contribute significantly to reducing the incidence of intraoperative accidents and postoperative complications. The study findings will form the basis for recommendations intended to assist practitioners in selecting the most appropriate treatment modality.

Implementation of scientific results: The study results have been implemented in the educational process for undergraduate students, residents, and postgraduate trainees within the Department of Oral and Maxillofacial Surgery "Arsenie Guțan". Furthermore, the research

findings are widely applied by practitioners working at the Republican Center of Oral and Maxillofacial Surgery of the Republic of Moldova.

Approval of the Scientific Results: The results of the study were presented and discussed at the following national and international scientific forumsAnnual Scientific Conference of the Emergency Medicine Institute, Chișinău, Republic of Moldova, December 4, 2015; Annual Scientific Conference of Young Specialists of the Emergency Medicine Institute, "Achievements and Perspectives in Medical and Surgical Emergencies", Chișinău, Republic of Moldova, May 20, 2016; The 25th Annual Congress of the European Association for Osseointegration, Paris, France, September 28–October 1, 2016;Scientific Conference of Nicolae Testemițanu State University of Medicine and Pharmacy, Chișinău, Republic of Moldova, October 18–21, 2016; The 9th International Congress of the Romanian Dental Association for Education, "Advanced Techniques and Technologies in Dental Medicine", Iași, Romania, May 18–20, 2017; Annual Scientific Conference of Young Specialists "Achievements and Perspectives in Medical and Surgical Emergencies", dedicated to the 60th anniversary of the Emergency Medicine Institute, Chișinău, Republic of Moldova, May 26, 2017; National Scientific-Practical Conference with International Participation dedicated to the 90th anniversary of the distinguished scientist Nicolae Testemițanu, Chișinău, Republic of Moldova, September 29, 2017;Annual Scientific Conference dedicated to the 90th anniversary of the distinguished physician and scientist Nicolae Testemițanu, Chișinău, Republic of Moldova, October 16–20, 2017; Annual Scientific Conference of Young Specialists of the Emergency Medicine Institute, "Current Issues and Controversies in the Management of Medical and Surgical Emergencies", Chișinău, Republic of Moldova, November 10, 2017; The 27th Annual Congress of the European Association for Osseointegration, Vienna, Austria, October 11–13, 2018; Days of Nicolae Testemițanu State University of Medicine and Pharmacy, Chișinău, Republic of Moldova, October 15–19, 2018;European Exhibition of Creativity and Innovation – EUROINVENT 2021, Iași, Romania, 2021; Scientific Conference with International Participation in memory of the distinguished scientist, Professor Valentin Topalo, Chișinău, Republic of Moldova, April 28, 2023; Scientific Conference with International Participation "Digital Technologies in Multidisciplinary Dentistry", Chișinău, Republic of Moldova, September 9, 2023;Congress of Dental Medicine, "Contemporary Dentistry – Between Fundamental Research and Clinical Reality", Iași, Romania, April 3–6, 2025; National Conference with International Participation "Interdisciplinary Approaches in Dentistry", Chișinău, Republic of Moldova, April 11–12, 2025; Scientific-Practical Conference with International Participation "Scientific and Practical Integration in Advanced Dental Technologies", Chișinău, Republic of Moldova, September 27, 2025.

Publications related to the thesis. The obtained results have been published in 44 scientific papers, listed at the end of the abstract.

Volume and thesis structure. The thesis comprises 121 pages of printed text. It was developed and structured in accordance with the current regulatory requirements and includes an introduction, four chapters, general conclusions and recommendations, a bibliography containing 218 references, and 5 appendices. The manuscript contains 92 pages of main text, 70 figures, 3 tables, and 1 formula.

Keywords: jaw cyst, statistical data, morbidity, treatment, decompression, marsupialization, bone regeneration

2. MATERIALS AND METHODS

2.1. General characteristics of the clinical material

The study included 66 patients with large jaw cysts (greater than 2.5 cm), who were examined and treated in the Department of Oral and Maxillofacial Surgery of the Emergency Medicine Institute (1 Toma Ciorbă Street) and at the *"Family Dentistry" Dental Clinic* (15 Alecu Russo Street), Chișinău, during the period 2014–2025.Additionally, for the retrospective analysis of morbidity among patients with cystic lesions of the jaws, the medical records of 1,016 patients diagnosed with cystic lesions of the oro-maxillofacial region and hospitalized in the Department of Oral and Maxillofacial Surgery of the Emergency Medicine Institute in Chișinău during the years 2010–2019 were reviewed.

To accomplish the aim and objectives of the research, a prospective controlled clinical study was designed to investigate minimally invasive treatment methods for patients with large jaw cysts. Accordingly, two treatment modalities were evaluated: decompression and marsupialization.

Simple size determination pool. G*Power 3.1.9.7
t tests - Means: Wilcoxon-Mann-Whitney test (two groups)
Options: A.R.E. method
Analysis: A priori: Compute required sample size
Input: Tail(s) = One
Parent distribution = Normal
Effect size d = 0.65
α err prob = 0.05
Power (1-β err prob) = 0.8
Allocation ratio N2/N1 = 1
Output: Noncentrality parameter δ = 2.5407331
Critical t = 1.6710410
Df = 59.1154981
Sample size group 1 = 32
Sample size group 2 = 32
Total sample size = 64
Actual power = 0.8069266

Therefore, the estimated minimum sample size (study power = 0.80, effect size = 0.56, significance level α = 0.05, equal group sizes) was at least 32 cases per group, resulting in a total of 64 patients. Consequently, two study groups were established, each consisting of 33 participants, according to the predefined inclusion and exclusion criteria.

The study group consisted of 33 patients treated by decompression, including 19 males (57.6 ± 8.6%) and 14 females (42.4 ± 8.6%), with a mean age of 42.5 ± 16.5 years.The control group included 33 patients treated by marsupialization, comprising 21 males (63.6 ± 8.4%) and 12 females (36.4 ± 8.4%), with a mean age of 38.1 ± 16.4 years.No statistically significant differences were observed between the groups regarding either sex distribution (p = 0.80) or age (p = 0.30).

A comparison of the preoperative cyst volume distribution between the decompression and marsupialization groups was also performed. The median cyst volume was 4.41 cm^3 in the decompression group and 4.86 cm^3 in the marsupialization group.The Mann–Whitney test yielded a value of W = 462.00 with p = 0.29, indicating that the observed difference between the

two groups was not statistically significant. Furthermore, the rank-biserial correlation coefficient (r = –0.15) and its 95% confidence interval (–0.41 to 0.13) confirmed the absence of a clinically relevant difference.

These findings suggest that patients in both groups had comparable cyst volumes at baseline, supporting cohort comparability prior to intervention and excluding initial cyst volume as a confounding factor in treatment efficacy assessment.

The inclusion criteria for study were as follows:

1. Patients presenting with large cystic lesions (greater than 2.5 cm in size) located within the jaws.
2. Patients aged 18 years and older, with no upper age limit.
3. Patients without morphologically confirmed neoplastic processes.
4. Patients who provided informed consent.
5. Patients able to attend scheduled follow-up visits.
6. Cooperative patients.

The exclusion criteria for study were as follows:

1. Pacienții cu diverse procese neoplazice confirmate morfologic.
2. Pacienții cu vârsta până la 18 ani.
3. Pacienții care refuză semnarea acordului informat sau solicită ieșirea din studiu.
4. Pacienții care nu respectă condițiile de igienă orală.
5. Pacienții ce nu pot veni la vizitele programate de control.
6. Pacienții necooperabili și/sau cu alcoolism, narcomanie, toxicomanie.

All patients included in the study were informed about the purpose of the research, the clinical requirements, a favorable opinion for conducting the present study was obtained from the Research Ethics Committee of Nicolae Testemițanu State University of Medicine and Pharmacy on May 21, 2024 (Verbal process No. 2) and December 18, 2024 (Verbal process No. 6).

According to the proposed aim and objectives, the study design was developed as illustrated in **Figure 3**.

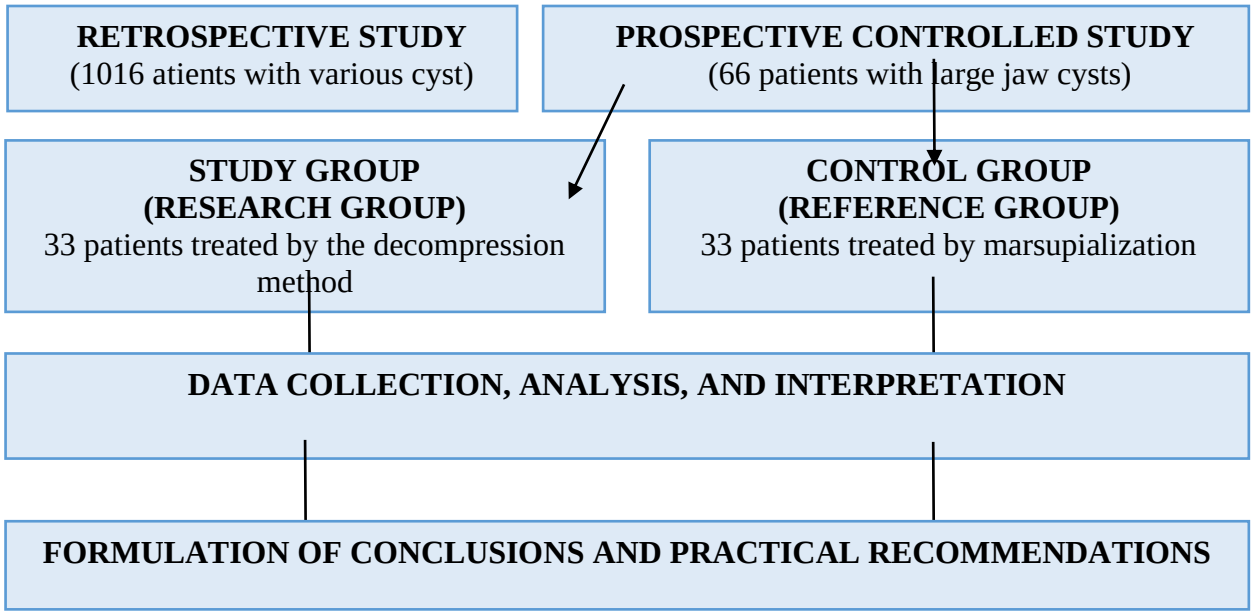

Figure 3. Study design

2.2. Methods of investigations

All patients included in the study underwent a comprehensive clinical and paraclinical evaluation protocol. The data obtained during the examinations were subjected to statistical processing and analysis according to the established methodology.In order to identify concomitant diseases and establish the most appropriate general therapeutic approach, consultations with medical specialists in general medicine (internists, cardiologists, hematologists, etc.) were requested whenever indicated.

Clinical examination

Clinical examination represents an essential stage in the evaluation of patients with jaw cystic lesions and aims to identify locoregional changes induced by the cystic lesion.

Patient assessment began with the evaluation of subjective symptoms, including spontaneous or provoked pain, the sensation of intraosseous pressure, and the presence or absence of sensory disturbances within the territories of the infraorbital, inferior alveolar, or mental nerves. In addition, the history of dental diseases, previous endodontic treatments, local trauma, and prior episodes of swelling or suppuration was documented.

Extraoral inspection allowed the assessment of possible facial asymmetry resulting from cortical bone expansion, as well as the presence or absence of cutaneous erythema, fistulas, or other skin alterations.Extraoral palpation provided information regarding lesion consistency, lesion boundaries, the presence of firm or elastic swelling, tenderness on palpation, and sensory alterations in the territories of the infraorbital, mental, or buccal nerves. In cases of superinfection, the presence of fluctuation was also evaluated.

Intraoral examination revealed alterations in osseous contours manifested by vestibular or palatal expansion, changes in the color of the oral mucosa (slightly congested or violaceous in cases of suppuration), and the presence of fistulous tracts with spontaneous drainage. Intraoral palpation assessed the integrity of the cortical plates and the presence or absence of signs characteristic of expansion of thinned cortices, such as the **"eggshell crackling"** or **"ping-pong ball"** phenomena.

Furthermore, the mobility of teeth adjacent to the cystic lesion, sensitivity to percussion, and the relationship between adjacent teeth and the area of osseous expansion were evaluated. The integrity of coronal restorations, existing endodontic treatments, and possible coronal or root fractures were also assessed.

Completion of the clinical examination by evaluating regional sensory function allowed early detection of inferior alveolar or infraorbital nerve involvement resulting from cystic expansion.All clinical findings were subsequently correlated with imaging and histopathological investigations in order to establish the final diagnosis and determine the appropriate therapeutic management.

Paraclinical Examination

The following paraclinical methods were employed in the present study:Cone-beam computed tomography (CBCT); Assessment of pulp sensitivity using the cold thermal test with Endo-Frost Spray; Histopathological examination, consisting of the morphopathological analysis of biopsy specimens obtained through incisional biopsy.

To accurately determine the reduction in cyst dimensions, CBCT was performed. Owing to its high resolution, absence of image distortion, and radiation dose approximately 40 to 60 times lower than that of conventional computed tomography, CBCT is widely used in dental practice, as also reported by numerous authors [35,45,60,61,63,64,65,68,71].Thus, bone regeneration was

assessed by comparing the volume of the cystic cavity preoperatively and postoperatively (at 6 and 12 months) (Figure 4).

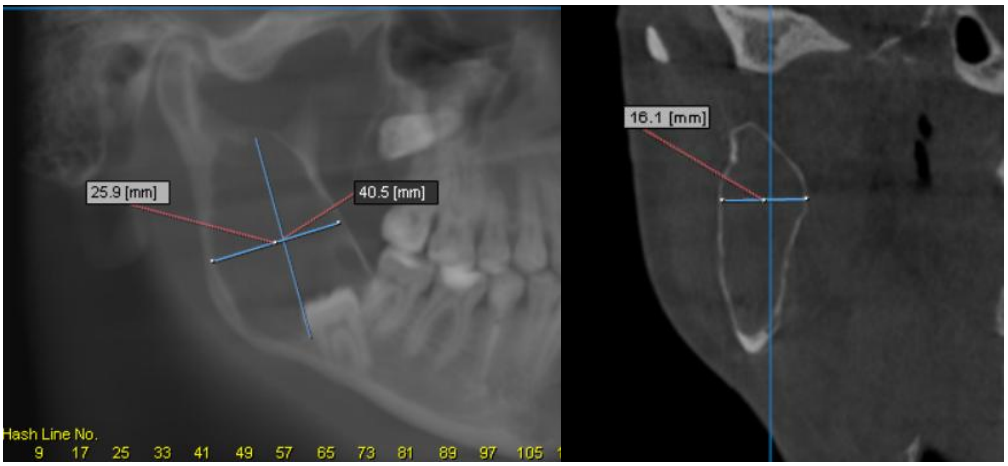

Figure 4. Assessment of cystic lesion volume using CBCT

For this purpose, cystic cavity volume was additionally calculated using a mathematical formula consisting of multiplying cyst length, width, and depth values by the correction coefficient of 0.52 (Formula 1).It should be emphasized that all measurements were calculated and should be expressed in centimeters (cm) rather than millimeters (mm).

Formula(1):

Cyst volume=Length×Width×Depth×0.52 (1)

For the assessment of pulp sensitivity in teeth adjacent to the cystic lesion, the cold thermal test using Endo-Frost Spray was employed. Endo-Frost is a refrigerant spray (−26°C or −50°C) that induces a rapid and intense decrease in enamel and dentin temperature, thereby producing hydrodynamic stimulation of pulpal nerve endings.Following tooth isolation and drying, cotton pellets soaked with the refrigerant spray were applied to and maintained on the middle third of the vestibular surface of the tooth until the patient reported a response. Each test was compared with a healthy control tooth to calibrate the individual response.Accordingly, a normal pulpal response (healthy pulp) was interpreted as a short-lasting painful sensation that disappeared immediately after removal of the stimulus, whereas pulp necrosis was diagnosed in the complete absence of a response to thermal stimulation.

The histopathological examination constitutes an essential step in the management of jaw cysts [32,43,46,49,56]. Morphopathological analysis of biopsy specimens allows confirmation of the cyst type, identification of potentially aggressive lesions (such as odontogenic keratocysts or ameloblastomas), and exclusion of dysplastic or neoplastic transformations.Therefore, tissue sampling and submission for histopathological examination were considered mandatory and fundamental for establishing a definitive diagnosis and formulating an appropriate treatment plan.

For these reasons, histopathological examination was performed in all patients included in the study and consisted of morphopathological analysis of specimens obtained by incisional biopsy.Regarding the distribution of histological types of odontogenic cysts according to anatomical location, radicular cysts predominated in the mandible (64.5%), followed by dentigerous cysts (22.6%) and residual cysts (12.9%). A similar distribution pattern was observed in the maxilla, where 62.9% were radicular cysts, 14.3% dentigerous cysts, and 22.9% residual cysts. Although minor variations were observed between the two anatomical regions, the Chi-square test with Monte Carlo simulation ($\chi^2 = 1.53$, $p = 0.5266$) did not reveal statistically

significant differences. These findings indicate that the histological composition of the lesions was homogeneously distributed, thus supporting the comparability of the groups in the analysis of the effectiveness of the therapeutic techniques applied.

Rare cases of neoplastic transformation of odontogenic cysts have been reported in the literature [7,12,14,47,54,59]. Thus, dentigerous cysts and, less frequently, radicular cysts may undergo ameloblastic transformation, leading to the development of mural or solid ameloblastoma. Furthermore, the cystic epithelium may undergo malignant transformation, most commonly in the form of squamous cell carcinoma, a phenomenon observed predominantly in radicular and residual cysts, with an estimated incidence ranging from 0.1% to 1%. In addition, case reports have documented the occurrence of mucoepidermoid carcinoma, particularly in association with dentigerous cysts.Patients with morphologically confirmed neoplastic processes were excluded from the study according to the exclusion criteria established in the research protocol.

2.3. Treatment methods

Surgical Protocol Applied to Patients in the Study Group

The study (research) group consisted of 33 patients treated by the decompression method.In 28 patients, the decompression procedure consisted of creating an access window to the cystic lesion through the vestibular cortical plate, harvesting a fragment of the cystic membrane for histopathological examination, followed by insertion and suturing of a drainage tube to the margin of the mucoperiosteal flap (Figure 8).

Figure 8. Surgical technique of decompression using a drainage tube and irrigation of the cystic cavity

In 5 patients requiring concomitant tooth extractions, individualized decompression devices were used. These devices were fabricated using one of the following two methods:1.Following the pre-extraction impression of the prosthetic field, a self-curing acrylic microprosthesis was fabricated in the laboratory, and a drainage tube was attached to its base (Figure 9A).Immediately after tooth extraction, the microprosthesis was inserted into the extraction socket (Figure 9B), while the drainage tube was advanced into the cystic cavity (Figures 9C and 9D).

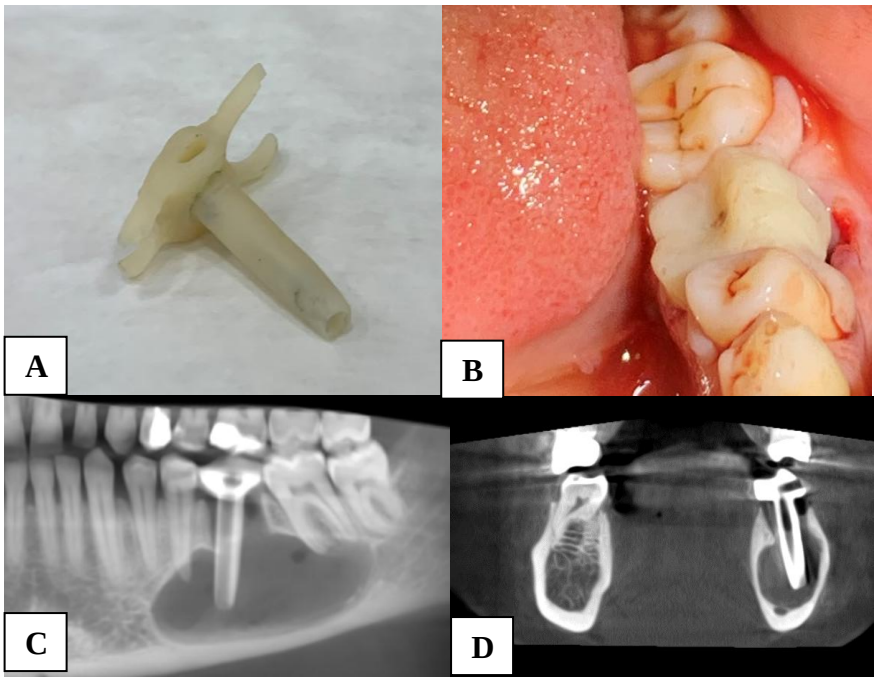

Figure 9. Cyst decompression using a self-curing acrylic microprosthesis

Thus, following computed tomography, three-dimensional reconstruction of the maxilla, and digital scanning of the dental arches, the following laboratory procedures were performed: segmentation of the tomographic images, superimposition of the CBCT dataset with the digital model obtained by intraoral scanning, virtual simulation of tooth extraction on the scanned model, virtual design of the decompression device, and fabrication of the device using a NextDent 5100 3D printer with NextDent C&B Micro Filled Hybrid biocompatible resin. Following printing, the device was cleaned in an ultrasonic bath using an isopropyl alcohol solution in order to remove residual resin. Subsequently, the decompression device underwent post-polymerization in a NEXTDENT LC-3D PRINT BOX UV Post-Curing Unit.

In this context, in 2019, Moldovan authors (Strîșca S., Sîrbu D., Cucu Gh., Topalo V.) proposed the method entitled *"Decompression in the treatment of giant maxillary cysts located in the lateral region of the maxilla"* (Certificate of Registration of Copyright and Related Rights Objects, Series O No. 6498, dated November 22, 2019). Subsequently, in 2021, Moldovan authors (Strîșca S., Sîrbu D., Caldarari S.) proposed the method *"Decompression in the treatment of giant maxillary cysts located in the anterior region of the maxilla"* (Certificate of Registration of Copyright and Related Rights Objects, Series O No. 6829, dated March 22, 2021).

Therefore, in order to maintain long-term communication between the oral cavity and the cystic cavity, which is essential for gradual reduction of the cystic lesion, individualized decompression devices were fabricated and used in all 33 patients included in the study group (Figure 8, Figure 9).

To verify the effectiveness of drainage, irrigation of the cystic cavity was performed through the inserted tube. Patients were instructed to irrigate the cystic cavity twice daily using 0.9% physiological saline solution. Sutures were removed on the 10th postoperative day.

Surgical Protocol Applied to Patients in the Control Group

The control (reference) group consisted of 33 patients treated using the marsupialization technique. This procedure (Figure 11) involved performing a mucoperiosteal incision, the design of which was determined by the location of the cystic lesion (maxilla or mandible), as well as by

its relationship with the maxillary sinus, the nasal floor, or the contents of the mandibular canal. Following elevation of the mucoperiosteal flap and establishment of access to the cystic lesion through the vestibular cortical plate, a fragment of the cystic membrane was harvested for histopathological examination. Subsequently, the margins of the cystic membrane were sutured to the adjacent oral mucosa in order to prevent spontaneous closure of the communication between the oral cavity and the cystic cavity. Thereafter, the cystic cavity was packed with iodoform gauze for a period of up to 30 days. The dressing was replaced every 7 days during the first postoperative month. Subsequently, patients were instructed to independently perform daily irrigation of the cystic cavity twice a day using 0.9% physiological saline solution throughout the entire follow-up period.

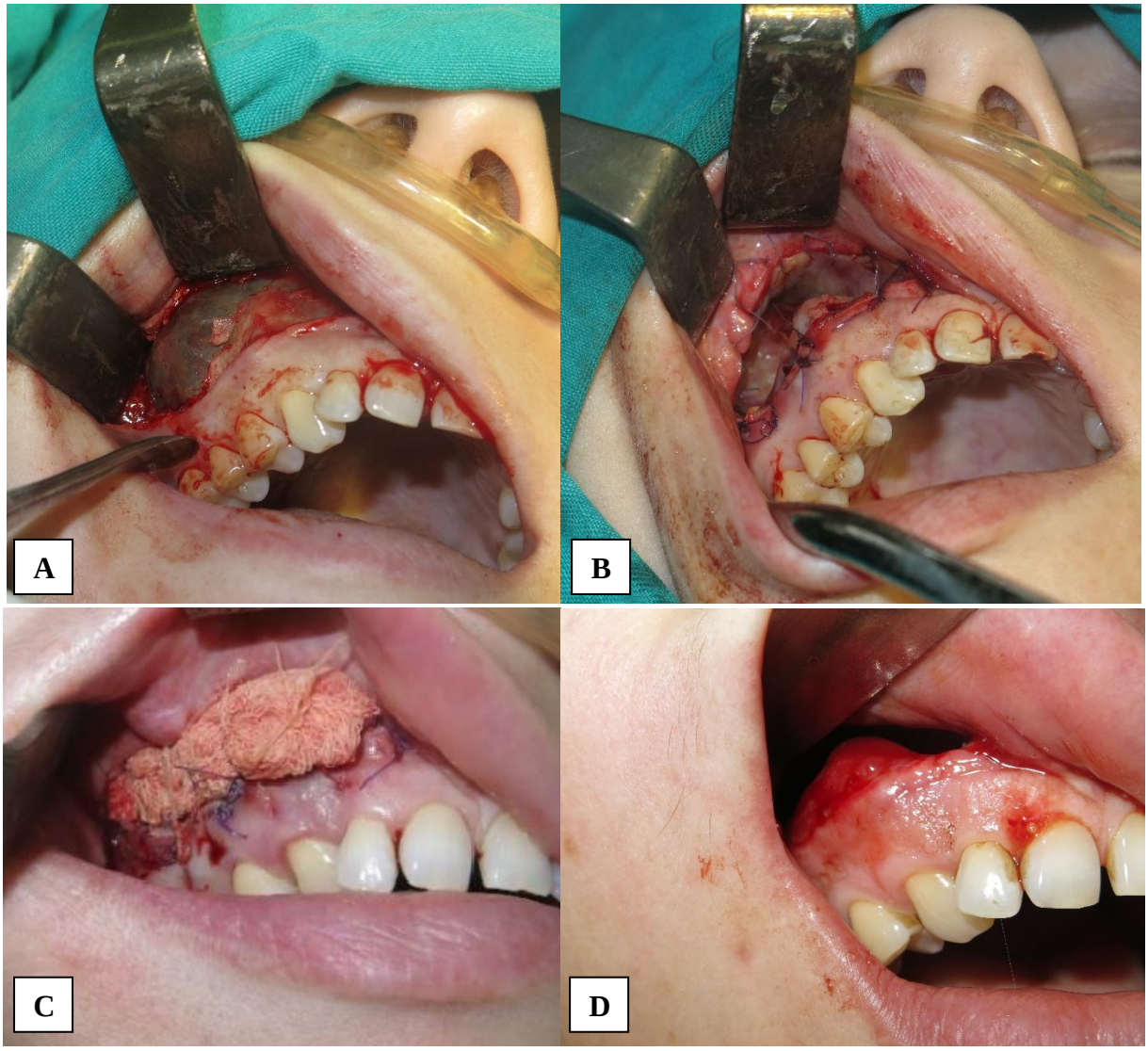

Figure 11. Main stages of marsupialization: A – Incision and elevation of the mucoperiosteal flap; B – Suturing of the cystic membrane to the oral mucosa; C – Packing of the cystic cavity with iodoform gauze; D – Intraoral appearance of the cavity 30 days after surgery

2.4. Evaluation of Postoperative Recovery in the Studied Patients

During the postoperative period, all patients received systemic medication (antimicrobial and anti-inflammatory therapy) associated with local antiseptic treatment for a period of 5–7 days. Throughout the healing period, patients were systematically monitored through follow-up visits. During the first postoperative week, clinical evaluations were performed daily, whereas during the following three weeks patients were examined twice weekly. Thereafter, beginning

with the second postoperative month, follow-up visits were scheduled on a weekly basis. During these visits, the following parameters were assessed: pain syndrome, severity of soft tissue edema, edema regression (expressed in days), presence or absence of sensory disturbances within the territories of the infraorbital, inferior alveolar, and mental nerves, as well as the occurrence of hematomas. Particular attention was also paid to the level of hygiene of the marsupialized cavity in patients from the control group and to the adjustment of the acrylic obturator in patients from the study group.

Pain intensity was assessed using a Visual Analog Scale (VAS) ranging from 0 to 10. Patients were asked to indicate the numerical value corresponding to the intensity of the pain experienced.

Postoperative edema was clinically evaluated using a semiquantitative classification according to the degree of inflammatory extension into adjacent soft tissues, as follows: Grade I (mild) – minimal edema limited strictly to the surgical site and not associated with visible facial asymmetry; Grade II (moderate) – edema extending into adjacent soft tissues without exceeding a single anatomical region, resulting in moderate facial contour deformity; Grade III (severe) – extensive edema involving two or more facial anatomical regions, associated with marked facial contour deformity and, in certain cases, limitation of mouth opening or functional discomfort.

Sensory disturbances involving the infraorbital, inferior alveolar, and mental nerves, as well as the occurrence of postoperative hematomas, were assessed by recording their presence or absence.

Cone-beam computed tomography (CBCT) examinations were performed at 6 and 12 months postoperatively. The obtained data were recorded in the patients' medical records and subsequently included in the statistical analysis.

At 12 months postoperatively, following reduction in the volume of the cystic lesion and decreased risk of injury to adjacent anatomical structures (maxillary sinus, nasal cavity, mandibular canal), the second stage of treatment was performed, consisting of curettage of the residual cystic membrane (Figure 13). In the study group, curettage of the residual cystic membrane was performed in 21 patients treated by decompression, whereas in the control group this procedure was carried out in 16 patients treated by marsupialization.

Figure 13. Curettage of the residual cystic membrane

2.5. Mathematical and Statistical Processing of the Obtained Results

Data were processed automatically using open-source software tools, namely RStudio (version 2024.09.1+394) and Python (version 3.12.3). The use of these widely recognized scientific platforms enabled rigorous, efficient, and fully reproducible statistical

analyses. The choice of these software environments contributed to ensuring transparency of the analytical process, validity of the obtained results, and the possibility of independent replication. The source codes used for data processing and analysis are available upon request, thereby facilitating verification of the results and reuse of the methodology in similar studies.

For the characterization of numerical variables, standard descriptive statistics were calculated, including minimum and maximum values, arithmetic mean, standard deviation, as well as median and interquartile range (IQR). These measures allowed a detailed description of variable distributions, identification of outliers, and assessment of deviations from normality.

For comparison of numerical variables between two groups, the nonparametric Mann–Whitney–Wilcoxon test was used, with the variant applied selected according to the nature of the analyzed groups (independent or dependent). This test was preferred due to its robustness and the fact that it does not require the normality assumption. Graphical representation of numerical variables was performed using box plots, which allow intuitive visualization of central tendency, dispersion, and potential differences between groups.

For categorical variables, absolute and relative frequencies were calculated, accompanied by 95% confidence intervals for proportions, thus ensuring a robust statistical characterization of data distribution. Graphical representation was performed using bar plots, facilitating category comparisons.

For hypothesis testing regarding categorical variables, Pearson's Chi-square test was applied. To ensure the robustness of results, especially in situations with low frequencies or unbalanced distributions, the Monte Carlo simulation variant (100,000 replications) was used, which allows a more precise estimation of the p-value.

All statistical analyses were carried out using a significance threshold of $\alpha=0.05$\alpha = 0.05$\alpha=0.05, and p-values below this threshold were considered statistically significant. Interpretation of the results was performed both in terms of statistical significance and in relation to clinical relevance, taking into account the magnitude of observed effects and potential implications for medical practice and public health.

Thus, the set of mathematical processing and statistical analysis methods was chosen in accordance with the aim and objectives of the research, as well as with the structure of the a priori defined cohorts. The results were presented transparently and reproducibly through standardized tables and graphical visualizations, ensuring a coherent interpretation aligned with the requirements for drafting the doctoral thesis.

3. OBTAINED RESULTS

3.1. Retrospective analysis of morbidity among patients with cystic lesions of the jaws.

For the retrospective assessment of morbidity due to cystic formations of the jaws, the medical records of 1,016 patients with cysts of the oro-maxillofacial territory hospitalized in the Oral and Maxillofacial Surgery Department of the Emergency Medicine Institute (IMU) in Chișinău during 2010–2019 were analyzed. Data were collected using a standardized questionnaire that included demographic, clinical, and therapeutic information. All data were entered into an electronic database and processed using the Microsoft Office 2010 Professional suite.

During the analyzed period, 14,034 patients were hospitalized in the OMF Surgery Department, of whom 1,016 (7.2%; 95% CI [5.6–8.8]) presented cystic formations of the oro-maxillofacial territory. Cysts of odontogenic etiology predominated significantly, being

diagnosed in 884 patients (87.0%; 95% CI [84.9–89.1]), compared to non-odontogenic cysts—132 cases (13.0%; 95% CI [10.9–15.1]).

Among patients with odontogenic cysts, 563 (63.7%; 95% CI [60.5–66.9]) were men and 321 (36.3%; 95% CI [33.1–39.5]) were women. Patient age ranged from 17 to 85 years, with a mean of 34.2 ± 5.63 years and a median of 35 years. Most originated from urban areas—503 cases (56.9%; 95% CI [53.6–60.2]), compared with 381 patients (43.1%; 95% CI [39.8–46.4]) from rural areas.

Regarding the mode of presentation, 735 patients (83.1%; 95% CI [80.7–85.6]) presented themselves, 74 (8.4%; 95% CI [6.5–10.2]) were referred by a specialist, 60 (6.8%; 95% CI [5.1–8.4]) by a family physician, and 15 (1.7%; 95% CI [0.8–2.5]) were transported by ambulance. Emergency hospitalization was necessary in 568 cases (64.3%; 95% CI [61.1–67.4]), and planned hospitalization in 316 cases (35.7%; 95% CI [32.6–38.9]).

Most presentations took place between 06:00–12:00 (77.5%), followed by 12:00–18:00 (19.2%), while presentations during 18:00–24:00 and 24:00–06:00 were rare (2.6% and 0.7%, respectively).

Topographically, odontogenic cysts were more frequently located in the maxilla—501 cases (56.7%; 95% CI [53.4–59.9]) compared with the mandible—383 cases (43.3%; 95% CI [40.1–46.6]).

Surgical treatment was performed predominantly under local anesthesia with potentiation, used in 867 cases (98.1%; 95% CI [97.2–99.0]), while general anesthesia was required in only 17 cases (1.9%; 95% CI [1.0–2.8]). The most frequently applied surgical intervention was cystectomy, performed in 714 patients (80.8%; 95% CI [78.2–83.4]), while cystotomy and incision with drainage were used less often.

In conclusion, cystic formations of the oro-maxillofacial territory accounted for 7.2% of total admissions to the OMF Surgery Department during 2010–2019. Most cases were of odontogenic origin, with a predominance in males and a more frequent localization in the maxilla. Treatment was carried out almost exclusively under loco-regional anesthesia with potentiation, and cystectomy was the surgical method of choice.

3.2. Evaluation of preoperative dimensions of large maxillary cysts according to treatment procedure

A comparison was made between preoperative morphometric parameters of cysts in the groups treated by decompression and marsupialization.

Regarding cyst length, the median was 3.40 cm in the decompression group and 4.00 cm in the marsupialization group. The Mann–Whitney test ($W = 400.00$; $p = 0.06$) showed a trend toward statistical significance, without reaching the conventional threshold. The rank-biserial correlation ($r = –0.27$; 95% CI [–0.50; –0.00879]) suggests a moderate difference, with slightly higher values in the marsupialization group. Although not statistically significant, this difference indicates a possible initial asymmetry requiring caution when interpreting postoperative results.

For cyst diameter, the median was 1.52 cm in the decompression group and 1.60 cm in the marsupialization group. Statistical analysis showed no differences between groups ($W = 542.50$; $p = 0.98$), and the rank-biserial r (–0.00367; 95% CI [–0.28; 0.27]) confirms the absence of a relevant association. These results demonstrate the comparability of the groups in terms of initial cyst diameter.

For cyst height, the median was 2.13 cm in the decompression group and 2.47 cm in the marsupialization group. The Mann–Whitney test (W = 486.00; p = 0.46) and rank-biserial r (–0.11; 95% CI [–0.37; 0.17]) did not show significant differences, confirming a similar level of this parameter between groups.

In conclusion, the analysis of preoperative morphometric parameters (length, diameter, and height) demonstrates good comparability of the groups treated by decompression and marsupialization. Although a trend toward difference was observed for length, none of the parameters showed statistically significant differences. These results support the initial homogeneity of the samples and allow an objective evaluation of the postoperative effectiveness of the two therapeutic methods.

3.3. Determination of variations in pulp sensitivity of teeth adjacent to the cystic lesion, pre- and postoperatively, according to therapeutic method and anatomical location.

Pulp sensitivity of teeth adjacent to cystic formations was evaluated using the cold thermal test with Endo-Frost Spray. Preoperatively, 47.0% of patients (95% CI: 34.9%–59.0%) presented a positive response, indicating maintained pulpal vitality. In 19.7% of cases (95% CI: 10.1%–29.3%) the response was negative, suggesting absence of dental vitality, and in 33.3% (95% CI: 22.0%–44.7%) the test could not be performed or interpreted. These results reflect variability in pulpal status of teeth near odontogenic cysts. Positive responses demonstrate preservation of pulpal vitality near expansive lesions, while negative responses are characteristic especially of radicular cysts associated with pulpal necrosis.

Postoperative evaluation showed maintenance of pulpal vitality in most patients. Thus, 45.5% (95% CI: 33.4%–57.5%) had a positive response, 15.2% (95% CI: 6.5%–23.8%) a negative response, and in 39.4% of cases (95% CI: 27.6%–51.2%) the test could not be performed for clinical reasons, such as edentulism, presence of crowns, or extensive restorations. The results suggest that decompression and marsupialization have a limited impact on dental vitality when properly applied.

Comparison of preoperative response distributions between groups treated by decompression and marsupialization did not show statistically significant differences ($\chi^2 = 2.73$; $p = 0.2511$). In the decompression group, 33.3% of cases had an absent test, 27.3% a negative response, and 39.4% a positive response, while in the marsupialization group the proportions were 33.3%, 12.1%, and 54.5%, respectively. These results confirm group homogeneity with respect to initial pulpal status.

Analysis of postoperative responses between the two therapeutic methods also showed no statistically significant differences ($\chi^2 = 2.22$; $p = 0.3863$). In the decompression group, 45.5% of patients had an absent test, 18.2% a negative response, and 36.4% a positive response, compared with 33.3%, 12.1%, and 54.5% in the marsupialization group. Although positive responses were more frequent after marsupialization, the observed differences were not statistically significant.

Analysis by anatomical location of the cysts did not show an influence on pulpal response. Preoperatively, at the mandibular level there were 35.5% absent tests, 12.9% negative responses, and 51.6% positive responses, and at the maxilla 31.4%, 25.7%, and 42.9%, respectively. Differences were not statistically significant ($\chi^2 = 1.72$; $p = 0.4518$). Similarly, postoperatively, the distribution of responses was comparable between the mandible (38.7% absent, 12.9% negative, 48.4% positive) and maxilla (40.0% absent, 17.1% negative, 42.9% positive), with no statistically significant differences ($\chi^2 = 0.31$; $p = 0.8466$).

In conclusion, analysis of the thermal test performed pre- and postoperatively demonstrated that decompression and marsupialization largely preserve pulpal vitality of teeth adjacent to cystic formations. No statistically significant differences were identified either between the two surgical procedures or by anatomical location. The predominance of positive responses confirms maintenance of pulpal function, and the thermal test can be considered a reliable and balanced variable for comparative evaluation of the efficiency of the two therapeutic techniques.

3.4. Comparative clinical evaluation of postoperative recovery

Postoperative recovery was evaluated comparatively based on several clinical parameters: pain syndrome, intensity and regression of soft tissue edema, presence of sensory disturbances in the territories of the infraorbital, inferior alveolar, and mental nerves, as well as the occurrence of hematomas.

Postoperative pain was assessed using the visual analog scale (VAS, 0–10 points). All 66 patients reported postoperative pain. The mean pain score was 2.8 ± 1.4 points, with a median of 3.0 and values between 1 and 6 points. Group analysis showed significantly lower pain intensity in the decompression group (2.2 ± 1.0; median 2.0; 95% CI: 1.8–2.5), compared with the marsupialization group (3.5 ± 1.3; median 4.0; 95% CI: 3.0–4.0). The difference was confirmed statistically by the Wilcoxon/Mann–Whitney test ($W = 241.00$; $p < 0.001$). The effect size ($r = –0.56$; 95% CI: –0.72 to –0.33) indicates a moderate-to-large effect, demonstrating superior pain control with decompression

The intensity of postoperative edema was evaluated using a semi-quantitative clinical classification. In the decompression group, grade I edema predominated (60.6%), followed by grade II (30.3%) and grade III (9.1%). In contrast, in the marsupialization group, moderate and severe forms of edema predominated (45.5% and 36.4%, respectively), while mild edema was present in only 18.2% of cases. The difference between groups was statistically significant ($\chi^2 = 13.94$; $p = 0.00073$), indicating a lower postoperative inflammatory reaction after decompression.

Analysis of edema regression also showed significant differences between the two procedures. The median duration of edema remission was 2 days in the decompression group and 4 days in the marsupialization group. The Mann–Whitney test confirmed the statistical significance of the difference ($W = 321.00$; $p = 0.00116$), and the rank-biserial coefficient ($r = –0.41$; 95% CI: –0.61 to –0.15) indicates a moderate effect. These results demonstrate faster edema regression and reduced tissue trauma in the case of decompression.

During the postoperative period, there were no recorded sensory disturbances in the evaluated nerves and no hematomas, confirming the minimally invasive nature and safety of both therapeutic methods.

In conclusion, the analysis of postoperative recovery parameters demonstrates the superiority of decompression compared with marsupialization. Patients treated by decompression had significantly lower postoperative pain, less severe edema, and faster edema regression. In the absence of neurological complications and hematomas, these results support that decompression ensures more favorable postoperative recovery and increased patient comfort.

3.5. Comparative analysis of bone and tissue density according to treatment type and anatomical location

Bone density expressed in Hounsfield units (HU) is an objective indicator of bone regeneration and the degree of tissue mineralization, being used to evaluate the effectiveness of

surgical procedures. HU values correlate significantly with bone mineral density determined by DXA and provide useful information regarding bone quality, although they do not fully reflect bone microarchitecture. The analysis of bone and tissue density aimed to evaluate the effects of decompression and marsupialization on bone regeneration, as well as the influence of anatomical location on these parameters.

Comparison of bone density between groups treated by decompression and marsupialization did not show statistically significant differences. At the level of the buccal cortical plate, the median was higher in the decompression group (258 HU) compared with marsupialization (208 HU), but the difference did not reach statistical significance ($W = 678.00$; $p = 0.09$; $r = 0.25$; 95% CI: –0.03 to 0.49), suggesting only a trend toward more pronounced bone regeneration after decompression.

For the oral cortical plate, medians were similar (222 HU versus 217 HU), with no significant differences between groups ($W = 480.00$; $p = 0.41$; $r = –0.12$). Similarly, the density of the healthy cortical bone showed comparable values between the decompression group (1258 HU) and marsupialization (1096 HU), without statistical significance ($W = 606.50$; $p = 0.43$; $r = 0.11$).

Analysis of tissue characteristics of the lesions showed similar results. The density of the cyst membrane was higher in the decompression group (194 HU) compared with marsupialization (109 HU), but the difference was not statistically significant ($W = 618.50$; $p = 0.35$; $r = 0.14$). Also, the density of the intracystic content did not differ between groups ($W = 499.50$; $p = 0.57$; $r = –0.08$), confirming comparability of lesions in terms of structure.

Overall, the analysis of bone and tissue density did not show statistically significant differences between decompression and marsupialization. Although some descriptive values suggest favorable trends for decompression, effect sizes were small and confidence intervals indicated considerable variability. These results support that both procedures offer comparable outcomes in terms of bone regeneration and tissue changes.

To evaluate the influence of anatomical location, bone and tissue density parameters were compared between mandibular and maxillary cysts. At the buccal cortical plate, the mandible showed higher values (285 HU versus 218 HU), without statistical significance ($W = 678.00$; $p = 0.08$; $r = 0.25$). The same trend was observed for the oral cortical plate (380 HU versus 183 HU; $p = 0.21$) and the healthy cortical bone (1256 HU versus 1093 HU; $p = 0.08$), suggesting higher bone density in the mandible, albeit without statistical significance.

The only statistically significant difference was identified at the cyst membrane level, where values were significantly higher for mandibular lesions compared with maxillary ones (205 HU versus 96 HU; $W = 712.00$; $p = 0.03$; $r = 0.31$; 95% CI: 0.04–0.54). This result may reflect regional structural peculiarities and may have implications for planning surgical treatment.

Regarding the density of the intracystic content, although values were slightly higher in the mandible, the differences were not statistically significant ($W = 637.50$; $p = 0.22$; $r = 0.18$).

In conclusion, the analysis of bone and tissue density highlights a consistent trend toward higher values in the mandible compared with the maxilla, although most differences do not reach statistical significance. The exception is the density of the cyst membrane, significantly higher in mandibular lesions. Clinically, anatomical location may influence certain structural characteristics and the therapeutic approach, without affecting the comparability of results and the overall efficiency of decompression or marsupialization.

4. SYNTHESIS AND INTERPRETATION OF THE OBTAINED RESULTS

4.1. Comparison of the effectiveness of decompression and marsupialization in reducing the morphological parameters of large maxillary cysts

A comparative analysis of postoperative volumetric and morphological parameters of cystic formations in patients treated by decompression and marsupialization was performed.

Regarding residual cyst volume, the median was 1.55 cm^3 in the decompression group and 1.69 cm^3 in the marsupialization group. The Mann–Whitney test did not show statistically significant differences between the two methods ($W = 500.50$; $p = 0.57$), and the rank-biserial r (–0.08; 95% CI [–0.35; 0.20]) confirms the absence of a relevant association between type of intervention and postoperative lesion volume.

Analysis of postoperative length showed similar values between groups, with a median of 1.58 cm for decompression and 1.87 cm for marsupialization. The difference was not statistically significant ($W = 464.00$; $p = 0.30$), and the rank-biserial r (–0.15; 95% CI [–0.40; 0.13]) indicates no clinically relevant effect.

For postoperative diameter, medians were practically identical: 0.82 cm in the decompression group and 0.83 cm in the marsupialization group. The Mann–Whitney test ($W = 494.50$; $p = 0.52$) and rank-biserial r (–0.09; 95% CI [–0.36; 0.19]) confirmed the absence of statistically and clinically significant differences between the two procedures.

Similarly, postoperative height of the cysts was comparable between groups, with medians of 1.19 cm for decompression and 1.14 cm for marsupialization. Statistical analysis did not show significant differences ($W = 503.50$; $p = 0.60$), and the rank-biserial r (–0.08; 95% CI [–0.34; 0.20]) confirms the lack of a relevant effect.

In conclusion, the analysis of postoperative volumetric and morphological parameters demonstrates that decompression and marsupialization have comparable effectiveness in reducing the dimensions of large maxillary cysts. No statistically or clinically significant differences were identified regarding residual volume, length, diameter, and postoperative height of the lesions. These results support that both procedures are effective and safe options in the minimally invasive management of large odontogenic cysts.

4.2. Comparative study of cyst size evolution before and after applied treatment

To evaluate the effectiveness of minimally invasive treatment of odontogenic cysts, the dimensions of cystic formations were comparatively analyzed before and after intervention. The study of morphological parameters sought to assess changes in volume, length, diameter, and height of the cysts, providing objective information regarding therapeutic response and the evolution of the healing process.

Comparative analysis demonstrated a significant reduction in cyst size after treatment. Cyst volume recorded a substantial decrease, confirmed statistically by the paired-sample Wilcoxon test ($W = 83.0$; $p < 0.001$). Additionally, the dispersion of postoperative values was reduced, and the number of outliers decreased compared with the preoperative period, reflecting a favorable therapeutic response in most patients. These results confirm the efficiency of minimally invasive procedures in progressively reducing the volume of cystic lesions.

Similar results were observed for the linear dimensions of the cysts. Cyst length decreased significantly after treatment ($W = 0.0$; $p < 0.001$), with the distribution of postoperative values being more compact and characterized by reduced variability. Cyst diameter also showed a statistically significant decrease ($W = 176.0$; $p < 0.001$), and the

reduction in value dispersion confirmed the evident regression of the lesions. Similarly, cyst height recorded a significant decrease after treatment ($W = 0.0$; $p < 0.001$), with postoperative values being more uniform and associated with the disappearance of most outliers initially observed.

The concomitant reduction in volume, length, diameter, and height demonstrates that the therapeutic effect is not limited to a single anatomical plane but is manifested three-dimensionally. This confirms the efficiency of minimally invasive approaches in controlling and regressing odontogenic cysts.

Separate analysis of results by procedure showed that both decompression and marsupialization lead to significant reductions in cyst dimensions. For volume, both methods produced marked lesion diminutions ($p < 0.001$), but the distribution of postoperative values was more uniform in the group treated by decompression. Patients treated by marsupialization showed greater variability in results, explainable by the initially larger lesion sizes in this group.

Reduction in length, diameter, and height was observed consistently for both techniques. Although marsupialization was more often applied to larger cystic formations, postoperative results showed effectiveness comparable to decompression. However, postoperative value distributions were more compact in the decompression group, suggesting a more predictable evolution and a more uniform therapeutic response.

Comparative analysis of morphological parameters confirms that both therapeutic methods lead to significant reductions in the dimensions of odontogenic cysts. All evaluated parameters—volume, length, diameter, and height—recorded significant decreases after treatment, with differences confirmed statistically by $p < 0.001$. Although decompression appears to offer more uniform and predictable results, no differences sufficient to demonstrate the clear superiority of one technique were identified. Consequently, both decompression and marsupialization represent effective and safe methods in the management of large odontogenic cysts, with the choice individualized according to the clinical and imaging particularities of each case.

Summarizing the obtained results, both procedures determined significant regression of cystic formations, confirmed both by imaging (tomographic examination) and statistically through analysis of volumetric and morphological parameters. The three-dimensional reduction of lesions observed at evaluations at 6 and 12 months postoperatively demonstrates the efficiency of minimally invasive treatment and supports the use of both decompression and marsupialization as valuable therapeutic options in managing large odontogenic cysts.

4.3. Advantages and disadvantages of decompression and marsupialization in the treatment of large maxillary cysts

Following the comparative analysis of decompression and marsupialization, it can be concluded that both methods are safe and effective therapeutic options for the minimally invasive management of large maxillary cysts. The choice of procedure depends on the particularities of the clinical case, including lesion size and location, as well as the patient's degree of cooperation. Each technique has specific advantages and limitations.

Tube decompression is a more conservative and easier-to-perform method compared with marsupialization. It involves reduced costs, does not require specialized equipment, and can be performed both in the outpatient setting and in hospital conditions by any oral and maxillofacial surgeon. The procedure is short in duration, offers adequate surgical access, and is associated with reduced postoperative morbidity and complication risk.

The minimally invasive nature of decompression reduces the risk of damage to adjacent anatomical structures and favors maintenance of vitality of adjacent teeth. Evaluation of pulpal response via thermal testing, performed pre- and postoperatively, showed that both decompression and marsupialization have minimal impact on dental vitality, with no statistically significant differences between methods or by cyst location (mandible versus maxilla).

Decompression is associated with more favorable postoperative recovery compared with marsupialization, evidenced by a significantly lower pain level (2.2 ± 1.0 vs. 3.5 ± 1.3; $p < 0.001$), a higher frequency of mild edema (60.6% of cases), and faster regression of soft-tissue edema (2 days versus 4 days). The method is particularly useful in elderly patients or those with systemic conditions (cardiovascular, respiratory, hematologic, etc.) who cannot undergo general anesthesia, contributing to improved quality of life.

An additional advantage is the use of individualized decompression devices, which maintain the necessary space in the dental arch, prevent mesiodistal and vertical dental migrations, and ensure stability through supporting and retention clasps. These devices maintain patency of the drainage orifice of the cystic cavity and can also have an aesthetic function in the anterior region.

The main disadvantages of decompression are the prolonged duration of treatment (approximately 6–12 months), discomfort caused by the presence of the tube, and the need for daily irrigation of the cystic cavity with isotonic solution. Persistence of residual cystic epithelium may favor recurrence, which is why curettage of the membrane is recommended after a significant reduction in lesion volume. Thus, in some cases, an additional surgical intervention may be necessary.

Marsupialization reduces intracystic pressure and contributes to the decrease in volume and dimensions of large maxillary cysts. By creating a permanent communication between the oral cavity and the cystic cavity, the procedure ensures a continuous decompressive effect during bone regeneration. However, its realization requires a trepanation orifice with a diameter equal to or greater than the anteroposterior diameter of the cystic cavity, implying greater operative trauma compared with decompression. Also, maintaining hygiene of the open cavity is difficult and requires regular irrigations, as well as adequate patient cooperation.

Statistical analysis demonstrated a significant reduction in all dimensional parameters of odontogenic cysts ($p < 0.001$), confirming the effectiveness of minimally invasive methods in the treatment of large maxillary cysts. Decompression and marsupialization produce similar reductions in lesion size, having comparable therapeutic effectiveness.

Selection of the optimal method should be individualized, depending on lesion size and location, integrity of the cystic epithelial membrane, relationship with adjacent vital teeth, and anatomical relationships with neighboring structures, including the inferior alveolar canal, mental foramen, infraorbital foramen, maxillary sinus, nasal cavity, and infratemporal space.

Particularities of providing dental care to patients with associated conditions, including those under antithrombotic treatment, are described in the national and international literature. Application of recommended therapeutic algorithms for patients with comorbidities who require oral surgery, including for large maxillary cysts, contributes to reducing complications and increasing the quality of dental medical services.

At the same time, anesthesia and tooth extraction techniques described by Prof. Chele N. and collaborators are currently used in the treatment of patients with large maxillary cysts. These methods remain relevant due to demonstrated clinical effectiveness, safety in the context

of associated pathologies, and adaptability to anatomical and morphological particularities of complex cases. Their implementation contributes to the optimization of surgical stages, reduction of intra- and postoperative complication risk, and adequate pain control, continuing to represent an important component of contemporary oral surgical practice in the Republic of Moldova.

GENERAL CONCLUSIONS

1. The frequency of patients with cystic formations located in the oro-maxillofacial territory was 7.2% (95% CI [5.6–8.8]), most being of odontogenic origin (87.0%; 95% CI [84.9–89.1]) and predominantly located in the maxilla (56.5%; 95% CI [53.4–59.5]).
2. Comparative analysis of postoperative recovery demonstrates that decompression ensures more favorable recovery than marsupialization, being associated with a significantly lower level of pain (2.2 ± 1.0; median 2.0; 95% CI 1.8–2.5 vs. 3.5 ± 1.3; median 4.0; 95% CI 3.0–4.0; $p < 0.001$), with less intense edema (mild in 60.6% of cases) and faster regression of soft-tissue edema (2 days vs. 4 days).
3. Thermal testing showed maintenance of pulpal vitality after decompression and marsupialization, with no significant differences between procedures (preoperative $\chi^2 = 2.73$, $p = 0.2511$; postoperative $\chi^2 = 2.22$, $p = 0.3863$) or anatomical sites (pre $\chi^2 = 1.72$, $p = 0.4518$; post $\chi^2 = 0.31$, $p = 0.8466$).
4. Bone and tissue density do not differ significantly between patients treated by decompression and those treated by marsupialization ($p > 0.05$), and although values are generally higher in the mandible, with a significant difference only for cyst membrane density ($p = 0.03$), these variations do not affect group comparability, suggesting that the choice of surgical technique can be guided primarily by clinical particularities and lesion location.
5. Decompression and marsupialization showed similarly favorable results in reducing the volume, length, diameter, and height of large maxillary cysts ($p > 0.30$; rank-biserial r with CIs including zero; Wilcoxon tests: $W = 83.0, 0.0, 176.0, 0.0$; all $p < 0.001$), confirming that both techniques are safe and effective therapeutic options.

PRACTICAL RECOMMENDATIONS

1. Given the relatively high prevalence of oro-maxillofacial cystic formations (7.2%), the predominance of those of odontogenic origin (87%), and their more frequent localization in the maxilla (56.5%), periodic monitoring through clinical and radiological examinations is recommended, especially for patients with odontogenic risk factors (e.g., impacted teeth, periapical infections, history of dental trauma). Early identification of cystic changes allows reduction of complication risk, optimization of therapeutic conduct, and selection of the least invasive intervention.
2. Despite more favorable postoperative recovery after decompression (lower pain, less intense edema, and faster regression), selecting this procedure in the management of large cystic formations is recommended, as it contributes to improved postoperative comfort and reduced recovery time.
3. Since pulpal vitality is similarly maintained after decompression and marsupialization, regardless of anatomical site, both techniques can be safely used without an increased risk of pulpal impairment.

4. Bone and tissue density do not present significant differences between patients treated by decompression and those treated by marsupialization, suggesting that the choice of surgical technique can be guided primarily by the clinical particularities of the case (lesion size and location, relationship with anatomical structures, patient compliance).
5. Both decompression and marsupialization can be recommended as safe and effective surgical options in the minimally invasive management of large maxillary cystic lesions, with the choice between them determined by case particularities, such as lesion size and topography, and patient involvement in the therapeutic process.

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Doctoral Supervisor Oleg Zănoagă, MD, PhD, Associate Professor

SCIENTIFIC PAPERS

- **Articles published in scientific journals abroad**
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1. **Cucu Gh,** Chele N, Zănoagă O. Retrospective study of morbidity in patients with cystic lesions of the jaws. In: Romanian Journal of Oral Rehabilitation. 2025, vol. 17, nr. 3, pp. 188-195. ISSN 2066-7000.
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3. Zugrav V, Chele D, Chele N, **Cucu Gh.** The importance of mucogingival flaps in guided bone regeneration in the jaws. In: Moldovan Journal of Health Sciences. 2024, vol. 11(4), 30-37. ISSN 2345-1467.

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- **Patents, Invention Patents, Registration Certificates and Materials Presented at Invention Exhibitions**

26. **Cucu Gh,** Topalo V. Metodă de chistectomie prin acces palatinal al chisturilor odontogene ale maxilarului superior cu extindere palatinală. Certificat de inovație Nr. 5619. 20 Nov 2017.
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