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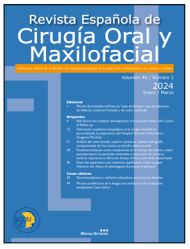

Original

Does the experience and maximum qualification of the surgeon influence the choice of odontogenic keratocyst treatment?

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ABSTRACT

Background: Odontogenic Keratocyst (OKC) has been considered a cystic lesion since 2017, marking a change in its previous classification as a benign intraosseous neoplasm. However, given the high recurrence rate and aggressive behavior of the OKC, the ideal therapeutic approach for treating the lesion remains under discussion among oral and maxillofacial surgeons. Therefore, this study aimed to evaluate the choice of treatment used in OKC among Brazilian oral and maxillofacial surgeons with different qualifications and years of experience.

Material and methods: A qualitative and quantitative descriptive study was carried out using an electronic questionnaire. There was the participation of 49 oral and maxillofacial surgeons, trained in their highest degree between the years 1976 and 2023, divided into specialist (n = 9), master (n = 13), Ph.D. (n = 28), and post-doctor (n = 2).

Results: 53 % of surgeons classified OKC as an odontogenic cyst, while 47 % categorized it as a benign odontogenic tumor. Regarding the selection of therapeutic intervention, enucleation followed by curettage (n = 26) was the predominant alternative, with a significant association being evidenced by Fisher's exact test between the year of completion of the maximum qualification and the curettage method of choice (p = 0.021). The other analyses did not demonstrate a significant association between the variables. Despite this, not all participants were able to inform the relationship between the treatment of choice and the risk of recurrence.

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Conclusion: There is a relationship between the experience of oral and maxillofacial surgeons and the choice of OKC treatment, with experienced surgeons opting for more conservative approaches. It is also important to highlight the need for continued education in decision-making based on scientific evidence.

¿La experiencia y máxima cualificación del cirujano influye en la elección del tratamiento del queratoquiste odontogénico?

Palabras clave:

Quistes odontogénicos, queratoquiste odontogénico, cirujanos oromaxilofaciales, cirugía bucal, recurrencia.

RESUMEN

Antecedentes: El queratoquiste odontogénico (QO) ha sido considerado una lesión quística desde el año 2017, marcando un cambio en su clasificación anterior como neoplasia intraósea benigna. Sin embargo, dada la alta tasa de recurrencia y el comportamiento agresivo del QO, el enfoque terapéutico ideal para tratar la lesión sigue siendo objeto de debate entre los cirujanos orales y maxilofaciales. Por lo tanto, este estudio tuvo como objetivo evaluar la elección del tratamiento utilizado en el QO entre cirujanos orales y maxilofaciales brasileños con diferentes cualificaciones profesionales y años de experiencia.

Material y métodos: Se realizó un estudio descriptivo cualitativo y cuantitativo mediante cuestionario electrónico. Se contó con la participación de 49 cirujanos orales y maxilofaciales, formados en su más alto grado entre los años 1976 y 2023, divididos en especialista (n = 9), maestría (n = 13), doctorado (n = 28), y postdoctorado (n = 2).

Resultados: El 53 % de los cirujanos clasificó el QO como un quiste odontogénico, mientras que el 47 % lo categorizó como un tumor odontogénico benigno. En cuanto a la selección de la intervención terapéutica, la enucleación seguida de legrado (n = 26) fue la alternativa predominante, evidenciándose una asociación significativa mediante el Fisher's exact test entre el año de finalización de la titulación máxima y el método de legrado de elección (p = 0,021). Los otros análisis no demostraron una asociación significativa entre las variables. A pesar de esto, no todos los participantes pudieron informar la relación entre el tratamiento de elección y el riesgo de recurrencia.

Conclusión: Existe una relación entre la experiencia de los cirujanos orales y maxilofaciales y la elección del tratamiento de la QO, y los cirujanos experimentados optan por enfoques más conservadores. También es importante resaltar la necesidad de una educación continua en la toma de decisiones basada en evidencia científica.

INTRODUCTION

Currently, the World Health Organization (WHO) classifies odontogenic keratocyst (OKC) as a cystic lesion, rather than a benign intraosseous neoplasm, as it was previously classified[1,2]. The OKC has an important prevalence in the angle of the mandible and can extend through the ascending ramus and to the anterior region of the mandibular body. In many cases, the symptoms do not occur at first. However, over time and with the development of the lesion, painful symptoms are present mainly when there is an invasion in regions such as the maxillary sinus, mandibular ramus, condylar process, and coronoid of the mandible[3]. This cyst is recognized for its relatively high recurrence rate and aggressive behavior compared to other odontogenic cysts[4].

From a histological point of view, the transition with the adjacent connective tissue is generally flat, and small secondary cysts may appear from the basal layer[5]. In addition, mitotic activity is higher than that found in other cysts of odontogenic origin[6]. In this sense, the objective of OKC treatment is to reduce the probability of recurrence and, simultaneously, limit the impacts on the patient's health. There are different surgical approaches debated for the treatment of odontogenic keratocysts. Nevertheless, it has been difficult to establish a unified agreement on the ideal therapeutic approach. This is because there is a specific probability of reappearance for each therapy, ranging from 16 % to 30 %[7].

Therefore, the choice between conservative or radical treatment depends on several important considerations. These include the location and size of the lesion, whether it is

unilocular or multilocular, how to handle the adjacent soft tissues, the presence of cortical bone perforation, and the age of the patient. There are several surgical options available, ranging from conservative enucleation alone or with additional procedures (such as ostectomy, use of Carnoy's solution and cryotherapy), to marsupialization, decompression, and radical treatment through marginal or segmental resection[8,9].

Consequently, odontogenic keratocyst remains a pathological entity that arouses discussion among those involved in its treatment, especially given its recurrence rate. Thus, this study aimed to evaluate the choice of treatment used in OKC among Brazilian oral and maxillofacial surgeons with different qualifications and years of experience. The authors' hypothesis to be tested was that the higher the surgeon's qualifications and experience, the greater the use of conservative treatments and the greater the knowledge of their recurrence rates.

MATERIALS AND METHODS

The present study consisted of a qualitative-quantitative research of a descriptive and cross-sectional nature, based on the responses of oral and maxillofacial surgeons to a questionnaire about the management of odontogenic keratocysts. Firstly, the research was submitted for evaluation and received approval from the Ethics and Research Committee of the Bauru School of Dentistry (FOB/USP) (Number 4.716.053). The development of the study took place over the period between June 2021 and June 2022.The inclusion criteria were oral and maxillofacial surgeons, regardless of degree level and year of training, who agreed to voluntarily participate in the research. The exclusion criteria used were those participants who did not inform their maximum degree in the field of oral and maxillofacial surgery in the questionnaire sent.

The recruitment of participants was carried out through an electronic link sent to social media groups by the responsible researcher (Postdoc and professor in oral and maxillofacial surgery and trauma). After accepting the Consent Form the surgeon should answer three questions about his training, followed by 6 multiple-choice questions about the OKC and, finally, a final space for comments about the previous questions, without character limits (Table I).

After six months, data were collected, tabulated, and analyzed descriptively and using Fisher's Exact Test in the Jamovi software (Version 2.2), considering $p < 0.05$. For qualitative analysis, participant comments were collected, transcribed literally, and analyzed individually. Such responses were categorized into themes based on the similarity of the content. The themes were grouped into domains that describe the Management, Definition, Diagnosis, Treatment, and Relapse rate of OKC (Figure 1).

RESULTS

There was the participation of 52 oral and maxillofacial surgeons, 22 from the Southeast region, 15 from the South region, 8 from the Northeast region, 6 from the North region, and only 1 from the Central-West region of Brazil. They were divided according to their maximum qualification into specialist (n = 9), master (n = 13), Ph.D. (n = 28) and post-doctor (n = 2). Regarding the year of completion of the maximum degree, participants were categorized into four-time intervals taking as a

Table I. Questionnaire used to analyze clinical practices in treating odontogenic keratocyst and its recurrence rate.

Question	*Response options*
What is your maximum qualification related to the CTBMF?	Specialist, Teacher, Doctor, Post-Doctor
What year was this maximum degree awarded?	1976-1990; 1991-2005; 2006-2015; 2016-2023
In which state of Brazil do you carry out your professional activity as CTBMF?	Brazil states
In relation to odontogenic keratocyst, which definition do you believe is most correct?	Odontogenic cyst, benign odontogenic tumor, malignant odontogenic tumor, none of the above, other
Regarding the diagnosis of odontogenic keratocyst, which method do you use most?	Only imaging examination, incisional biopsy only, excisional biopsy only, association of imaging and anatomopathological exams
Regarding the treatment of odontogenic keratocyst, which method(s) do you use most? *(More than one option available to choose from)	Decompression and incisional biopsy, marsupialization and incisional biopsy, enucleation with curettage, excision/partial resection
Regarding enucleation with curettage, what would be the "curettage" method used? In the case of "others", please explain	I do not use curettage, Lucas curette, ostectomy of the bone walls, cryotherapy, Carnoy 's solution, other
How long do you follow the patients you have operated on for odontogenic keratocyst, post-operatively?	6 to 12 months, 12 to 24 months, more than 24 months
Among the treatments used, would you be able to tell us the recurrence rate according to the treatment used?	Yes, No, He didn't respond
Feel free to make any comments you deem relevant.	Free essay answer

OMS: oral maxillofacial surgery. Source: prepared by the authors.

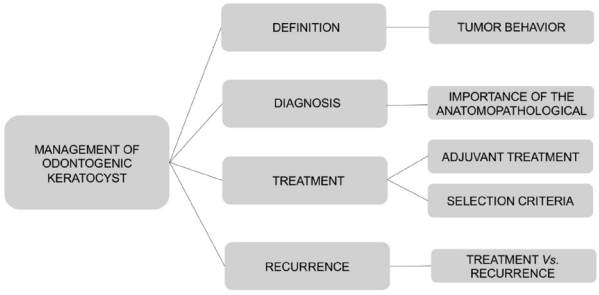

Figure 1. The receiver operating characteristic (ROC) curve of the five-factor prediction model for implant loss risk.

reference the years of publication of the odontogenic tumor classifications of the World Health Organization (WHO) (2, 10-12): 1976-1990 (n = 3), 1991-2005 (n = 17), 2006-2015 (n = 18) and 2016-2023 (n = 14).

Among these professionals, 26 surgeons classified OKC as an odontogenic cyst, while 23 categorized it as a benign odontogenic tumor. Regarding the establishment of the diagnosis, the majority preference (n = 46) was for the combined approach involving imaging methods and anatomopathological analysis. Regarding the selection of therapeutic intervention, enucleation followed by curettage (n = 26) was the predominant alternative, followed by decompression with incisional biopsy (n = 12) and, finally, partial resection (n = 3). Concerning post-treatment follow-up, 5 years was indicated by 50 % (n = 26) of the surgeons as an adequate period. The results according to the maximum qualification and the year it was obtained are described, respectively, in Tables II and III.

A significant association was evidenced between the year of completion of the highest qualification and the curettage method of choice (p = 0.021). From the interpretation of the contingency table, it was observed that, while the period from 1976 to 1990 showed a significant association with the Lucas curettage method, the following period studied between 1991 and 2005 showed an association with ostectomy of the bone walls. In the period from 2006 to 2015, an association with cryotherapy was evidenced, while in the more recent period from 2016 to 2023, an association with Carnoy's solution was noted. The other tests did not demonstrate a significant association between the variables.

A total of five themes emerged during the coding of results in the qualitative assessment, which were grouped into four domains. The domains and themes are described in detail below.

Despite the World Health Organization's most recent definition of OKC being published more than a year ago, maintaining the definition of cyst established 7 years ago, close to half of surgeons chose to define OKC as a tumor. Such a choice may refer to the aggressive behavior of the pathology. The comment made by one of the participants (Ph.D., 2016-2023) supports this thought: "Although the WHO has reclassified the pathology as a Cyst, the evidence in the literature that indicates the lesion as a tumor is strong. In clinical practice, we perceive a tumor-like behavior". Thus, his choice of definition leaves aside international guidelines such as that of the WHO and is guided by clinical experience, to relate to the cases experienced.

Regarding diagnosis, surgeons point out its importance for successful treatment. According to them, the diagnosis that confirms the OKC alerts to the need for adjuvant treatments to reduce the chances of recurrence, as evidenced in the following comment: "Smaller lesions, identified as keratocysts only after total excision during surgery can occur eventually. However, I always prefer to carry out definitive approaches after anatomopathological diagnosis to have complementary means of treatment (cryostat) at hand. I have been using complementary therapy with liquid nitrogen since 1999" (Ph.D.; 2006-2015). The comment is also one of the mentions that brings to light examples of adjuvant therapies used in the treatment of OKC.

Adjuvant treatment, despite making therapy more aggressive compared to marsupialization or simple enucleation, is still more conservative than resection surgeries. In this sense, the following participant (Ph.D.; 2006-2015) states: "Curettage and the use of nitrogen spray makes the treatment more radical for the cyst and more conservative for the patient". Given this, several curettage adjuvants emerged in the participants' comments, such as: "Ostectomy", "Carnoy's Solution" and "Nitrogen Spray".

Faced with several options, how treatment is decided for each case can be complex. In one of the reports, we see how a participant, a Master trained in 1991-2005, determines the treatment of his patients. He states: "There are issues in which we can employ more than one method, as in the case of enucleation, in which Lucas curettes are used, but also associated with peripheral osteotomy". In this passage, the participant evokes more than one form of employment for treating OKC. Despite mentioning that there are several issues to be considered when making this choice, it does not go into depth on the topic. However, other comments were able to elucidate this reflection.

For example, one of the recurring concerns during the treatment of cysts and tumors is damage to adjacent noble structures. In this context, the following comment mentions the precaution with injuries to the Inferior Alveolar Nerve (IAN), often close to the OKC, during enucleation with peripheral ostectomy: "Simple drilling with approximately 1 to 2 mm of wear, always taking care of the peripheral region to the IAN, to concentrate efforts to carry out an effective, uniform and injury-free drilling of the IAN" (Specialist; 2006-2015). In the same sentence, the indicated amount of minimum wear necessary for effective curettage of the bone walls is also noted.

Participants also point out that large injuries in contact with the IAN can benefit from procedures to reduce their size and perform safer surgery at a later stage, as mentioned below: "Depending on the extent, the decompression technique is important to reduce size and perform the exeresis in a second step. Preserving adjacent noble anatomical structures (nerves, vessels, etc.)" (Specialist; 2006-2015).

Most surgeons highlight marsupialization and decompression as an aid to more conservative treatments. Nevertheless, some criteria are involved in selecting this treatment, as emphasized by the following comment: "In extensive lesions,

Table II. Responses to the questionnaire according to the participant's maximum degree in oral and maxillofacial surgery.

	Maximum degree in CTBMF			
Definition for odontogenic keratocyst	Specialist	Teacher	Doctor	Post-Doctor
Odontogenic Cyst	6	7	12	1
Benign odontogenic tumor	3	6	13	1
Malignant odontogenic tumor	0	0	0	0
Other	0	0	3	0
Diagnostic method				
Clinical examination only	0	0	0	0
Imaging exam only	0	1	0	0
Incisional biopsy only	0	0	1	0
Excisional biopsy only	1	1	two	0
Association of imaging and anatopathological exams obtained by incisional biopsy	8	11	25	two
Most used treatment methods				
Marsupialization associated with incisional biopsy	3	4	8	1
Decompression associated with incisional biopsy	6	6	18	1
Enucleation without curettage	0	0	0	0
Enucleation with curettage	1	0	3	0
Partial excision/resection	1	4	4	0
Adjuvant enucleation methods used				
I don't use	1	0	two	0
Curettage with Lucas curette	1	two	4	0
Ostectomy of the bone walls	3	4	10	1
Carnoy 's solution	1	4	two	0
Cryotherapy	1	3	7	1
Other	two	0	3	0
Post-operative follow-up time				
6 to 12 months	1	1	1	0
12 to 24 months	two	0	1	0
More than 24 months	6	12	26	two
Would you be able to report the recurrence rates among the treatments used?				
Yes	6	8	19	two
No	two	4	7	0
Did not answer	1	1	two	0

libOMS: Oral maxillofacial surgery. Source: prepared by the authors.

I start therapy with marsupialization/decompression, when I perceive the possibility of patient cooperation, followed by enucleation associated with additional therapy, in most cases. Sometimes, ostectomy with a drill (Ph.D.; 1991-2005)". Therefore, in addition to the size of the OKC and the intimate contact with noble structures, the patient's collaboration also influences the choice of this treatment.

An important distinction emerged among participants regarding the use of resections as a treatment for OKC. On the one hand, we see statements that the trend should be toward increasingly conservative treatments: "The surgeon's expertise and experience with this condition allows for more conservative treatments compared to what we have seen currently, we have seen a lot of surgical resection and unnecessary reconstructions" (Master, 2006-2015). On the other hand, one of the participants warns of the need for resections in specific cases: "Still about treatment, there are cases in which resection and not curettage is indicated, such as in cases involving the condyle and the entire mandibular branch" (Master, 1991-2005).

Regarding recurrence rates, the following comment expresses a form of treatment used by one of the participants

Table III. Responses to the questionnaire according to the year of completion of the participant's maximum qualification in oral and maxillofacial surgery.

	Year of maximum degree in CTBMF			
Definition for odontogenic keratocyst	1976-1990	1991-2005	2006-2015	2016-2023
Odontogenic Cyst	1	10	10	5
Benign odontogenic tumor	two	5	7	9
Malignant odontogenic tumor	0	0	0	0
Other	0	two	1	0
Diagnostic method				
Clinical examination only	0	0	0	0
Imaging exam only	0	0	1	0
Incisional biopsy only	0	0	1	0
Excisional biopsy only	0	two	two	0
Association of imaging and anatopathological exams obtained by incisional biopsy	3	15	14	14
Most used treatment methods				
Marsupialization associated with incisional biopsy	1	two	4	two
Decompression associated with incisional biopsy	0	5	4	7
Enucleation without curettage	0	0	0	0
Enucleation with curettage	3	11	13	4
Partial excision/resection	0	1	two	1
Adjuvant enucleation methods used				
I don't use	0	0	0	3
Curettage with Lucas curette	two	two	two	1
Ostectomy of the bone walls	1	8	6	3
Carnoy 's solution	0	1	two	4
Cryotherapy	0	two	8	two
Other	0	4	0	1
Post-operative follow-up time				
6 to 12 months	0	1	two	0
12 to 24 months	0	two	1	0
More than 24 months	3	14	15	14
Would you be able to report the recurrence rates among the treatments used?				
Yes	two	11	14	8
No	1	4	two	6
Did not answer	0	two	two	0

OMS: oral maxillofacial surgery. Source: prepared by the authors.

(Mestre, 2006-2015) who has generated cases successfully treated in his clinical practice: "I have cases over these 16 [years] in follow-up without recurrence, after excisional biopsy and scarification with drills associated with taping". Still, on the subject, another surgeon (Ph.D., 1976-1990) highlights: "About the previous index, it should be emphasized that after a second or third intervention, the 'cure' rate is practically total". In this way, we can observe the intimate relationship between the choice of treatment and the total efficient removal of the lesion and, consequently, its recurrence rate and treatment success.

DISCUSSION

The structure we present contributes to the understanding of how the qualification and experience of the oral and maxillofacial surgeon may be related to the management of odontogenic keratocysts. For this, we opted for a quantitative-qualitative approach to the topic to not only highlight significant associations between the variables but also to understand the motivations for such results[10]. In this sense, electronic tools that were on the rise at the time of the re-

search were used to collect data from participants. Data collection was carried out in 2021, during the COVID-19 pandemic, a period of limited mobility and contact between individuals. Therefore, Google Forms was employed as a means of collection, as it is easy to access and utilize by users and allows the results to be automatically encoded in tables, reducing the chances of human error. Thus, this work is another example of how new technologies can add to science, as they are accessible, low-cost, and dynamic[11].

The researchers chose to divide the sample into four distinct periods about the year of completion of their maximum degree course, using as a reference the years of publication of the WHO classifications of odontogenic tumors. The first period, between 1976 and 1990, mentions the first official WHO guide for classifying tumors, created in 1971, which described OKC as a jaw cyst. The second period, between 1991 and 2005, is related to the second edition of the 1992 classification, which defined OKC as a developmental odontogenic cyst[2]. The third edition, published in 2005 and related to the group from 2006 to 2015, reclassified the keratocyst as a neoplasm, which came to be called keratocystic odontogenic tumor[10]. Finally, the edition was updated in 2017[13] and, again, in 2022[14], encompassing the group from the period 2016 to 2023. In the latest versions, the lesion was again named odontogenic keratocyst and classified as a cyst.

Despite the hypothesis that perhaps there was an association between the year of completion of the highest degree course and the choice of the current definition at that time, we did not find a significant relationship between such variables. On the contrary, the most recent group, centered after the 2017 and 2022 classifications, was the only group in which participants overwhelmingly chose the definition of tumor rather than cyst. As observed in the qualitative assessment, this understanding may be due to the clinical behavior of OKC. However, despite such aggressive behavior with high recurrence rates, it was observed that the mutation in the PTCH1 gene that could justify the classification of OKC as a neoplasm also occurs in other odontogenic cysts, such as the dentigerous cyst[1,15,16]. Furthermore, it has been shown in several clinical studies that marsupialization is a successful treatment for OKC and may be linked to epithelial reversion to normality, which normally does not occur in cases of neoplasia[1,17].

The old maxim "biggest incisions, great surgeons" does not corroborate the findings of this work. In fact, surgeons who participated in this research with more than 40 years of experience, thus, technical skill and experience, have recommended more "conservative" surgeries to patients in their clinical routine, preceded by marsupialization or decompression. Although few surgeons have recommended resection as a form of treatment during their clinical practice, complete excision of the lesion represents a crucial condition for achieving a successful surgical approach to OKC[18]. Therefore, it is imperative to consider alternatives that expand the boundaries of surgical removal, aiming to improve the prognosis of each clinical situation[19]. In the given context, it is noteworthy that many surgeons employ adjuvant treatments to minimize the chances of recurrence. Despite this, they often face difficulty in assessing the risk of recurrence resulting from such treatments. Given this result, supplementary material was distributed as contained in the available supplementary file (Appendix 1) with clarifications on the topic.

According to the literature, the OKC relapse rate was directly linked to the treatment used[20,21]. A systematic review of the literature that evaluated a total of 2287 OKC determined the following risks of recurrence on average according to treatment: marsupialization alone (32.3 %), enucleation alone (23.1 %), decompression or marsupialization followed residual cystectomy (14.6 %), enucleation with liquid nitrogen cryotherapy (14.5 %), enucleation plus Carnoy's solution (11.5 %), and, finally, resections with 8.4 %[18]. Accordingly, the first-line treatment should be enucleation with the application of Carnoy's solution or cryotherapy. In our research, we found that surgeons who completed their highest qualification more recently (between 2016 and 2023) were more likely to use this form of curettage. Furthermore, to reduce recurrence, the literature advises that marsupialization (when necessary) should be followed by a subsequent cystectomy. Also, it is advised that in addition to total removal of the lesion, the adherent mucosa overlying it may need to be removed to prevent recurrence[18]. Resections, consequently, should be reserved for specific cases, such as recurrent lesions and syndromic patients[22-25].

Despite such results, recently, the Food and Drug Administration (FDA) banned the adjuvant used in Carnoy's Solution, making it more difficult to obtain. Thus, alternative chemical agents, including 5-fluorouracil (5-FU) and modified Carnoy's solution, have attracted interest as new forms of adjuvant treatment, with promising results[26]. Another future perspective is non-surgical treatments, encompassing pharmacological approaches. Contemporary research is focused on specific inhibitors of molecules that target targets associated with the Sonic Hedgehog (SHH) signaling pathway, related to PTCH1. Furthermore, there are investigations into the role of fibroblasts, which make up connective tissue, aiming to identify potential therapeutic targets to be considered in the future[27-29].

Among the limitations of the study, we can highlight the low adherence of participants to include comments about the management of OKC. Despite the research team's extensive network of contacts, the questionnaire was satisfactorily completed by only 49 surgeons, who were included in the research. To address this limitation, other qualitative methods, such as interviews, could be considered to obtain the opinions of a larger group of surgeons on the subject.

In any case, from this research, it was possible to observe that a considerable portion of the sample maintained concepts that were already outdated or had little scientific evidence to support them, or even reported that they did not know essential information for the treatment of the pathology. The importance of continuing education in the scope of oral and maxillofacial surgery and trauma stands out, guiding evidence-based treatment. Given this, informative material was produced to disseminate the main information about the treatment of OKC. It was sent to social media groups and is published together with the material in this article for public information.

CONCLUSION

The study delved into the correlation between the academic qualifications and professional experience of oral and maxillofacial surgeons, and their approach to treating odontogenic keratocyst (OKC). The findings revealed that experienced surgeons opted for more conservative treatments such as marsupialization, while reserving resection for specific cases due to the potential for morbidity. The research highlights the importance of continuing education and the dissemination of evidence-based information in the field of oral and maxillofacial surgery.

STATEMENTS AND DECLARATIONS

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The authors have no relevant financial or non-financial interests to disclose.

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Bauru School of Dentistry, University of Sao Paulo (FOB/USP).

Informed consent was obtained from all individual participants included in the study. The authors affirm that human research participants provided informed consent for publication of the survey's results.

PREVIOUS PRESENTATIONS

Partial results of this work were previously presented at the 16th Congress of Oral and Maxillofacial Surgery and Traumatology of Sao Paulo (COPAC) in November 2023.

APPENDIX 1

Supplementary material constructed from a questionnaire administered to oral and maxillofacial surgeons about the management of odontogenic keratocyst. the objective of this material is to resolve any doubts and correct conceptual errors that were observed.

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