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Pioneering the Use of MESNA in Oral and Maxillofacial Surgery: A double-blinded Randomized Controlled Trial for Safe and Effective Dissection of Large Maxillary Odontogenic Cysts Encroaching Critical Structures

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Aim: Despite decades of research, there is no information published on MESNA (Sodium 2-Mercaptoethanesulfonate) application in oral and maxillofacial surgery despite validity in other surgical specialties, we aimed to evaluate the safety and effectiveness of chemo-mechanical dissection using MESNA versus mechanical dissection in surgical excision of large maxillary odontogenic cysts encroaching critical structures.

Materials and methods: A prospective, randomized, double-blinded controlled trial was conducted among patients with large maxillary odontogenic cyst encroaching critical structures scheduled for enucleation and were randomized into: Group I (chemo-mechanical dissection with MESNA),or Group II (mechanical dissection with saline). Primary outcomes were differences in critical structures' injury and intraoperative blood loss. Secondary outcomes included postoperative sensory nerve recovery assessment using a Visual Analogue Scale of 0 – 10,lesion dissection time and ease,wound healing, bone density, and histopathological correspondence.

Results: In total 16 patients were included.The incidence of sinus and nasal mucosa tears was significantly lower in Group I than in Group II. In group I, A lower mean intraoperative blood loss and lesion dissection time were reported than in group II. P-values were (0.003 and 0.004) respectively.In group I, early sensory nerve recovery scores were reported after 1 week and 3 weeks. In group I lower median lesion dissection easiness score was reported than in group II.No statistically significant differences were found in wound healing, 6 months' bone density,or histopathological correspondence between both groups.

Conclusion: Chemo-mechanical dissection using MESNA safely and effectively preserves encroached critical structures, facilitates dissection, and minimizes complications in the surgical management of large maxillary odontogenic cysts.

Keywords: MESNA,Oral and maxillofacial surgery, Sodium 2-Mercaptoethanesulfonate,chemically assisted dissection, Odontogenic cyst.

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Introduction

Odontogenic cysts are frequently encountered lesions in the maxilla and due to the maxilla's inherent anatomical characteristics such as proximity to the maxillary antrum and nasal cavities, they can silently enlarge without clinically evident jaw enlargement following paths of least resistance encroaching critical structures until requiring invasive surgery for complete removal, This underscores additional complexities during surgical dissection to avoid injury to these critical structures. [1, 2], especially aggressive and invasive ones as odontogenic keratocysts as evidenced by the over-expression of Alpha Smooth Muscle Actin.[3]

Attempting complete enucleation through current mechanical dissection techniques while preserving these critical structures is still considered a non-victory task. so, some authors argue that surgical intervention may not be the most effective treatment option; instead, marsupialization is adequate.[4]

However, in addressing incomplete removal of pathological tissue, possible histopathological changes, high risk of recurrence, and extended healing period, conservative surgery is considered the gold standard.[5-7] Or combined treatment modality with the risk of developing a persistent postoperative fistula.[8, 9] Even expensive sophisticated endoscopic-assisted approaches failed to address these challenges.[10]

Sodium 2-mercaptoethanesulfonate (MESNA) is utilized in urology as a cytoprotective agent to prevent hemorrhagic cystitis. It is a thiol compound that is recognized for its ability to disrupt disulfide bonds in polypeptide chains, proving itself a valuable chemical dissector in several surgical specialties. Also, thanks to sulfhydryl groups, it is considered an antioxidant for preventing ischemia-reperfusion injury.[11-17]

Also, extensive research validated MESNA's role in cholesteatoma surgery, demonstrating its efficacy in facilitating dissection, preserving critical structures, minimizing recurrence, and safely fragmenting keratin layers.[12, 18, 19]

Despite decades of research, MESNA's application in oral and maxillofacial surgery, particularly for lesion dissection, remains unknown. Also, given MESNA's known antioxidant properties and the research that has emphasized the influence of oxidative stress on the pathogenesis of odontogenic cysts.[(17, 20)] its application for odontogenic cysts may offer a more efficient and less traumatic enucleation, potentially minimizing critical structure injury through disulfide bond breakage responsible for adhesion while simultaneously mitigating oxidative stress.

This study aimed to assess the safety and efficacy of the chemo-mechanical dissection technique utilizing MESNA compared to conventional mechanical dissection techniques in the surgical excision of large maxillary odontogenic cysts encroaching critical structures.

Materials and methods

Study design and patients

This was a double-blinded prospective randomized controlled trial study to evaluate the safety and effectiveness of chemo-mechanical dissection using sodium 2-mercaptoethanesulfonate (MESNA) compared to conventional mechanical dissection using saline in the surgical management of large maxillary odontogenic cyst encroaching critical structures. sixteen patients diagnosed with maxillary odontogenic cysts requiring enucleation were recruited from the Department of Oral and Maxillofacial Surgery at the Faculty of Dentistry, Tanta University, Egypt. We excluded patients from the study if they had

hypersensitivity to MESNA, hepatic or renal disease, or were pregnant.

The sample size was 12 which was calculated using the Epi-info software statistical package created by WHO CDC (Center for Disease Prevention and Control) in Atlanta, Georgia USA. Version 2002 considers the following criteria: Confidence level (95 %), Power of study (80 %), and Significance level (.05). An oversizing of the sample was done to compensate for the potential failure and increase the availability of the result, so the sample size was 16 instead of 12.

The same surgical team performing the surgical procedures was blinded to the type of solution (MESNA or saline) used for each patient. The solutions were prepared by a research assistant not involved in the surgeries and presented to the surgeon identically, labeled with a unique code.

Patient and lesion preoperative assessment

A preoperative MESNA sensitivity test was performed on all patients. A medical and dental history was obtained, including age and sex. Also, radiographic evaluation included panoramic radiography to assess the involvement of related teeth. Additionally, soft tissue window computed tomography (CT) scans were acquired to precisely measure the lesion's size using RadiAnt DICOM Viewer 2022.1.1 (RadiAnt DICOM Viewer, version 2022.1.1. Medixant, Poznan, Poland) and to assess its extension to critical structures including the maxillary sinus, nasopalatine bundle, and nasal and palatal mucosa. A preoperative incisional biopsy was done to establish a histopathological diagnosis. These baseline patient and lesion characteristics are summarized in Table 1.

Table 1: The baseline patient's and lesion's characteristics.

Characteristic	Group I (n=8)	Group II (n=8)	p-value
Gender			
Male, n (%)	6 (75%)	7 (87.5%)	0.522[a]
Female n (%)	2 (25%)	1 (12.5%)	
Age (mean ± SD), years	38.875 ± 12.922	42.375 ± 13.373	0.603[b]
Lesion size in maximum diameter (cm) measured in computed tomography (Mean ± SD)	3.450 ± 1.078	2.715 ± 0.832	0.149[b]
Lesion Extension to critical structure n (%)			
Sinus encroachment, n (%)	4 (50%)	4 (50%)	1.000[a]
Nasopalatine encroachment, n (%)	3 (37.50%)	4 (50%)	0.614[a]
Palatal mucosa encroachment, n (%)	6 (75%)	7 (87.50%)	0.522[a]
Nasal mucosa encroachment, n (%)	6 (75%)	6 (75%)	1.000[a]
Histopathological diagnosis n (%)			0.298[a]
Radicular cyst, n (%)	5 (62.5%)	6 (75%)	
Odontogenic keratocyte, n (%)	1 (12.5%)	2 (25%)	
Unicystic ameloblastoma n (%)	2 (25%)	0 (0%)	

p-value < 0.05. [a] Chi-square test. [b] independent t-test.

Randomization and intervention

The patients were randomly assigned to two groups using a random number generator (simple 1:1 randomization); in group I (study group), 8 patients in this group underwent surgical excision of the cystic lesion through the chemo-mechanical dissection technique using MESNA. The other 8 patients in group II (the control group), underwent surgical excision of the cystic lesion using conventional mechanical dissection techniques with saline instead of MESNA. Each patient was assigned a unique number for identification during randomization and throughout the study.

Outcomes

The primary outcomes, Intraoperative incidence of critical structures injury (maxillary sinus, nasopalatine bundle, palatal mucosa, and nasal mucosa) was recorded, and intraoperative blood loss was quantified by subtracting the volume of saline and the prepared solution used from the total aspirated fluid volume.

The secondary outcome, the time taken for a complete lesion dissection was

measured in minutes. Also, surgeons rated the ease of lesion dissection without cutting using a Likert scale (0–10), with 5 representing equivalence to current practice.

For short- and long-term follow-ups, the patients were followed up at specific intervals (3 days, 1 week, 3 weeks, and 6 months). Assessment of subjective sensibility using a visual analog scale-based questionnaire to assess postoperative sensory nerve recovery when the infraorbital skin or anterior third of the hard palate was touched with a pinprick when compared to the contralateral side. The patient provided subjective ratings of sensory experience using a visual analog scale (VAS) ranging from 0 to 10, where 0 represents a total loss of sensation and 10 indicates completely normal sensation, wound healing assessment using a standardized wound healing scoring system (3: good healing, 2: satisfactory healing, 1: bad healing) and bone density measurements using multi-slice computed at 6 months in Hounsfield Units. Finally, A blinded histopathological diagnosis of the excised lesion was compared with the preoperative diagnosis.

MESNA solutions preparation

20% MESNA (Uromitexan-400 mg/4 ml; Baxter Oncology GmbH, Halle, Germany) concentration was used through dilution with 0.9% saline and 0.01:0.03% methylene blue, provided that the maximum volume of the solution used per surgery is 40 ml and stored in sterile, airtight intravenous bag until utilization.

Instruments, Equipment Setup and Modifications

A standard dental implant motor system (I-Surge Implant Motor. Satelec Acteon Group. Available at: https://www.dentaltix.com) was modified for use in this study using its irrigation delivery system to direct flow from a mounted fluid bag, while the other end is connected to the blunt gorney's suction elevator for controlled solution installation regulated by the foot pedal control when needed and for mechanical dissection. As detailed in (Fig.1)

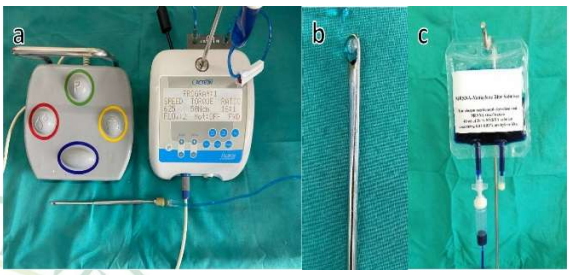
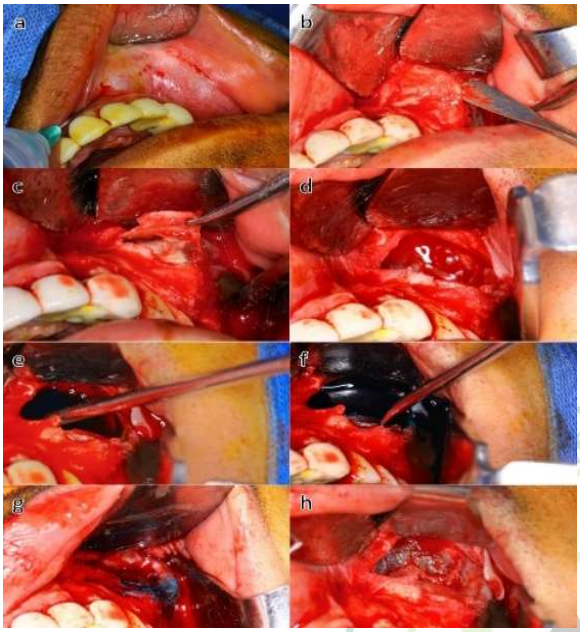


Fig.1: a, modified implant motor system used to control drug releases showing irrigation delivery tube is connected to the blunt gorney suction elevator while a foot pedal is used to control the solution's delivery.b, High magnitude particular of the tip of Gorney's suction elevator where it reversed from its typical suctioning and showed the hole for drug release. C, showing the air-tight intravenous bag containing the MESNA-Methylene blue solution, which is connected to the other end of the irrigation delivery tube. The image showcases the preparation of the solution before use, highlighting the importance of preserving the prepared solution before use during the process.

Technique

Under general anesthesia via endotracheal nasal intubation, pre-incision 5 ml of a 20% MESNA solution was infiltrated at the planned surgical site. After 5 minutes of incision, elevation of the mucoperiosteal flap exposing the lesion and identifying its capsule, installation of solution using a modified blunt gorney's suction elevator, controlled by a foot pedal, and waiting for 5 minutes. During this period, the parts where MESNA was applied were identified with quick ascertaining of targeted MESNA application to the area of interest and adjustment as needed. Subsequently, the area of surgical interest was flushed with normal saline before dissection. Repeated applications were employed as needed. The step-by-step surgical technique is visually illustrated in Figures 2 and 3.



In pat Fig. 2: a, A pre-incision 5 ml MESNA solution infiltration at the planned surgical site. b, Elevation of the mucoperiosteal flap after 5 minutes. c, the bone covering the cyst being removed exposing the underlying cystic lesion for further chemo-mechanical dissection. d, the identification of the cyst's capsule after overlying bone removal. e, capturing the moment of solution dispensation from the modified blunt Gorney's suction elevator to the targeted area. f, inadvertently escaping of MESNA solution into the oral cavity as evident by dye color, allowing prompt identification and suctioning. g, after suctioning excess solution, targeted application of MESNA to cystic wall confirmed by dye coloration. h, cystic lesion after flushing with normal saline.

In patients of Group II, before having carried out the usual incisions intended for the lesion, a pre-incision 5 ml saline solution was infiltrated using the identical type of syringe. Also, the same instrument and device were used, but with a saline solution mixed with the same concentration of dye, resulting in an identical color.

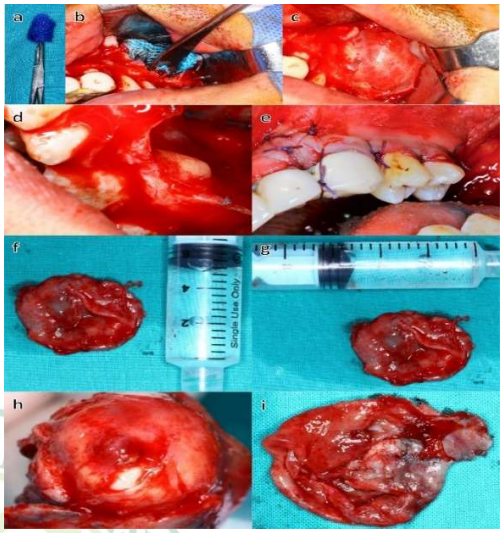


Fig.3: a, MESNA solution-soaked gauze pledget held in forceps for immediate use (accessory). B, MESNA solution-soaked pledget placement in the surgical cavity allowing sufficient contact time in the desired location (accessory). c, The surgical cavity following the meticulous enucleation of the cyst and curettage.d, Close-up view showing the clean smooth surface of protruding root apex.e, Immediate postoperative view showing surgical site after suturing. f-g, portray a meticulously performed surgical excision of the cystic lesion displaying a remarkable level of precision with an intact and smoothly separated outer surface. h, Notably, a seamlessly rounded indentation corresponding to the attachment site to the associated root apex underscores the chemical nature of the dissection technique

Statistical analysis

The data collected was subjected to statistical analysis using IBM SPSS version 17 software (SPSS Inc., Chicago, IL, USA). The analysis of categorical data involved the use of the "Chi-square" test, specifically for critical structural injury and wound healing scores. On the other hand, independent t-tests were employed to evaluate continuous variables such as intraoperative blood loss, lesion dissection time, and bone density. The Mann-Whitney U test was employed to evaluate the median scores for postoperative sensory nerve function status using VAS and the Likert scale for assessing the ease of lesion dissection.

Result

Demographic data

No statistically significant differences were detected in preoperative patients and lesion characteristics between both groups as shown in Table 1

Primary outcomes

Incidence of critical structures injury

As shown in Table 2, significantly fewer incidences of intraoperative critical structure injuries of the maxillary sinus and nasal mucosa were observed in group I compared to group II. P-values were (0.028 and 0.021) respectively.in contrast to injury to the nasopalatine bundle and palatal mucosa despite numerical difference but it didn't reach statistical significance. P-values were (0.270 and 0.391) respectively.

Intraoperative blood loss

The patients in Group 1 had a lower mean Intraoperative blood loss of 249.375 ± 44.436 (range 180-320 ml), compared to Group 2, mean 338.125 ± 51.957 (range 260-420 ml) p = 0.003 as shown in Figure 4 and Table 2

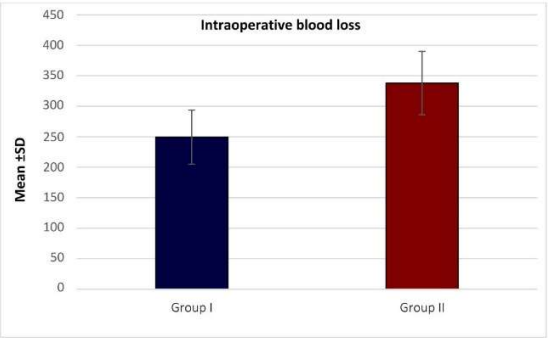


Fig. 4. Comparison of intraoperative blood loss measured in milliliters between both groups.

Secondary outcomes

Complete lesion enucleation was achieved in both groups, As regards lesion dissection time, it was significantly lower in group I, mean of 11.73 ± 3.69 (range 6-18 min) in contrast to group II, mean of 21.40 ± 6.94 (range 13-30 min), p = 0.004 As shown in (Table 2).

As shown in Table 2, ease of lesion dissection without cutting revealed statistically significant differences between both groups as a blinded Surgeon in Group I reported a higher median Likert score, median 9 (IQR 8.50-10.00 [0–10]), compared to the group II, median 5 (5.00-6.00 [0–10]), p = 0.001

As regards subjective sensibility for postoperative sensory nerve status assessment using the visual analogue scale, at the initial assessment 3 days, there was no statistically significant difference between both groups, in contrast to at 1-week and 3 weeks assessment points, in group I, the median score was higher also by the end of the third week in contrast to group II, P= 0.001. Finally at 6 months postoperatively, both groups showed no statistically significant difference. P= 0.317 (Table 2)

By comparing wound healing scores between both groups, no statistically significant difference in healing progression was observed at any of the assessed time points. also, Both Groups exhibited increased bone mineral density (measured in Hounsfield units) and the difference was not statistically significant. Furthermore, As regards post-enucleation histopathological diagnosis, both groups had total correspondence of the excised lesions with pre-surgical biopsy results with no discrepancies observed. (Table 2)

Table 2: Outcome Comparison between both groups

Outcome Measure	Group I (MESNA, n=8)	Group II (Saline, n=8)	p value
Intraoperative			
Critical Structure Injury N (%)			
Maxillary Sinus Tear	1 (25.00%)	4 (100.00%)	0.028 [a]
Nasopalatine bundle Tear	1 (33.33%)	3 (75.00%)	0.270[a]
Palatal Mucosa Injury	2 (33.33%)	4 (57.14%)	0.391[a]
Nasal Mucosa Injury	1 (16.67%)	5 (83.33%)	0.021[a]
Intraoperative Blood Loss (ml) Mean ± SD	249.375 ± 44.436	338.125 ± 51.957	0.003 [b]
Lesion Dissection Time in Minutes Mean ± SD	11.73 ± 3.69	21.40 ± 6.94	0.004 [b]
Ease of Lesion Dissection (Likert Scale, 0-10) Median (IQR)	9 (8.50-10.00)	5 (5.00-6.00)	0.001[c]
Postoperative			
Subjective sensibility for Sensory nerve function status (VAS Score) Median (IQR)			
3 Days	0 (0.00)	0 (0.00)	-
1 Week:	9.00 (8.50-9.00)	6.00 (5.00-6.00)	0.001 [c]
3 Weeks:	10.00 (9.00-10.00)	7.00 (6.00-7.00)	0.001 [c]
6 Months	10.00 (10.00-10.00)	10.00 (10.00-10.00)	0.317 [c]
Wound Healing Score N (%)			
3 Days			
Bad	0 (0.00%)	2 (25.00%)	0.131 [a]
Satisfactory	8 (100.00%)	6 (75.00%)	
Good	0 (0.00%)	0 (0.00%)	
1 Week			
Bad	0 (0.00%)	2 (25.00%)	0.131 [a]
Satisfactory	8 (100.00%)	6 (75.00%)	
Good	0 (0.00%)	0 (0.00%)	
3 Weeks			
Bad	0 (0.00)	2 (25.00%)	0.287 [a]
Satisfactory	5 (62.50%)	3 (37.50%)	
Good	3 (37.50%)	3 (37.50%)	
6 Months			
Bad	0 (0.00%)	2 (25.00%)	0.264 [a]
Satisfactory	4 (50.00%)	2 (25.00%)	
Good	4 (50.00%)	4 (50.00%)	
Bone Density (Hounsfield Units) Mean ± SD	931.88 ± 75.50	903.75 ± 136.73	0.618 [b]
Histopathological Correspondence N (%)	8 (100%)	8 (100%)	-

Abbreviations: VAS, visual analog scale, p-value < 0.05. [a] Chi-square test. [b] independent t-test. [c] Mann-Whitney U test.

Discussion

In light of the inherent complexities associated with conventional mechanical dissection techniques in the surgical management of large odontogenic cysts encroaching critical structure as well as the debates and controversies in the best management approach for these lesions.[1, 2] and despite MESNA's established efficacy and safety profile in other surgical fields.[11-14, 18, 21, 22] Its application in oral and maxillofacial surgery remains largely unexplored.

Based on these backgrounds, this study aimed to pave the way in oral and maxillofacial lesion dissection and contribute to the advancement of the MESNA application method during surgery.

We incorporated a rigorous approach to address the inherent characteristics nature of MESNA as a tissue dissecting agent for preserving it and maximizing its efficacy while maintaining the safety of the patients. In this study, like the study by Capart et al.[23] A dye was introduced into the MESNA solution. This decision stems from the transparent and odorless nature of MESNA, which facilitates a clear visualization of the application areas guiding the surgeons to the coverage extent ensuring precise application, and allowing for necessary adjustments. To align with the study's recommendation, this research employed a concentration range of 0.01% to 0.03% of methylene blue in conjunction with the 20% MESNA solution to balance between optimal visibility and the effectiveness of MESNA as a tissue-dissecting agent

Nevertheless, the quickly dissipating MESNA hypoosmotic water-like solution may limit the ability to perform lengthy surgeries in contrast to the study's reliance on a modified dissector connected to a syringe for the local manual release of the solution.[16] This research introduced an innovative approach employing the modified Gorney's suction elevator connected to an implant motor system and irrigation delivery system which combines chemical and mechanical assistance to ensure precise and controllable solution placement at the tissue cleavage plane, effectively saturating targeted areas

with MESNA especially when needed even in supine or inclined position where liquid must travel upwards, streamlining the process, reducing instrument transfers, and granting the surgeon greater control and freedom during dissection, By presenting this groundbreaking application method, this research redefines the conventional approach used in the mentioned study, making a significant contribution to the field of MESNA applications in surgical procedures.

MESNA is transparent and odorless, commonly used intravenously as an uro-protective drug to prevent hemorrhagic side-effects of antineoplastic agents such as ifosfamide and cyclophosphamide, and has the unique chemical effect of dissolving disulfide bonds, thus softening the connective tissue fibers between anatomic plains. For this reason, there is a growing utilization of MESNA as a chemical dissecting agent within otolaryngology practices, particularly for the eradication of cholesteatoma from the mastoid cavity.[11, 12, 17, 19]

This study revealed a significant reduction in the incidence of critical structure injuries in Group I through chemo-mechanical dissection using MESNA. This finding is consistent with a study on revision lumbar spine surgery by Denaro et al.[16] where the MESNA-treated group exhibited a noteworthy reduction in the occurrence of Dural tears highlighting the potential of MESNA as an effective chemical help for minimizing the risk of encroached critical structures' injuries during the dissection process, also, with Dobashi et al.[13] when no esophageal perforation occurred where chemically assisted endoscopic submucosal mechanical dissection using MESNA for resection of superficial esophageal squamous cell carcinomas was employed when performed by non-expert endoscopists.

The chemo-mechanical dissection technique using MESNA showed a considerable decrease in intraoperative blood loss in Group I compared to the control Group II, which is consistent with the findings of Vincenzo Denaro et al.[16] Specifically, the incidence of intraoperative bleeding requiring intervention from epidural veins was found to be significantly lower in the MESNA-treated group than in the saline group. We hypothesize that this effect is due to the ability of MESNA to break down adhesions, which facilitates the atraumatic separation of adjacent critical structures, along with decreasing intraoperative complications such as nasal mucosa bleeding or sinus tears beyond the limit of repair which opts for complete removal.

As regards postoperative sensory nerve recovery, the result of this study showed that chemo-mechanical dissection using MESNA in Group I led to significantly better and earlier sensory recovery compared to conventional mechanical We think that this observed finding is attributed to MESNA's chemical dissection properties, offering a gentle and less mechanically disruptive approach to dissection and manipulation of adjacent neurovascular bundle coupled with reduced time required for lesion dissection.

This study demonstrated pronounced reductions in the time of odontogenic cyst lesion dissection with MESNA in the chemo-mechanical dissection technique compared to the conventional mechanical dissection technique, aligning with the analogous study by Benassi et al.[21] This demonstrated a significantly shorter operation time in the MESNA group for the excision of endometriotic cysts, In contrast to the discrepant outcome that emerged in Dobashi et al.[14] such nuances may underscore the context-specific nature of MESNA benefits.

Our study highlighted the effectiveness of MESNA in easing lesion dissection and adherence management through blinded surgical evaluations, as there was a statistically significant difference in lesion dissection ease scores indicating a less

favorable perception of the conventional mechanical technique aligning with the study conducted by Vincenzo Denaro et al. [16] This observed outcome is hypothesized to emerge from MESNA's capacity to cleave disulfide bonds, which are implicated in forming adhesions.

This study demonstrated the safety of chemo-mechanical dissection using MESNA in several aspects. Firstly, wound healing progressed similarly in both groups, as no statistically significant differences were found at any of the assessed periods and no complications either during or after surgery linked to MESNA were observed, consistent with various studies. [11, 12, 14, 16] Secondly, postoperative bone healing did not differ significantly between both groups, which indicates that MESNA exerts no discernible effects that may retard the bone physiological healing supporting the potential application of MESNA as an adjunct agent in surgical interventions requiring bone repair aligning with de la Torre and Villamor study. [19]

Combining an erythritol-containing gel with xenografts represents a promising strategy for enhancing soft tissue healing in intra-bony defects.[24] Incorporating the MESNA agent warrants further investigation for its potential synergistic effects on bone regeneration.

Finally, the blinded comparison of pre- and post-intervention histopathological findings unveiled a blinded seamless correspondence aligning with the blinded analysis by Dobashi et al.[13] We aimed to guarantee precision and authenticity in reflecting the inherent nature of the lesion, validating the dependability of the chemo-mechanical dissection in ensuring diagnostic, safety, and surgical precision.

While no recurrences were observed in either group during follow-up, longer-term monitoring and large sample size are necessary to definitively evaluate the efficacy of chemo-mechanical dissection with MESNA on recurrence rates.

We acknowledge and thoroughly comprehend the constraints of this study. However, both groups of patients showed total resemblance, the assessed parameters aligned with the surgical outcomes, and each surgery was performed by an expert surgeon. Also, the results of our study provide an uncontested perspective on MESNA application in oral and maxillofacial surgery. For this reason, drawing comparisons between the findings of this study and previously documented same-field observations presents a substantive challenge due to the absence of any other prospective studies that have assessed the safety and efficacy of MESNA in dissecting oral and maxillofacial lesions.

MESNA will certainly start to play a crucial role in the oral and maxillofacial surgery field in the future. This study, while promising, merely scratched the surface of what MESNA could offer oral and maxillofacial surgery field.

Conclusion

The chemo-mechanical dissection technique represents a pioneering application of MESNA as a chemical dissecting agent in oral and maxillofacial surgery. This technique has been proven to be safe and effective in surgically treating maxillary odontogenic cysts that are encroaching on critical structures. By demonstrating significant reductions in critical structure injuries, reduced intraoperative blood loss, enhanced sensory nerve recovery, and improved surgical precision with efficient lesion dissection, all while maintaining the safety profile of the surgical procedure without compromising postoperative bone and soft tissue healing dynamics as well as histopathological validity.

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Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study was conducted as of September 2022 and the study protocol was approved by the clinical research ethics committee at the faculty of dentistry, Tanta University, Egypt (REC-FODTU) with approval number #R-OS-7-22-1. All patients signed their written informed consent to participate in the study.

Competing interest

The authors have no relevant financial or non-financial interests and declare no conflict of interest.

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