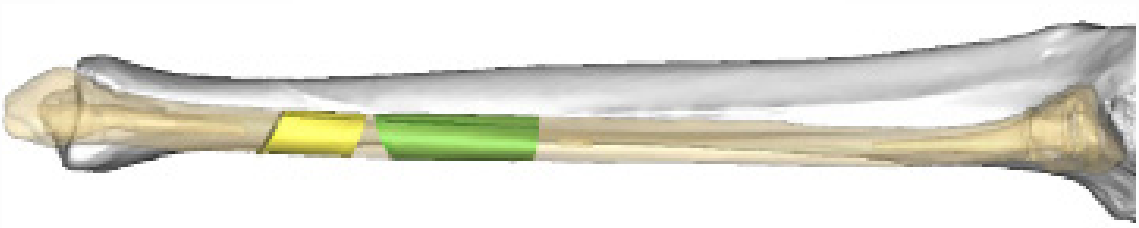
APRIL 28, 2023 • VOLUME 7 • ISSUE 4 ONLINE ISSN 2522-1965

DT Journal

4 2023

Journal of Diagnostics and Treatment of Oral and Maxillofacial Pathology



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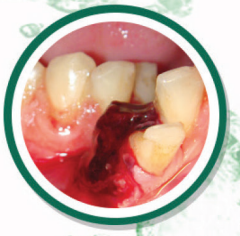
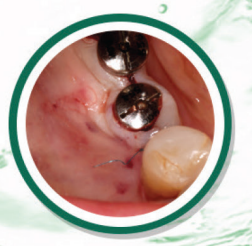
TANTUM VERDE®

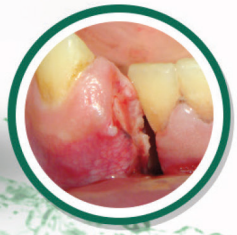
QUICK RELIEF FROM PAIN AND INFLAMMATION IN THE MOUTH AND THROAT[1]

AN INTEGRAL COMPONENT OF THE TREATMENT OF PAIN AND INFLAMMATION IN THE ORAL CAVITY IN 60 COUNTRIES WORLDWIDE![2]

- **JAWS FRACTURES[3]**
- **IMPLANTS PLACEMENT[4]**
- **WOUNDS OF ORAL CAVITY[5]**







Reg. № UA/3920/01/01

LOCAL ANESTHETIC AND ANTI-INFLAMMATORY EFFECT[1]

SUMMARY OF PRODUCT CHARACTERISTICS

NAME OF THE MEDICINAL PRODUCT. Tantum Verde 0.15% mouthwash. QUALITATIVE AND QUANTITATIVE COMPOSITION. Each 100 ml contains: active ingredient: benzydamine hydrochloride 0.15 g (equivalent to 0.134 g of benzydamine). **Therapeutic indications.** Treatment of symptoms such as irritation/inflammation including those associated with pain in the oropharyngeal cavity (e.g. gingivitis, stomatitis and pharyngitis), including those resulting from conservative or extractive dental therapy. **Posology and method of administration.** Pour 15 ml of Tantum Verde mouthwash into the measuring cup, 2-3 times per day, using it either at full concentration or diluted. If diluted, add 15 ml of water to the graduated cup. Do not exceed the recommended dosage. **Contraindications.** Hypersensitivity to benzydamine or to any of the excipient. **PHARMACOLOGICAL PROPERTIES. Pharmacodynamic properties.** Pharmacotherapeutic group: Stomatologic drugs: other agents for local oral treatment, ATC code: A01AD02. Clinical studies demonstrate that benzydamine is effective in relieving suffering from localised irritation of the mouth and pharynx. In addition, benzydamine possesses a moderate local anaesthetic effect. **Pharmacokinetic properties.** Absorption. Absorption through the oropharyngeal mucosa is demonstrated by the presence of measurable quantities of benzydamine in human plasma. These levels are insufficient to produce systemic effects. Distribution. When applied locally, benzydamine has been shown to accumulate in inflamed tissues where it reaches effective concentrations because of its capacity to penetrate the epithelial lining.

Information about medicines. Information for health care professionals for use in professional activities.

1. Інструкція для медичного застосування лікарського засобу Тантум Верде®, розчин для ротової порожнини, РП № UA/3920/01/01, затверджено Наказом Міністерства охорони здоров'я України № 636 від 01.10.2015.
2. http://www.angelinipharma.com/wps/wcm/connect/com/home/Angelini+Pharma+in+the+world/
3. Тимофеев А.А. и др. "Особенности гигиены полости рта для профилактики воспалительных осложнений при переломах нижней челюсти". Современная стоматология 2015;1(75):52–8.
4. 4,5. Tymofieiev O.O. et al"Prevention of inflammatory complications upon surgeries in maxillofacial region". J Diagn Treat Oral Maxillofac Pathol. 2017;1:105–12.

Clinical and CT images are courtesy of: Ievgen Fesenko (Department of Oral & Maxillofacial Surgery, PHEI "Kyiv Medical University", Kyiv, Ukraine), Oleg Mastakov ("SCIEDECE—Scientific Center of Dentistry & Ultrasound Surgery" Kyiv, Ukraine)

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Dileo FARMA

About the Journal: Aims and Scope

APRIL 2023 • VOLUME 7 • ISSUE 4
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Official Title

Journal of Diagnostics and Treatment of Oral and Maxillofacial Pathology

Standard Abbreviation: ISO 4

J. Diagn. Treat. Oral Maxillofac. Pathol.

Acronym

JDTOMP

International Standard Serial Number (ISSN)

Electronic ISSN 2522-1965

Aims & Scope

This is a monthly peer-reviewed oral and maxillofacial surgery journal focused on: microvascular and jaw reconstructive surgery, dental implants, salivary gland tumors/diseases, TMJ lesions, virtual surgical planning, implementation of ultrasonography into the practice of oral and maxillofacial surgeons.

Editorial Board (EB) Composition

- EB shows significant geographic diversity representing 30 opinion leaders from 13 countries: Brazil, Canada, Colombia, Greece, Hong Kong (SAR, China), India, Israel, Italy, Slovak Republic, Spain, Ukraine, United Arab Emirates, and United States.
- The majority of the EB Members have a discernible publication history in Scopus, Web of Science, and journals with a high impact factor.
- The publication records of all EB members are consistent with the stated scope and published content of the journal.
- The journal has a several full-time professional editors.
- Gender distribution of the editors: 10% women, 90% men, 0% non-binary/other, and 0% prefer not to disclose.

Frequency

12 issues a year (from January 2020)

Publication History

2017: 4 issues a year
2018: 4 issues a year
2019: 10 issues a year
From 2020: 12 issues a year

Publishing Model

Journal of Diagnostics and Treatment of Oral and Maxillofacial Pathology is a fully online-only open access and peer-reviewed publication.

Type of Peer Review

The journal employs "double blind" reviewing.

Article Publishing Charge (APC)

The APC in this journal is US $500 and US $250 (excluding taxes) depending on the article`s type. Details at website: dtjournal.org.

13 Types of Articles Currently Published by the Journal

Editorials/Guest Editorials/Post Scriptum Editorials, Images, Case Reports/Case Series, Original Articles, Review Articles, Discussions, Paper Scans (*synonyms*: Review of Articles, Literature Scan), Book Scans (*synonym*: Book Reviews), Letters to the Editor (*synonym*: Letters), and Viewpoints.

State Registration: Ministry of Justice of Ukraine

Registration: Jul 28, 2016 (Certificate: КВ № 22251-12151 Р)
Re-registration: May 21, 2019 (Certificate: КВ № 23999-13839 ПР)
Re-registration: Aug 10, 2021 (Certificate: КВ № 24951-14891 ПР)

Co-Founders

1. Shupyk National Healthcare University of Ukraine (formerly known as Shupyk National Medical Academy of Postgraduate Education).
2. Private Higher Educational Establishment "Kyiv Medical University."
3. OMF Publishing, Limited Liability Company.

Publisher

OMF Publishing, LLC is an academic publisher focused on medical and linguistic sciences.
Address: 13-A Simferopolska Street, office 121, Kyiv 02096, Ukraine.

Crossref Membership

OMF Publishing, LLC is a member of Publishers International Linking Association, Inc. which doing business as a Crossref. OMF Publishing`s active membership: From February 2017 to present.

Official Journal of the Association

Ukrainian Association for Maxillofacial and Oral Surgeons

Ukrainian Association for Maxillofacial and Oral Surgeons (UAMOS)

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Editorial Board

APRIL 2023 • VOLUME 7 • ISSUE 4
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TANTUM VERDE®

INFORMATION LEAFLET
for the medicinal product

Composition:
active substance: **benzydamine hydrochloride**;
100 mL of solution contain benzydamine hydrochloride 0.15 g;
excipients: ethanol 96%, glycerol, methyl parahydroxybenzoate (E 218), flavor (menthol), saccharin, sodium hydrocarbonate, Polysorbate 20, Quinoline Yellow (E 104), Patent Blue V (E 131), purified water.

Dosage form. Oromucosal solution.
Basic physical and chemical properties: a clear green liquid with a typical mint flavor.

Pharmacotherapeutic group. Dental preparations. Other agents for local oral treatment.
ATC code: A01A D02.

Pharmacological properties.
Pharmacodynamics.
Benzydamine is a non-steroidal anti-inflammatory drug (NSAID) with analgesic and antiexudative properties.

Clinical studies have shown that benzydamine is effective in the relief of symptoms accompanying localized irritation conditions of the oral cavity and pharynx. Moreover, benzydamine has anti-inflammatory and local analgesic properties, and also exerts a local anesthetic effect on the oral mucosa.

Pharmacokinetics.
Absorption through the oral and pharyngeal mucosa has been proven by the presence of measurable quantities of benzydamine in human plasma. However, they are insufficient to produce any systemic pharmacological effect. The excretion occurs mainly in urine, mostly as inactive metabolites or conjugated compounds.

When applied locally, benzydamine has been shown to cumulate in inflamed tissues in an effective concentration due to its ability to permeate through the mucous membrane.

Clinical particulars.
Indications.
Symptomatic treatment of oropharyngeal irritation and inflammation; to relieve pain caused by gingivitis, stomatitis, pharyngitis; in dentistry after tooth extraction or as a preventive measure.
Contraindications.
Hypersensitivity to the active substance or to any other ingredients of the product.

Interaction with other medicinal products and other types of interaction.
No drug interaction studies have been performed.

Warnings and precautions.
If sensitivity develops with long-term use, the treatment should be discontinued and a doctor should be consulted to get appropriate treatment.

In some patients, buccal/pharyngeal ulceration may be caused by severe pathological processes. Therefore, the patients, whose symptoms worsen or do not improve within 3 days or who appear feverish or develop other symptoms, should seek advice of a physician or a dentist, as appropriate.

Benzydamine is not recommended for use in patients hypersensitive to acetylsalicylic acid or other non-steroidal anti-inflammatory drugs (NSAIDs).

The product can trigger bronchospasm in patients suffering from or with a history of asthma. Such patients should be warned of this.

For athletes: the use of medicinal products containing ethyl alcohol might result in positive antidoping tests considering the limits established by some sports federations.

Use during pregnancy or breast-feeding
No adequate data are currently available on the use of benzydamine in pregnant and breastfeeding women. Excretion of the product into breast milk has not been studied. The findings of animal studies are insufficient to make any conclusions about the effects of this product during pregnancy and lactation.

The potential risk for humans is unknown.

TANTUM VERDE should not be used during pregnancy or breast-feeding.

Effects on reaction time when driving or using machines
When used in recommended doses, the product does not produce any effect on the ability to drive and operate machinery.

Method of administration and doses.
Pour 15 mL of TANTUM VERDE solution from the bottle into the measuring cup and gargle with undiluted or diluted product (15 mL of the measured solution can be diluted with 15 mL of water). Gargle 2 or 3 times daily. Do not exceed the recommended dose.

Children.
The product should not be used in children under 12 years due to a possibility of ingestion of the solution when gargling.

Overdosage.
No overdose has been reported with benzydamine when used locally. However, it is known that benzydamine, when ingested in high doses (hundreds times higher than those possible with this dosage form), especially in children, can cause agitation, convulsions, tremor, nausea, increased sweating, ataxia, and vomiting. Such acute overdose requires immediate gastric lavage, treatment of fluid/salt imbalance, symptomatic treatment, and adequate hydration.

Adverse reactions.
Within each frequency group, the undesirable effects are presented in order of their decreasing seriousness.

Adverse reactions are classified according to their frequency: very common (≥ 1/10); common (≥ 1/100 to <1/10); uncommon (≥ 1/1,000 to <1/100); rare (≥ 1/10,000 to <1/1,000); very rare (<1/10,000); frequency unknown (cannot be estimated from the available data).

Gastrointestinal disorders: rare – burning mouth, dry mouth; *unknown* – oral hypesthesia, nausea, vomiting, tongue edema and discoloration, dysgeusia.

Immune system disorders: rare – hypersensitivity reaction, *unknown* - anaphylactic reaction.

Respiratory, thoracic and mediastinal disorders: very rare –laryngospasm; *unknown* – bronchospasm.

Skin and subcutaneous tissue disorders: uncommon – photosensitivity; *very rare* – angioedema; *unknown* – rash, pruritus, urticaria.

Nervous system disorders: unknown – dizziness, headache.

TANTUM VERDE contains methyl parahydroxybenzoate, which can cause allergic reactions (including delayed-type reactions).

Shelf life. 4 years.

Storage conditions.
Do not store above 25°C. Keep out of reach of children.

Packaging.
120 mL of solution in a bottle with a measuring cup; 1 bottle per cardboard box.

Dispensing category.
Over-the-counter medicinal product.

Manufacturer.
Aziende Chimiche Riunite Angelini Francesco A.C.R.A.F. S.p.A., Italy.

Location of the manufacturer and its business address. Via Vecchia del Pinocchio, 22 – 60100 Ancona (AN), Italy.

Date of the last revision of the text.
September 26, 2018.

Information leaflet is

APPROVED by
Order of the

Ministry of Health of Ukraine
No. 636 dated 01.10.2015

Registration Certificate
No. UA/3920/01/01

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APRIL 2023 • VOLUME 7 • ISSUE 4
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FIGURE. Evangelos G. Kilipiris, MD, DMD from the National Institute of Children's Diseases and Faculty of Medicine at Comenius University, Bratislava, Slovak Republic. A kind support of Dr. Kilipiris during the 5 years at the position of Director, Journal Development Department helped our journal to move forward and to evolve. An honorary plaque was presented to him on behalf of the Chief Editor with words "To a Founding Director, Author of Multiple Articles and Reviews, Great Thanks and Appreciation." Photo was taken on November 23, 2021.

Content

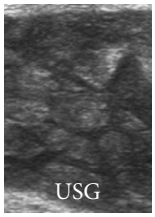
of the Volume 7 • Issue 4 • April 2023

COURTESY

Journal`s cover image (virtual surgical planning for a segmental mandibular reconstruction with fibula transplant) is courtesy of Rui P. Fernandes, MD, DMD, FACS, FRCS.

Image was taken from the article: Fernandes RP, Quimby A, Salman S. Comprehensive reconstruction of mandibular defects with free fibula flaps and endosseous implants. *J Diagn Treat Oral Maxillofac Pathol* **2017**;1(1):6–10.

https://doi.org/10.23999/j.dtomp.2017.1.1



CASE

Ultrasonographic Assessment of Masseter Muscle Region and Minimally Invasive Treatment of Post-Extraction Osteomyelitis

Oleksii O. Tymofieiev,[a] Ievgen I. Fesenko,[b,*] Olha S. Cherniak[c], & Olena O. Serha[d]

ABSTRACT

Background: Mandibular osteomyelitis is commonly associated with invasive surgery and sequestrectomy. Here, we report a unique case in which it was possible to choose minimally invasive treatment during the exacerbation of osteomyelitis at the stage of sequestrectomy owing to the use of and correct assessment with ultrasonography (USG). This report aimed to present wide possibilities of USG for accurate diagnosis and minimally invasive management of chronic osteomyelitis.

Case Presentation: A 50-year-old woman presented with significant swelling in the left masseteric region, trismus, and severe pain in the area of a previously extracted lower third molar. The imaging protocol included panoramic radiography, USG, and cone-beam computed tomography. Using USG, it was possible to identify the intermediate stage of abscess/phlegmon formation in the masseteric area, which would require an extraoral incision to drain the purulent focus.

Conclusion: USG allows oral and maxillofacial surgeons to obtain a precise understanding of the condition of the tissues (e.g., bone surface, masseter muscle, subcutaneous tissue) and pathologic changes (e.g., periosteal reaction, bony defects) due to purulent processes in the area of the lateral mandibular ramus surface and surrounding soft tissues. The presence of purulent material and its motion on sonopalpation can be clearly identified using USG. Therefore, it is possible to plan for a less invasive surgical strategy.

Keywords: Third molar, alveolar osteitis, osteomyelitis, cone-beam computed tomography, ultrasonography

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Please cite this article as: Tymofieiev OO, Fesenko II, Cherniak OS, Serha OO. Ultrasonographic assessment of masseter muscle region and minimally invasive treatment of post-extraction osteomyelitis. J Diagn Treat Oral Maxillofac Pathol 2023;7(4):33–8.

The abbreviation 'USG' at the upper right icon means that article contains ultrasonographic images.

Paper received 14 February 2023
Accepted 03 April 2023
Available online 28 April 2023

https://doi.org/10.23999/j.dtomp.2023.4.1

INTRODUCTION

Mandibular third molar removal is a common procedure in the outpatient clinic; however, complications such as alveolar osteitis postoperatively occur in 30% cases.[1] In severe cases, osteitis can progress into chronic purulent osteomyelitis[2,3], which makes treatment difficult and long, requiring periodic imaging and drug therapy. The management of mandibular osteomyelitis often involves sequestrectomy, an invasive surgery[3]. Radiography or computed tomography is typically performed for detailed and appropriate treatment planning in such cases. Considering the growing role and advantages of ultrasonography (USG) in the diagnosis of oral and maxillofacial pathology[4,5], especially in infection cases[6–8], the application of USG seems to be preferable for the precise localization of pus in osteomyelitis cases.

Here, we report a unique case of a 50-year-old woman with chronic osteomyelitis following an uncomplicated lower third molar removal wherein it was possible to choose minimally invasive treatment during the exacerbation of osteomyelitis at the stage of sequestrectomy owing to the use of and correct assessment with USG. Therefore, this report aimed to present the wide possibilities of USG in accurately identifying the purulent process, enabling minimally invasive management of chronic osteomyelitis.

CASE REPORT

A 50-year-old Caucasian female was referred to our hospital in June 2015 with significant swelling in the left masseteric region (Fig 1), trismus, and severe pain in the tooth socket of a previously extracted lower left third molar. According to the patient, the tooth was removed by a dentist 3 weeks earlier at another clinic because of a partially destroyed crown and periodic night pain. Clinically, painful swelling was noted in the left parotid-masseter region on palpation (Fig 1B). The mouth opening was also painful and limited to 1.0 cm. Intraoral examination revealed purulent discharge from the socket of tooth 3.8 (i.e., the lower left third molar). No comorbidities were reported by patient.

For soft tissue examination, USG was performed using a 12-3 MHz linear transducer (model HD11 XE, Koninklijke Philips N.V., Eindhoven, Netherlands). Gray-scale USG showed the spread of purulent exudate between bundles of fibers of the left masseter muscle, which created a honeycomb patten on USG (Fig 1) (also known as cobblestoned appearance). Sonopalpation (i.e., gentle pressure with the transducer) on gray-scale USG revealed slight motion of the purulent material located between the fibers of the masseter muscle. Ultrasound signs of periosteal reaction and bone defects at the lateral surface of the ramus were noted. Periosteal reaction at the lateral surface of the left ramus was visualized on USG as a thick hyperechoic line compared with a thin hyperechoic band (lateral surface of the right ramus) on the healthy side. On both sides, the artifact of acoustic shadowing was noted distal to the mandibular surface due to the reflective properties of the cortical bone tissue. The diagnostic protocol included USG of both the masseter muscles and rami, the right healthy side, and the left affected side. Color and power Doppler USG revealed hypervascularity in the left masseter muscle. Panoramic radiography (Fig 2A) showed margins of the socket of the removed tooth 3.8, a tortuous area of bone resorption posteriorly, and no radiological signs of the non-removed parts of the tooth. An exacerbation of chronic suppurative post-extraction osteomyelitis of the left ramus mandible was diagnosed.

First, local anesthesia, 2.5 mL of 4% Ultracaine® D-S forte (Aventis Pharma Deutschland GmbH, Frankfurt, Germany), using an anesthetic solution in ampules (2.0 mL per ampule) was performed. Then, using a gauze swab, a smear was obtained from the wall of the alveolus for bacteriological examination. The alveolus was washed with 30.0 mL of diluted betadine solution (Betadine® 10%, Egis Pharmaceuticals PLC, Körmend, Hungary) using a pre-broken and bent needle on a 10.0-mL syringe. On irrigation, the tip of the needle was moved to the posterior area of resorption, rotated, and advanced through the area of the cortical bone defect. A significant amount of purulent exudate was removed. The patient was advised to visit our clinic daily for the next 7 days until the purulent discharge, swelling, and other complaints resolved. The following medications were prescribed: cafaxone (Ceftriaxonum) 1.0 g (Lupin Ltd., Mumbai, India) intramuscularly twice daily for 7 days, rinsing the oral cavity with a chlorhexidine solution three times daily for 7 days, Nurofen® non-steroidal anti-inflammatory drug (Reckitt Benckiser Healthcare International Ltd, Slough, England) twice daily for 5 days, and Linex® (Lek Pharmaceuticals d.d., Sandoz, Novartis division, Ljubljana, Slovenia) two capsules three times a day for 7 days.

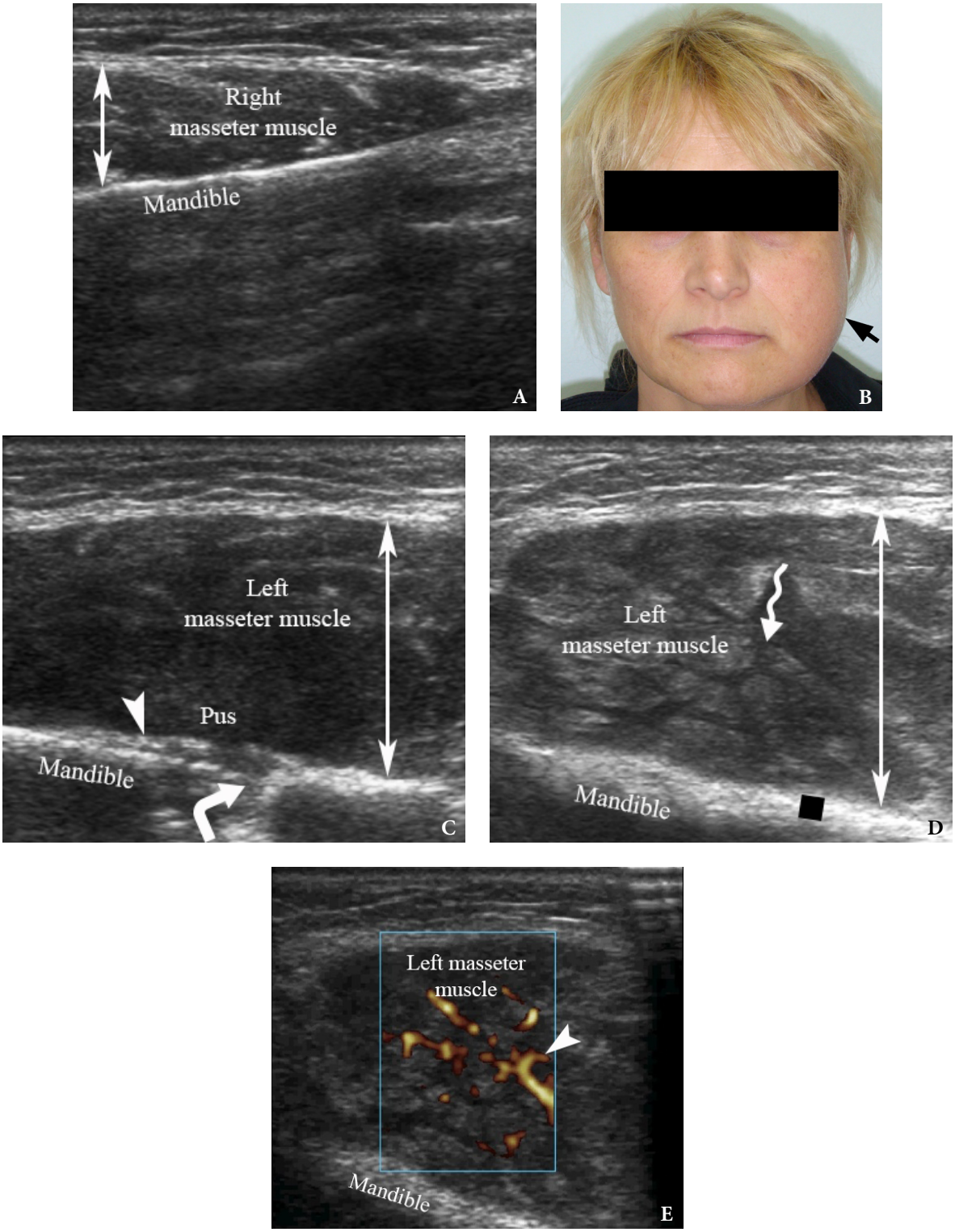

FIGURE 1. (**A**) Gray-scale USG of the right masseter muscle and ramus (healthy side). Lateral surface of the ramus visualized as a thin hyperechoic line. (**B**) Clinical photograph shows significant swelling (*arrow*) in the left masseter region. *Up and down arrows* show thickness of the right (healthy) and left (involved in purulent inflammation) masseter muscles. (**C**) *Curved arrow* indicates cortical bone defect at the lateral surface of left ramus and *arrowhead* – on periosteal reaction. (**D**) The spread of purulent exudate (*waved arrow*, anechoic content) between the bundles of fibers of the left masseter muscle creates a honeycomb USG pattern on gray-scale sonogram. *Quadrate* labels hyperechoic area (periosteal reaction). (**E**) Power Doppler USG shows increased masseter muscle vascularity (*arrowhead*). The soft tissues' "depth" at the presented cropped sonograms is 3.0 cm.

A comparison of panoramic radiography and cone-beam computed tomography (CBCT) (Planmeca ProMax 3D Max, Planmeca, Finland) performed on days 28 and 51 after tooth removal is presented in Figure 2. CBCT showed a bilobed cortical bone defect measuring 0.52 × 0.9 cm at the lateral surface of the mandible ramus, thin periosteal reaction along the lateral and medial aspects of the mandible, and clearly formed sequestrum. The density of the periosteal reaction at the lateral surface of the left mandibular ramus varied from 102 to 317 Hounsfield units and was 0.14 cm thick.

Eight weeks after the onset of symptoms, the patient underwent a pre-sequestrectomy evaluation of the local tissues, analysis of the complaints, and planning for the surgery. Swelling or trismus was not observed. The patient reported no pain during the previous week. Intraoral examination revealed improved mouth opening and a healthy color of the soft tissues around the socket of tooth 3.8. The anterior part of the sequestrum was visible in the epithelialized tooth socket. The mandibular sequestrum was removed using a Folkman spoon without premedication and/or anesthesia. The patient did not experience pain or discomfort. Histological examination confirmed the diagnosis. Using USG, it was possible to identify the intermediate stage of abscess/phlegmon formation in the masseteric area, which would require an extraoral incision to drain the purulent focus.

DISCUSSION

Management of third molar pathology requires both accurate imaging[9] and appropriate surgical techniques to reduce the likelihood of developing complications and their manifestations[10–15]. Imaging analysis of the jawbone and condition of neighboring soft tissues requires correct understanding of the anatomy and the pathological effects on anatomical structures. Extensive research (2022) based on dissected formaldehyde-fixed human cadaver heads, computed tomography of fresh cadavers, magnetic resonance data, and histological sections has shown all the three masseter muscle layers—superficial, deep, and coronoid[16]. Recently published sonographic studies have highlighted the possibilities of non-radiation imaging for pathologies located in masseter muscle[7,17]. USG proved its usefulness for identifying masseteric area abscesses, phlegmon diagnostics, and drainage of the abscesses[7,16,17].

To clarify the diagnostic possibilities of USG[18,19] and CBCT[20,21] for the analysis of the bone structure, presence of periosteal reaction, and condition of masseter muscle in a case of mandibular osteomyelitis, we compared the gray-scale (i.e., B-mode) sonogram and axial CBCT scan (Fig 3).

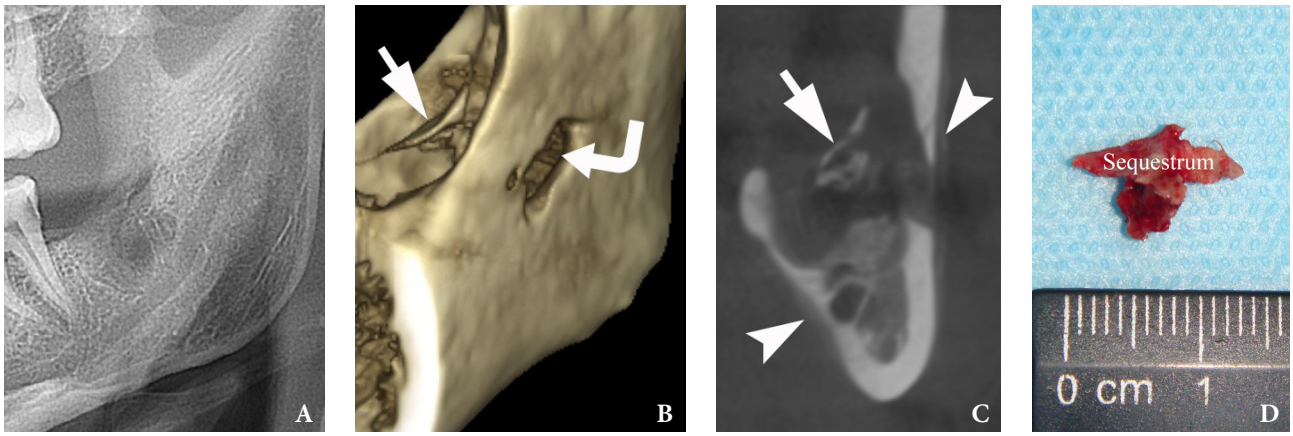

FIGURE 2. (**A**) Panoramic radiography at the initial hospital visit (day 28 after tooth extraction). (**B**) Three-dimensional and (**C**) coronal CBCT scans on day 51 after extraction. *Arrow*, sequestrum; *curved arrow*, cortical bone defect; *arrowheads*, thin periosteal reaction. (**D**) Removed mandibular sequestrum on day 62 after tooth extraction.

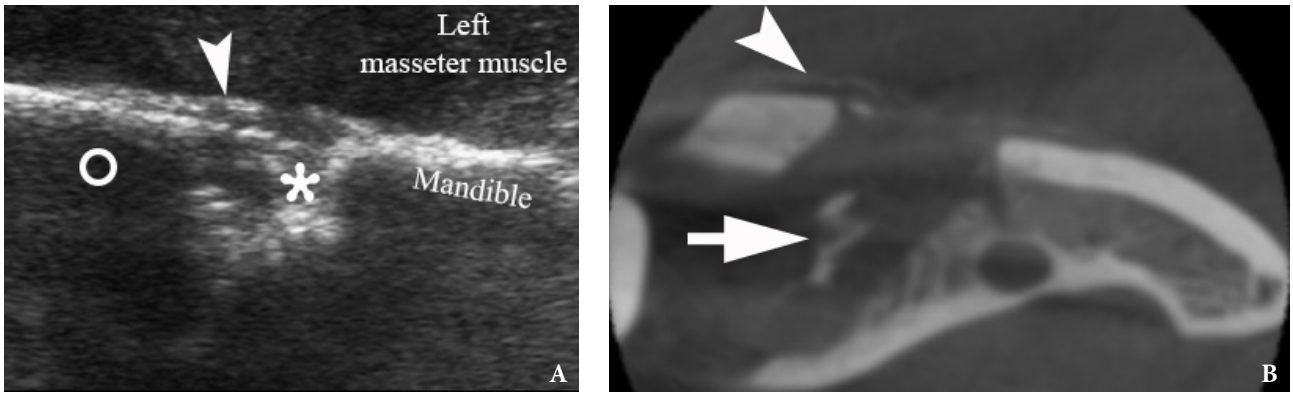

FIGURE 3. Left side. Comparing periosteal reaction on (**A**) gray-scale sonogram and (**B**) axial CBCT scan at the same location but on different terms of the course of osteomyelitis (USG – on day 28 after tooth extraction and CBCT – on day 51 after tooth extraction). Periosteal reaction (*arrowhead*) is visualized as thickening and elevation of the periosteum from the underlying lateral cortical bone of the ramus. Intraosseous defect in ramus is indicated by *asterisk*. A *circle* labels the artifact of acoustic shadowing posteriorly to the lateral surface of the mandibular ramus. Bone defect of the cortical bone is a place via which the purulent content spread through the periosteum and between fibers of the masseter muscle. *Arrow* labels sequestrum.

The results suggest that USG depicts a periosteal reaction earlier than plain radiography, indicating underlying bone disorders[20]. Moreover, USG, a non-radiation imaging technique, can be performed multiple times at all stages of osteomyelitis. Although a relatively similar ultrasound picture (Fig 1C) of the condition was published in another study[22], in our case, we conducted a more in-depth examination of the sonographic features of the tissues (in particular, the newly formed periosteal reaction). Comparing our case with other published cases of purulent processes in the area of the masseter muscle and their ultrasound descriptions[7,18,19,22,23], it is worth noting that the described cases demonstrate different ultrasound pattern with limited accumulation of purulent material. The ultrasound images showing the spread of pus between the fibers of the masseter muscle and the minimally invasive treatment presented in this article are unique among other scientific studies.

USG is highly recommended for oral and maxillofacial surgeons as a first-line imaging technique for the detection and assessment of purulent processes in the masseter muscle region. Thus, the sonographic assessment of the masseter muscle and other tissues involved in the purulent process allows for a correct diagnosis and, in some cases, avoidance of extraoral incisions and more invasive treatment procedures. USG, including sonopalpation, being a dynamic imaging technique, in contrast to static CBCT imaging, provides more benefit to the treating team in diagnostics.

CONCLUSIONS

In summary, diagnostic ultrasound allows oral and maxillofacial surgeons to obtain a precise understanding of the condition of the tissues (e.g., bone surface, masseter muscle, subcutaneous tissue) and pathologic changes (e.g., periosteal reaction, bony defects) due to purulent processes in the area of the lateral mandibular ramus surface and surrounding soft tissues. The presence of purulent material and its motion on sonopalpation can be clearly identified using USG. Such precise diagnosis makes it possible to opt for a less invasive surgical approach, such as in the current case of post-extraction osteomyelitis of the mandible.

AUTHORS CONTRIBUTION STATEMENT

OOT and IIF drafted the manuscript. IIF participated in patient management. All authors participated in the data collection and analysis. IIF and OSC contributed to figure preparation. All authors have contributed to the manuscript and approved the submitted version.

TRANSPARENCY DECLARATION

This work was unfunded. The authors have no conflicts of interest to disclose.

REFERENCES (23)

1. Hatab N, Yahya J, Alqulaihi S. Management of alveolar osteitis in dental practice: a literature review. *J Diagn Treat Oral Maxillofac Pathol* **2017**;1(3–4):147–55. https://doi.org/10.23999/j.dtomp.2017.34.7
2. Schoen R, Suarez-Cunqueiro MM, Metzger MC, Schmelzeisen R. Osteomyelitis of the mandible following third molar surgery: a regrettable consequence in a healthy patient. *Quintessence Int* **2009**; 40(5):351–4.
3. Humber CC, Albilia JB, Rittenberg B. Chronic osteomyelitis following an uncomplicated dental extraction. *J Can Dent Assoc* **2011**;77:b98.
4. Demidov VH, Cherniak OS, Snisarevskyi PP, et al. Schwannoma of the tongue: ultrasonography. *J Diagn Treat Oral Maxillofac Pathol* **2022**;6(11):138–47. https://doi.org/10.23999/j.dtomp.2022.11.2
5. Savchuk LA, Nozhenko OA. Foreign body retrograde migration to the intraglandular duct of the submandibular gland with a developing of foreign body-induced sialolithiasis: analysis of ultrasonography, surgery, and literature published during last 124 years. *J Diagn Treat Oral Maxillofac Pathol* **2020**;4(3):53–9. https://doi.org/10.23999/j.dtomp.2020.3.2
6. Tymofieiev OO, Ushko NO, Fesenko II, et al. Suppurative mastoid lymphadenitis mimicking mastoiditis: a case report. *J Korean Assoc Oral Maxillofac Surg* **2021**;47(5):398–402. https://doi.org/10.5125/jkaoms.2021.47.5.398
7. Cherniak OS, Ripolovska OV, Nozhenko OA, Fesenko II. Accuracy of ultrasound in diagnostics of odontogenic infection in layers of temporal and parotid masseter region. *J Diagn Treat Oral Maxillofac Pathol* **2019**;3(9):214–29. https://doi.org/10.23999/j.dtomp.2019.9.2
8. Borodavko DS, Abramenko AV, Borodavko SP, et al. Analysis of a first unilateral and then bilateral internal jugular vein thrombosis in a heroin user. *J Diagn Treat Oral Maxillofac Pathol* **2019**;3(10):234–55. https://doi.org/10.23999/j.dtomp.2019.10.2
9. Babkina TM, Shekera OG, Storozhchuk YO, et al. Gigantic dentigerous cysts associated with the ectopic/impacted upper third molars: computed tomography analysis of nasolacrimal duct and osteomeatal complex obstructions and review of literature. *J Diagn Treat Oral Maxillofac Pathol* **2020**;4(5):79–94. https://doi.org/10.23999/j.dtomp.2020.5.1
10. Ciantar M, Adlam DM. Treatment with infliximab: implications in oral surgery? A case report. *Br J Oral Maxillofac Surg* **2007**;45(6):507–10. https://doi.org/10.1016/j.bjoms.2006.06.004
11. Silva TCG, Maranhão Filho AWA, Alencar MGM, et al. Mandibular fracture after third molar removal: a case report. *Gen Dent* **2019**;67(4):e7–e10.
12. Kvolik Pavić A, Zubčić V. Osteomyelitis of the jaw in COVID-19 patients: a rare condition with a high risk for severe complications. *Front Surg* **2022**;9:867088. https://doi.org/10.3389/fsurg.2022.867088
13. Tymofieiev OO. Removal of the teeth [Ukrainian]. In: Tymofieiev OO, editor. Maxillofacial surgery. Kyiv: Medicine VSV; **2011**. p. 105–43.
14. Susarla SM, Blaeser BF, Magalnick D. Third molar surgery and associated complications. *Oral Maxillofac Surg Clin North Am* **2003**;15(2):177–86. https://doi.org/10.1016/S1042-3699(02)00102-4
15. Christidis N, Al-Moraissi EA. Editorial: orofacial pain of muscular origin-from pathophysiology to treatment. *Front Oral Health* **2022**;2:825490. https://doi.org/10.3389/froh.2021.825490
16. Mezey SE, Müller-Gerbl M, Toranelli M, Türp JC. The human masseter muscle revisited: first description of its coronoid part. *Ann Anat* **2022**;240:151879. https://doi.org/10.1016/j.aanat.2021.151879
17. Qin F, Zhang X, Zhang J, et al. Masseter muscle metastasis of renal cell carcinoma: a case report and literature review. *Front Oncol* **2022**;12:830195. https://doi.org/10.3389/fonc.2022.830195
18. Al-Belasy FA. Ultrasound-guided drainage of submasseteric space abscesses. *J Oral Maxillofac Surg* **2005**;63(1):36–41. https://doi.org/10.1016/j.joms.2004.05.218
19. Gudi SS, Sarvadnya J, Hallur N, Sikkerimath BC. Ultrasound guided drainage of submasseteric space abscesses. *Ann Maxillofac Surg* **2013**;3(1):31–4. https://doi.org/10.4103/2231-0746.110074
20. Moraux A, Gitto S, Bianchi S. Ultrasound features of the normal and pathologic periosteum. *J Ultrasound Med* **2019**;38(3):775–84. https://doi.org/10.1002/jum.14762
21. Ida M, Tetsumura A, Kurabayashi T, Sasaki T. Periosteal new bone formation in the jaws. A computed tomographic study. *Dentomaxillofac Radiol* **1997**;26(3):169–76. https://doi.org/10.1038/sj.dmfr.4600234
22. Mallorie CN, Jones SD, Drage NA, Shepherd J. The reliability of high resolution ultrasound in the identification of pus collections in head and neck swellings. *Int J Oral Maxillofac Surg* **2012**;41(2):252–5. https://doi.org/10.1016/j.ijom.2011.10.012
23. Muthyala S, Krishna KV, Kishan TV, et al. Masseteric cysticercosis with abscess formation: a diagnostic dilemma. *Med J Armed Forces India* **2015**;71(Suppl 1):S148–S151. https://doi.org/10.1016/j.mjafi.2013.09.008

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