The Role of Ultrasonography in The Diagnosis of Oral and Maxillofacial Disease

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Abstract

Objective: Ultrasonography, as a diagnostic tool, constitutes a non-invasive, cost-effective, readily-available and repeatable imaging technique. Ultrasonography has been used as a means of diagnosing various medical conditions for many years. However, in the field of maxillofacial surgery it represents a relatively new aid in the diagnosis of various diseases affecting the oral and maxillofacial regions. These include: infection, soft-tissue related diseases and vascular anomalies which can be detected using Doppler ultrasonography. This article presents four cases, in which ultrasonography was employed to confirm diagnoses and act as a guide to treatment. **Methods:** Four cases of soft tissue swelling and enlargement were diagnosed with the aid of ultrasonography, namely: a submasseteric abscess, a nasolabial cyst, a dermoid cyst and a left buccal space abscess caused by a foreign body (i.e. a fish bone). **Result**: In the case of a submasseteric abscess, ultrasonography was used in confirming the diagnosis and therapy, while determining the maximal point of the abscess. In the cases of both cysts, ultrasonography highlighted well-defined cystic lesions with internal echo showing fluid accumulation, while in the buccal space abscess, an ultrasonogram confirmed the exact location of the fish bone. **Conclusion**: Ultrasonography is a quick, widely-available, relatively inexpensive, painless procedure which can be repeated as often as necessary without risk to the patient. Thus, ultrasonography is a valuable diagnostic aid to the oral and maxillofacial surgeon in achieving early and accurate diagnosis.

***Keywords**: Abscess, Cyst, Maxillofacial abnormalities, Ultrasonography.*

Introduction

Ultrasonography (USG), as a diagnostic tool, is a non-invasive, cost-effective, readily-available and repeatable imaging technique. Although used as a diagnostic tool in the treatment of various medical conditions since 1940, in the field of maxillofacial surgery it represents a relatively new diagnostic aid.[1,2] Medical ultrasound devices use ultrasound waves of 2-20 MHz. USG technique is based on the variable acoustic impedance produced at tissue interphases as sound waves reflected at various organ surfaces to produce images.[3] The reflected sound beam produces diagnostic anatomic information relating to the size, shape and internal structure of normal tissues and also pathologic processes. The time interval between the ultrasound wave's being emitted from the transducer and the registering of the reflected wave produces a measurement of the distance between the skin and the organ and also the location of the pathology. The resulting information from the reflected waves is digitalized and thousands of such measurements generate an ultrasound cross-sectional image which is then recorded on the monitor in order to enable its interpretation. Ultrasonography images comprise: hypoechoic (low reflection of sound waves) that appear black, isoechoic (intermediate reflection of sound waves) that appear heterogeneously grey, and hyperechoic (high reflection of sound waves) that appear white. Bone tissue, empty space and water are generally hypoechoic, while bone margin is hyperechoic and muscular tissue is isoechoic. [4]

USG is used as an aid in the diagnosis of various diseases in the oral and maxillofacial regions such as infection, soft-tissue related diseases such as those afflicting the salivary gland, lymphnode reactions, cysts and neoplasm. Vascular anomalies can also be detected using Doppler ultrasonography.[1,3,5] Recently, USG became more popular in dentomaxillofacial region because of increasing radiation dose concerns and

economic limitations.[6]

The purpose of this clinical study is to present four cases of soft tissue swelling where USG was used as an aid in confirming diagnosis and supporting surgical treatment.

Material and Methods

Clinical study was conducted through retrospective medical record study of four cases of soft tissue swelling and enlargement in patients of the Oral and Maxillofacial Department, Universitas Airlangga Dental Hospital where diagnosis was confirmed using USG (GE), as well as an aid in surgical theraphy.

Case 1

A 24-year old female presented swelling of the left cheek and unability to open her mouth after having her lower left first molar extracted ten days prior to admission. Clinical examination findings included: patient looking unwell, presence of a diffuse, hard and painful swelling in the left masseter region and limited ability to open the mouth (i,e, less than 1 cm wide). No fluctuation was encountered, while intraoral examination confirmed no signs of post-extraction infection of the socket. Clinical diagnosis of a submasseteric space abscess was conducted and surgical drainage was planned. A USG examination completed for confirmation revealed a hypoechoic lesion in the submasseteric region with fluid echo intensity at a maximal point of 1.57 cm. The presence of a submasseteric abscess was confirmed by means of USG examination (figure 1).

Figure 1. Ultrasonogram showed hypoechoic lesion (x sign) in submasseteric space abscess.

An intraoral incision with Swann Morton surgical blade no.11 was performed to evacuate pus from the submasseteric space abscess, 1 cc pus mixed with blood being drained. On evaluation, pain was found to have diminished, mouth opening had widened and the swelling had gradually subsided.

Case 2

A 59-year old male attended with painless enlargement of the left nasal base which had been developing during the ten years prior to admission. Clinical examination revealed soft tissue enlargement with defined borders in the left nasolabial region resulting in a narrowing of the left nasolabial sulcus when compared to the right side, measuring ± 2 cm in diameter with a soft consistency and painless on palpation. Intraoral examination revealed a flattened left upper anterior vestibulum due to enlargement with defined borders, measuring ± 2 cm in diameter, with a soft consistency and painless on palpation. Periapical radiograph examination was within normal limits (Figure 2A). Diagnosis of a nasolabial cyst was made and confirmed by means of USG which showed a thin walled cystic lesion with defined border and internal echo, measuring 2,49 x 1,87 x 2,39 cm in the left nasolabial fold (Figure 2B).

Extirpation of the cyst was performed through an intra oral approach, healing was effective and no recurrence was found upon evaluation.

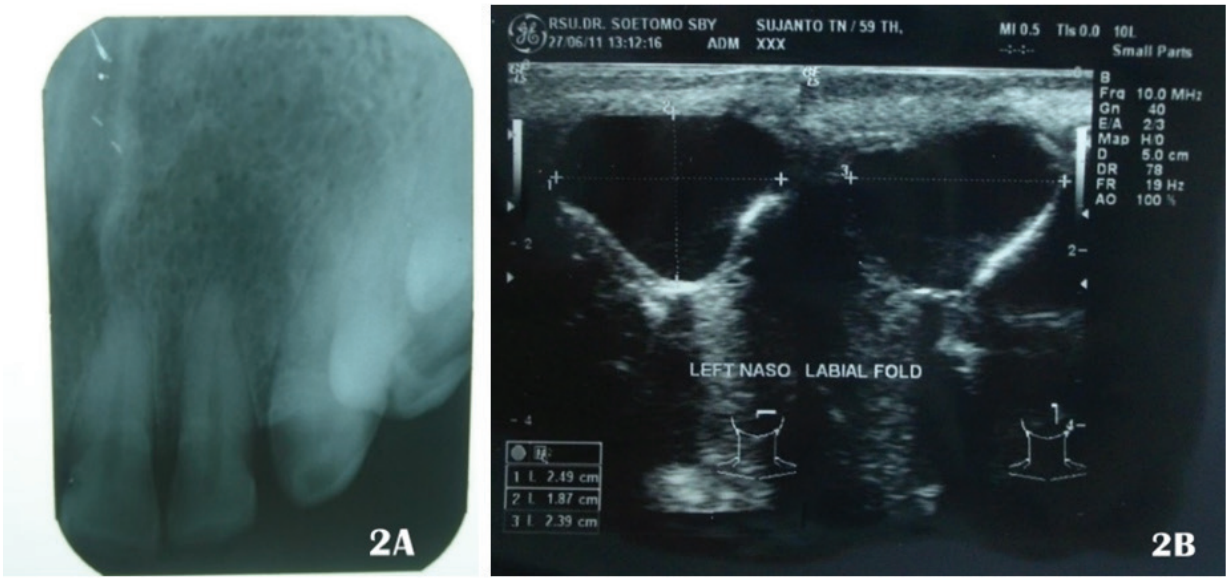

Figure 2. Periapical radiograph showed normal appearance in nasolabial cyst (2A). Ultrsonogram showed cystic lesion in the left nasolabial fold (2B).

Case 3

A 25-year old female had complained for the previous 12 years of a recurrent neck swelling that forced her tongue upwards and backwards, thereby impairing both her breathing and ability to swallow. She also complained of pain and fever, but was generally in good condition. The submental swelling was erythematous, well-defined, measured 4 cm in diameter and extended sublingually, pushing the tongue upwards and backwards. The consistency was firm and tender on palpation. Submandibular node enlargement was evident.

Clinical diagnosis of the infected dermoid cyst was conducted and, after aspiration made from the submental region for decompression revealed an extremely viscous, yellowish fluid, the patient was sent for USG examination. The USG revealed a well-defined heterogeneous echoic lesion, measuring 3.34 cm

in diameter, with mixed content and debris. There was also post-aspiration defect with adjacent fluid collection and no intralesion vascularization was found. The submandibular glands were enlarged and diagnosis of an infected dermoid cyst was confirmed (figure 3).

The treatment consisted of extirpation of the cyst through an extra oral approach under general anesthesia, healing was effective and no recurrence was found upon evaluation.

Figure 3. Ultrasonogram of Dermoid cyst showed a well defined heterogenous echoic lesion measuring 3,34 cm in diameter, with mixed content and debris. There was also post aspiration defect with adjacent fluid collection, and no intralesion vascularization found.

Case 4

A 68 year old male presented with swelling on his left buccal region that had been present with intermittent pain for one week prior to admission,. The patient had suffered a fish bone puncture to the left buccal region upon eating three months previously. Clinical examination confirmed well-defined erythematous swelling in the left buccal region measuring 2 cm in diameter, with firm consistency and little pain on palpation. Well-defined intraoral swelling in left buccal mucosa measuring 2 cm in diameter, with a soft consistency and tender on palpation. An initial, provisional diagnosis was one of a left buccal space abscess caused by a foreign body (fish bone). This was subsequently confirmed by USG which revealed a foreign body (fish bone) in the left buccal region measuring 7 mm and 8.4 mm in depth from the skin surface. There was also adjacent fluid collection around the fish bone, edematous surrounding tissue and increased vascularization (figure 4).

Surgical drainage and exploration of the fish bone using an intraoral approach was performed. Upon

exploration, a 7 mm long fish bone was found and evacuated. The healing process was successful and no recurrence found.

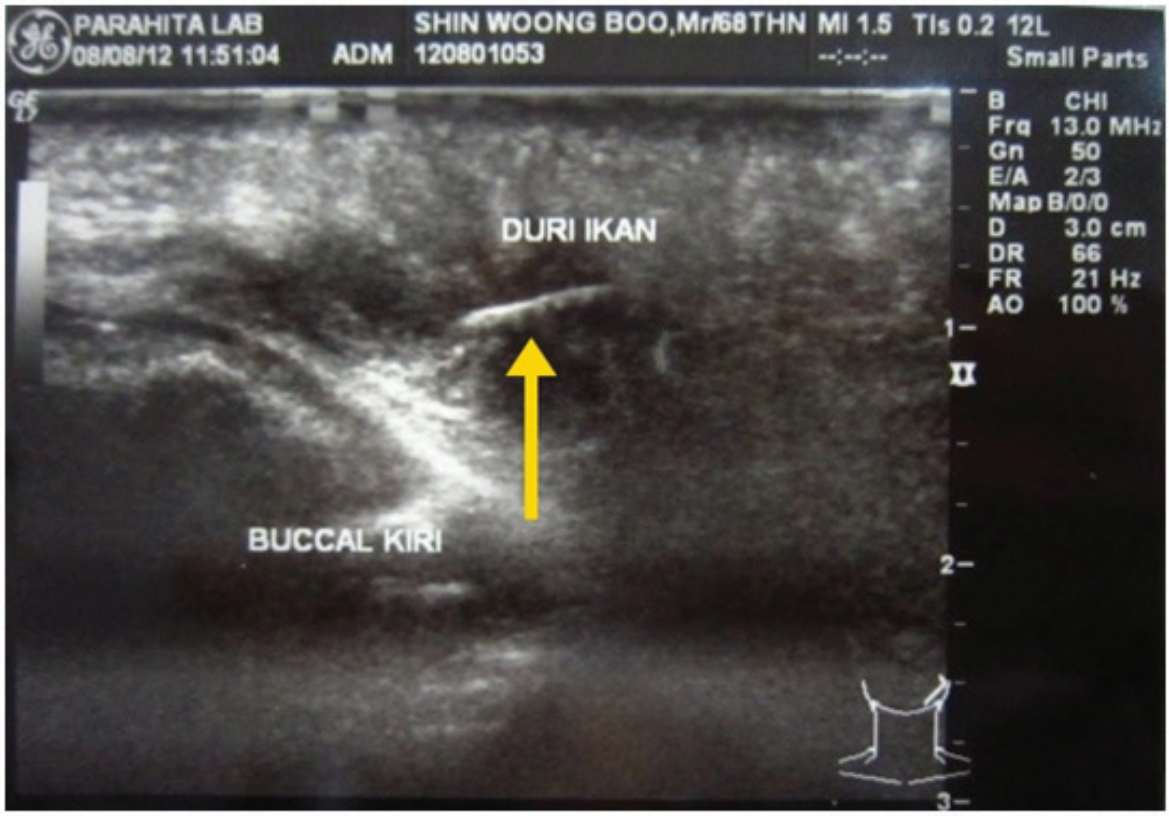

Figure 4. Ultrasonogram showed foreign body measuring 7 mm and 8,4 mm in depth from skin surface in the left buccal region (yellow arrow). There was also adjacent fluid collection arround the fish bone, oedematous sorrunding tissue, and increased vascularization in buccal space abscess caused by foreign body.

Result

All cases presented showed that USG 100% accuracy in diagnosis of soft tissue enlargement in oral and maxillofacial region, as well as guiding surgical drainage and approach.

Discussion

USG has been traditionally employed in the assessment of soft tissues in the abdomen and pelvis. Its role in oral and maxillofacial surgery is less widely recognized. Recently, a considerable body of literature and research reports about the reliable use of USG in diagnostic processes relating to oral and maxillofacial lesions. Research into the accuracy, sensitivity, specificity and predictive value of ultrasound as a means of diagnosis of cervico-facial soft tissue swelling conducted by Akinbami, et al. (2006) confirmed the reliability of ultrasonography in the diagnosis of pleomorphic adenoma as being 80% and 100% for adenocarcinoma and hemangioma. It was also 100% in the majority of cyst and salivary gland swellings. Ultrasonography was also 100% specific in the diagnosis of monomorphic adenoma and hemangioma.[7] Research conducted by Chandak et al., (2011) to evaluate USG in the diagnosis of head and neck swelling, showed that this form of diagnosis provided a sensitivity and accuracy rate of 98,5% compared to that of clinical diagnosis at 85,7%.[8]

All of the four cases reported in this paper showed congruence between clinical, ultrasonographic and histopathological diagnosis. This is consistent with the findings in the research reports referred to above.

In aiding therapy such as abscess drainage, ultrasonography can delineate the location and extent of abscess formation. USG is capable of measuring the distance from skin to oral mucosa, denoted a third dimension of the swelling and quantification of pus through its anechoic pattern and inflammatory zone.[9] Ultrasonography can also be used intraoperatively to aid in the aspiration, incision and drainage of pus.[10] As in the case of submasseteric abscesses and buccal space abscesses discussed in this report, the distance of the maximal point of the abscess, the location and distant of fish bone from the skin can be detected using ultrasonography.

Conclusion

Ultrasonography is a quick, widely available, relatively inexpensive, painless procedure which can be repeated as often as necessary without risk to the patient. Thus, ultrasonography is a valuable diagnostic aid to the oral and maxillofacial surgeons for early and accurate diagnosis, as well as in surgical treatment of oral and maxillofacial soft tissue enlargement.

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Conflict of Interest: There are no conflict of interest.

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