Efficacy of Ultrasonography in the Diagnosis of Inflammatory Swellings of Odontogenic Origin

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ABSTRACT

Objective: The purpose of this study was to evaluate the efficacy of ultrasound in the diagnosis of inflammatory swellings of odontogenic origin.

Study design: The study group consisted of 25 patients with inflammatory swellings of odontogenic origin. Only patients with unilateral swellings were considered for inclusion in the pathologic study group and normal contralateral side was taken as control.

Results: Clinically, four cases were diagnosed as cellulitis and 21 cases as abscesses. Under ultrasonography (USG) diagnosis, six cases were diagnosed as edema and two cases as cellulitis and 15 cases as preabscess and two cases as abscesses, considering the intra operative diagnosis as the gold standard technique. The ultrasonography technique presented sensitivity of 92%.

Conclusion: USG can differentiate facial edema, facial cellulitis, and dentoalveolar abscess. USG can also evaluate the extension of these swellings. It is prudent to subject patients with inflammatory swellings of the maxillofacial region to USG in order to determine the appropriate treatment plan.

Keywords: Ultrasonography, Imaging, Facial edema, Facial cellulitis, Dentoalveolar abscess, Echoes.

INTRODUCTION

Various imaging modalities play a virtual role for the diagnosis of inflammatory swellings of head and neck. Revolutionization in the field of diagnostic radiology with the introduction of techniques, such as ultrasonography (USG), computerized tomography (CT) and magnetic resonance imaging (MRI) has reduced the therapeutic dilemma. Though, CT and MRI are effective in demonstrating inflammatory conditions, the choice of technique usually depend on the anatomic area involved. Despite the advantages, both the techniques being relatively expensive and utilization of ionizing radiation by CT scanning hampers their usage in routine practice. Advantages like utilization of harmless nonionizing radiation, wide availability, easy-to-use, inexpensive and nonproduction of artifacts due to metallic restorations makes USG to score over the other imaging modalities. Repeated exposure to the patients for establishing an accurate diagnosis, without causing any harmful effects, makes USG a good option for formulating the treatment plan. Accurate demonstration of presence, stage and extent of inflammatory swelling is possible with USG, which influences the adequacy of treatment. USG plays an inevitable role in identifying orofacial swelling, the etiology of which can be attributed to different reasons, which include inflammation, diseases of salivary glands and lymph node reactions, etc. A clear depiction of any fluid collection or abscess in the superficial facial spaces is now possible with high resolution diagnostic ultrasound.

Demarcation between a soft tissue abscess from edema and cellulitis is important because each condition may require a different treatment. Edema and cellulitis respond to anti-inflammatory and antibiotics respectively, whereas an abscess may also require the consideration of drainage along with antibiotics. Diagnosis is traditionally based upon the appearance of the lesion, with the criterion standard being demonstration of pus by needle aspiration or surgical drainage. Abscesses often starts as cellulitis and these two conditions frequently coexist, which poses a diagnostic dilemma, leading to contraindication and unnecessary invasive procedures.

In this study, ultrasonography is used to investigate inflammatory swellings of odontogenic origin and to differentiate edema, cellulitis and abscess of the maxillofacial region. Its impact upon the management is also evaluated.

MATERIALS AND METHODS

The subjects were selected based on the following criteria: Patients of all age groups and both sexes were included within the study. Only the patient suffering from unilateral inflammatory swellings in the maxillofacial region of odontogenic origin was included within the study. Patients with other noninflammatory swellings like soft tissue or bony cysts, tumors and developmental anomalies were excluded from the study. Contralateral side of the patient with pathologies and variations most likely to show ultrasonographic changes were excluded from the study.

Ultrasound echogenicities were described in comparison with adjacent tissues as follows: Hyperechoic (brighter), isoechoic (equal), hypoechoic (darker), anechoic (no internal...
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Edematous changes: The echogenicities of the tissues were isoechoic, similar to the normal or uninfected side but with an increase in the fluid contents (Fig. 1).

Cellulitis: The echogenicities of the tissues were higher (hyperechoic) than normal because of massive inflammatory infiltration to the infected region (Fig. 2).

Preabscess stage: The echogenicities of the tissues were mixed (hypoechoic and hyperechoic) at the end of cellulitis stage and the beginning of abscess formation stage (Fig. 3).

Abscess stage: The echogenicities of the tissues were absent (anechoic) because of the abscess cavity, which can be solitary or multiple well-defined foci of pus (Fig. 4).

All USG examinations were performed using a 5 to 10 MHz linear array transducer, applied over the skin covering the suspected area in transverse and longitudinal sections to determine the presence or absence of fluid collection and its anatomic location. Pertaining to the USG diagnosis, patients diagnosed as edema and cellulitis were given appropriate anti-inflammatory and antibiotic therapy respectively, and for the patients diagnosed as suffering from an abscess, pus was aspirated and patients were referred to Department of Oral and Maxillofacial Surgery for incision and drainage, after which they were prescribed antibiotics. All the patients were recalled after 5 days, and the condition of the patients were evaluated.

RESULTS
The study consisted of a total number of 25 patients with inflammatory swellings of odontogenic origin. The condition of the subjects was diagnosed clinically and ultrasonographically. The age of 25 patients who participated in the study ranged from 14 to 70 years and there were 14 males and 11 females in the study. Under
clinical diagnosis, four cases were diagnosed as cellulitis and 21 cases as abscesses. Under USG diagnosis, 6 cases were diagnosed as edema and two cases as cellulitis and 15 cases as preabscess and two cases as abscesses (Table 1). Aspiration of pus was positive in 15 out of 17 patients; however, in two cases aspiration was negative. Considering the intra-operative diagnosis as the gold standard technique, the diagnosis with USG technique presented with a sensitivity of 92%.

DISCUSSION

Odontogenic infections, being one of the major sources of fascial space infections in the head and neck region, their evaluation and management of patients can be difficult due to the dilemma of whether there is, in fact, an abscess requiring surgical intervention or a cellulitis that can be managed satisfactorily with only supportive care.7

The use of USG for diagnosing swelling due to intraoral odontogenic infections and infections of the spaces of the maxillofacial area are well known. It was also found that USG was also useful in detecting the stages of the swelling viz., edematous changes, cellulitis, preabscess and complete abscess formation.8

The present study aids in confirming the diagnosis of edema, cellulitis and abscess. This is important because each condition requires a different treatment. Edema responds to anti-inflammatory and cellulitis responds to systemic antibiotics; an abscess must be treated carefully as it warrants surgical drainage.

A study was performed in 1987 by Ralf Siegert9 in which; USG seemed to show a slightly higher (82%) sensitivity than the clinical diagnosis (69%). When looking at the diagnosis of inflammatory swellings USG seemed to be clearly superior to the clinical diagnosis. Chandak R et al (2011)10 stated that clinical diagnosis had a sensitivity and specificity of 85.7% whereas sonographic diagnosis had a sensitivity of 97.1% and specificity of 100%. Srinivas K et al 200911 stated that the sensitivity of clinical criteria over ultrasonographic diagnosis was 96% with a specificity of 100%.

In our study, the sensitivity of ultrasonographic diagnosis was 92% with a specificity of 100%. Based on our study, USG can be considered to be a valuable addition in diagnosis of inflammatory swellings of odontogenic origin. It can also demonstrate the stages of infections, thus influencing the therapeutic options of antibiotic and/or anti-inflammatory medications and surgical drainage. Further studies based upon large samples with space infection in the maxillofacial region along with usage of color Doppler and high-frequency transducer needs to be undertaken, as they can alter and specify the treatment approach for providing better patient care.

CONCLUSION

Ultrasound can be used as a first line diagnostic tool for the management of fascial space infections. It could be considered to be an effective method in detecting and staging spread of odontogenic infections of the fascial spaces. This study has shown that the sensitivity of ultrasonographic diagnosis was 92% with a specificity of 100% in the evaluation of inflammatory swellings of head and neck region due to odontogenic infections.

USG can differentiate facial edema, facial cellulitis, and dentoalveolar abscess. USG can also evaluate the extension of these swellings. It is prudent to subject the patients with inflammatory swellings of the maxillofacial region to ultrasonography in order to determine the appropriate treatment plan to prevent the inadvertent use of antibiotics.

REFERENCES


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