Ultrasonographic Evaluation of Inflammatory Changes in the Masseter Muscle

Ajit Damera, Sanjeev Onkar, Y Pavan Kumar, Rajesh Takur, P Suresh Kumar

INTRODUCTION

For many years, ultrasonography has played a major role as a diagnostic tool in various medical fields. Only recently, it has been used in the field of dentistry to evaluate inflammatory changes in the masseter muscle, etc. but still has not found its place as routine diagnostic aid.1

Masseter is a quadrilateral muscle and has three layers: The superficial, middle and deep.2 Potential spaces exist between the masseter muscles, which are infected most frequently by infections spreading from third molars and other molar teeth, the hallmark of which is trismus.3

Acute odontogenic infections may result in inflammatory changes which may be localized to form an abscess or spread deeply into the contiguous facial spaces, such as submandibular, pterygomandibular, etc. and lead to space infections.1 Severe complications can result, if the infection is not recognized and treated promptly and properly.4 Imaging of soft tissue infections has traditionally been a challenging and difficult undertaking. With the advent of cross-sectional imaging, diagnosis of soft tissue infections has improved dramatically. Ultrasound, computed tomography (CT) and magnetic resonance imaging (MRI) have greatly improved the ability to evaluate infectious conditions of the soft tissues.5 Ultrasound is noninvasive and inexpensive procedure that can be applied repeatedly and easily.6 Although there are many reports regarding the use of ultrasonography to diagnose an abscess in head and neck region, but there are no detailed reports of describing inflammation affecting the muscles of mastication. Ultrasonography demonstrates the internal muscle structures more clearly than CT.6

Hence, present study was undertaken to evaluate the efficacy of ultrasonography in diagnosing the inflammatory changes in masseter muscle in patients who were diagnosed of having facial cellulitis or abscess clinically and to find correlation of clinical findings with that of ultrasound.

MATERIALS AND METHODS

Samples of 20 adult patients having unilateral cellulitis or abscess in masseter region (Fig. 1) were included in the study with the approval from the college ethical committee and consent of each patient. Patients with noninflammatory enlargement of masseter muscle were excluded from the study. The diagnosis of cellulitis or abscess was made as per the criteria given by Laskin,7 and then the patient was subjected to ultrasound examination (Medison SA 9000 ultrasonographic machine) for evaluating thickness of masseter muscle on affected and the normal contralateral side of patient.

ABSTRACT

Objectives: To evaluate the efficacy of ultrasonography in diagnosing inflammatory changes of masseter muscle in patients having facial cellulitis or abscess clinically.

Materials and methods: A total of 20 patients diagnosed clinically as having unilateral cellulitis or abscess of massecet region were selected and subjected to ultrasonography (Medison SA 9900 ultrasonographic machine) for evaluating thickness of masseter muscle on affected and the normal contralateral side of patient.

Results: The mean thickness of masseter muscle on affected side was 1.5295, whereas on unaffected side was 1.1745, which clearly shows an increase in thickness of muscle on affected side.

Conclusion: Trismus, resultant of soft tissue infections requires different treatment modalities according to the etiology. Thus, a potent diagnostic tool which can minimize the dilemma regarding the treatment selection is warranted. These findings highlight the significance of ultrasonography as important diagnostic tool to rule out the involvement of masseter muscle in inflammatory swelling of facial region.

Keywords: Abscess, Cellulitis, Masseter muscle, Ultrasound.

576
The presence of internal hyperechoic bands that correspond to internal fascia was assessed on both sides; these procedures were repeated for all patients for study group.

The maximum thickness of masseter muscle was calculated by measuring it from bottom of subcutaneous tissue to the buccal cortical plate of mandible on pathological side and compared it with the similar scans obtained from the unaffected side. Then real-time images of ultrasound were interpreted by the sonologist (Fig. 2). The values obtained were subjected to statistical analysis using t-test and Chi-square test.

**RESULTS**

Out of 20 patients examined, 19 patients were diagnosed clinically as cellulitis and 1 patient had abscess in the massetric region. Of the 20 patients examined, the cause of infection in 13 patients was due to pericoronal infection and periapical infection in seven patients (Table 1). The mean thickness of the masseter was found to be more on affected side (1.52 cm) than compared to the normal (1.17), this difference in thickness was found to be stastically significant (p = 0.0025).

Table 1 shows observed frequencies of a total of 20 patients of which 19 were diagnosed, as cellulitis and one abscess case.

<table>
<thead>
<tr>
<th></th>
<th>Cellulitis</th>
<th>Abscess</th>
<th>Normal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical</td>
<td>19</td>
<td>1</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>11</td>
<td>2</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>3</td>
<td>7</td>
<td>40</td>
</tr>
</tbody>
</table>

Whereas on ultrasound, 11 cases were cellulitis, two are abscess and seven were normal.

The presence, partial absence and complete absence of hyperechoic bands were evaluated. All 20 patients showed hyperechoic bands which correspond to the internal fascia on the normal side, whereas on the affected side, 11 patients showed partial absence of the bands, seven showed presence of hyperechoic bands and two showed complete absence of bands with hypoechoic areas. Partial absence of hyperechoic bands indicate that there is massetric inflammation and complete absence of hyperechoic bands with hypoechoic areas shows that there is a massetric abscess. Analysis of data showed statistical significance with p-value of (<6.575 14 E-05) which indicated that in massetric inflammation there is partial absence of hyperechoic bands. This study was statistically significant with p-value of 1.2454E-10 indicating that ultrasound is more superior in evaluating inflammatory changes in masseter muscle (Table 2).

Table 2 shows expected frequencies of 13.5 for cellulitis in clinical and ultrasound and 5.5 for abscess and normal value of 1 for clinical and ultrasound and p-value is obtained by Chi-square test of 1.2454E-10, which is less than α-value, which is 0.05 and constant. As p-value is less than α, we take an alternate hypothesis into account, according to it ultrasound is superior to clinical diagnosis.

<table>
<thead>
<tr>
<th></th>
<th>Cellulitis</th>
<th>Abscess</th>
<th>Normal</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical</td>
<td>13.5</td>
<td>5.5</td>
<td>1</td>
<td>1.2454E-10</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>13.5</td>
<td>5.5</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**DISCUSSION**

The diagnosis of cellulitis in orofacial region is a clinical one that requires urgent attention as fulminating course may occur resulting in severe tissue destruction or life-threatening bacteremia. Evaluation of these patients is often difficult for oral physician who had to deal with the dilemma of whether there is infact an abscess requiring surgical intervention or a cellulitis that can be managed with only antibiotic supportive care. The finding of fluctuance which is diagnostic of abscess is often difficult especially in spaces, such as the submassetric region, where the purulent material is deep within the soft tissue and muscle. There are potential spaces in masseter muscle between middle and deep layers where intermediate fibers present can easily be separated from bone by accumulation of pus at this site. These are frequently infected from spreading of infections from third molar and molar teeth, the hallmark of which is trismus.
In the present study, out of 20 patients examined 19 patients were diagnosed clinically as cellulitis and one patient had abscess in the masseteric region because of well-defined border and fluctuation. The cause of infection in 13 patients was due to pericoronal infection and periapical infection in other seven patients. The mean thickness of the masseter was found to be more on affected side (1.52 cm) as compared to the normal (1.17), this difference in thickness was found to be statistically significant (p = 0.0025) which can be attributed to the inflammatory changes that take place in muscle.

Ultrasonographic reading is expressed as echoes which describe reflected sound (ultrasonic energy 1-20 MHz), in radiographs, the image is produced by transmitting radiation and ultrasound reflected portion of the beam known as ‘real time imaging’. The presence of the partial absence and complete absence of hyperechoic bands were evaluated. All the 20 patients showed hyperechoic bands which correspond to the internal fascia on the normal side, whereas on the affected side, 11 patients showed partial absence of the bands, seven showed presence of hyperechoic bands and two showed complete absence of bands with hypoechoic areas. Partial absence of hyperechoic bands indicate that there is masseteric inflammation and complete absence of hyperechoic bands with hypoechoic areas which show that there is a masseteric abscess. These findings highlight the significance of ultrasonography as a diagnostic tool to rule out whether masseter muscle is involved or not in inflammatory swelling of region and also show that discrepancy between clinical diagnosis and ultrasonographic findings.

The introduction of ultrasound, CT and MRI has revolutionized the field of diagnostic radiology then in turn minimized the therapeutic dilemma of oral physicians. Of the various advances, ultrasonography is widely accepted non-invasive imaging technique for cellulitis, facial infections and abscess. This was clearly observed in our study.

CONCLUSION

‘Trismus’—the hallmark of masseter muscle involvement—is a debilitating condition for a patient in addition to general state of the patient with orofacial infection. It is resultant of soft tissue infections requiring differing treatment modalities according to the etiology. Thus, a potent diagnostic tool which can minimize the dilemma regarding the treatment selection is warranted. Ultrasound has revolutionized the field of diagnostic radiology as a widely accepted noninvasive technique in evaluating inflammatory changes in the muscles of masticatory apparatus.

REFERENCES