

# ULTRASONOGRAPHY (USG) AS AN ADJUVANT DIAGNOSTIC AID IN FASCIAL SPACE INFECTIONS

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## Abstract

**The aim:** to evaluate the efficiency of USG as an adjuvant diagnostic aid in fascial space infections and help draw a treatment plan as per the diagnosis made by USG examination

**Materials and methods:** 60 patients having odontogenic superficial fascial space infection of the maxillofacial region were included. All of the patients included in our study were properly examined clinically with proper work up done, ordering different radiographs necessary to ascertain odontogenic cause most patients diagnosed with cellulitis were given medical line of treatment, and those with abscess were subjected to incision and drainage. Informed consent was obtained from all the participants involved in the study.

**Results:** in this study, total of 60 patients were studied. Out of 60 patients of odontogenic facial space infections, 24 were male and 36 were female. Buccal space was the most common space involved (24; 40 %) followed by submandibular space (9; 15.0 %) than Canine space (6; 10 %). In a total of 60 cases, clinical diagnosis of cellulitis was made in 18 cases (30 %) and that of abscess in 42 patients (70.0 %).

All patients were subjected to the USG examination in which cellulitis was diagnosed in 24 cases (40 %) and abscess in 36 cases (60 %).

**Conclusion:** USG could be considered to be a valuable adjuvant to clinical examination in patients with fascial space infection and help in delivering better treatment, after intervention 34 cases were found to be abscess while USG found 36 cases hence clearly proving the superiority of USG in diagnosis of abscess than clinical examination.

It has its own advantages like minimal cost, repeated examinations, and readily available in especially in developing countries where people could not easily afford better imaging modalities.

**Keywords:** ultrasonography, fascial space infections, incision and drainage, abscess, cellulitis, buccal space, orthopantomograph, odontogenic.

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## 1. Introduction

Infections of odontogenic origin can propagate to various fascial spaces of head and neck [1, 2]. This propagation of infection can be fatal leading to obstruction of airway passage due to severe pressure from the pus build up which is life threatening. Head and neck anatomy is complicated which makes it difficult to determine by clinical examinations [3].

Ultrasonography (USG) being inexpensive, relatively cheap, non-invasive with high sensitivity and readily available used to examine various structures in head & neck region such as salivary glands, vasculature, lymph nodes and inflammatory lesions [4].

Improper diagnosis in such conditions could be fatal leading to medical emergency, invasive actions which are not required and medical therapy unwarranted [5].

Ultrasonography (USG) uses ultrasonic waves by directing them into tissues required to be examined and capturing their reflections (echoes).

The importance of USG in Oral and Maxillofacial surgery as tool of diagnostic importance could not be undermined [6].

The aim of our study was to evaluate the importance of USG in diagnosis of fascial space infections of maxillofacial region and further helping the surgeon in modifying management protocol if needed.

## 2. Materials and methods

This study was conducted in the department of Oral and Maxillofacial Surgery, from 1st January 2022 to 31st May 2022 at Govt. Dental College & Hospital Srinagar. This study comprised patients of all ages and both sexes.

This study was approved by the Research Ethics Committee of Government Dental College & Hospital. Informed Consent was obtained from all the participants involved in the study.

In this prospective study, 60 patients involving 24 male and 36 female patients between ages 18–64 years old with average age of 34 years, having odontogenic superficial fascial space infection of the maxillofacial region were included.

All the patients included in our study were properly examined clinically with proper work up done, ordering different radiographs necessary to ascertain odontogenic cause and the offending tooth identified such as IOPAR (intra-oral periapical radiograph), OPG (orthopantomograph).

Patients were than referred for USG evaluation all patients referred to the same center and being investigated by the same radiologist. Areas of interest were always examined with diagnostic ultrasound machine (GE Logiq P5) by the same radiologist, ultrasound gel was applied to the probe to eradicate air bubbles and directed against the area of the interest bilaterally for comparison between infected and non-infected sites.

The ultrasound echogenicities were described in comparison with the adjacent tissues as hyperechoic (brighter) or isoechoic (equal) or hypoechoic (darker) or anechoic (no internal echoes) or mixed signals.

The descriptive parameters of the study were represented using frequencies and percentages the data was analyzed using SPSS software version 20.0.

## 3. Results

In this study, total of 60 patients were included in our study. Out of 60 patients of odontogenic facial space infections, 24 were male and 36 were female.

Buccal space was the most common space involved (24; 40 %) followed by submandibular space (9; 15.0 %) than Canine space (6; 10 %) (**Table 1**).

**Table 1**

Representing the distribution of spaces involved based on gender

S. NO	SPACES INVOLVED	GENDER (FREQUENCY/PERCENTAGES)		GENDER TOTAL
		MALE	FEMALE	
1	BUCCAL	4/6.67	12/20	16/26.67
2	SUBMANDIBULAR	6/10	8/13.3	14/23.33
3	SUBMENTAL	1/1.67	2/3.33	3/5
4	CANINE	3/5	4/6.67	7/11.67
5	PAROTID	1/1.66	1/1.66	2/3.32
6	BUCCAL+SUBMANDIBULAR	4/6.66	6/10	10/16.67
7	SUBMENTAL+SUBMANDIBULAR	2/3.33	1/1.67	3/5
8	CANINE+BUCCAL	3/5	2/3.33	5/8.34
9	BUCCAL+SUBLINGUAL	0/0	0/0	0/0
	TOTAL	24/40	36/60	60/100

In males, the most frequently involved space was submandibular space (6; 25 %), while in females, it was buccal space (12; 33.3 %).

The most affected tooth was mandibular first molar both in males (10) and in females (15). In a total of 60 cases, clinical diagnosis of cellulitis was made in 18 cases (30 %) and that of abscess in 42 patients (70.0 %). (Table 2).

**Table 2**

Representing the clinical and USG diagnosis and its comparison in the study patients

DIAGNOSIS	FREQUENCY/PERCENTAGE	
	CELLULITIS	ABSCCESS
CLINICAL	18/30	42/70
USG	24/40	36/60

All patients were subjected to the USG examination in which cellulitis was diagnosed in 24 cases (40 %) and abscess in 36 cases (60 %) (Table 2). After intervention 34 cases were found to be abscess while USG found 36 cases hence clearly proving the superiority of USG in diagnosis of abscess than clinical examination.

In a total of 60 patients, 10 patients underwent conservative treatment only by oral or intravenous medications, and 50 patients were managed by Incision and Drainage after administering prophylactic antibiotics.

Offending tooth was removed in all cases immediately.

The results have clearly showed that ultrasonography to be superior and a valuable adjuvant to clinical diagnosis to determine the extent and spread of the infection.

#### 4. Discussion

Infections of odontogenic origin are most frequently seen to be the reason of fascial space infections in head and neck region [2]. Pulpal necrosis which is subsequently invaded by bacteria is the most common cause of the infections of odontogenic origin [7].

Odontogenic infections could spread into spaces distinguished as primary maxillary and mandibular spaces and secondary fascial spaces which include cervical spaces. Infections in primary spaces which are not dealt properly could spread posteriorly into secondary and cervical spaces and then it is more difficult to manage and could cause severe complications such as respiratory distress as in Ludwig's angina, mediastinitis and parapharyngeal spread and morbidity arise [8, 9].

Anatomic complexity of head and neck region is intricate and complicated hence it is difficult to determine extent and spread of fascial space infections and examining patient clinically for facial swelling is restricted to visual and tactile sensation. In some cases, the induration of the overlying skin may make it difficult to determine if any underlying abscess is present and the exact anatomic location [10]. Exploration of any facial swelling based on clinical diagnosis only may result in extensive tissue damage, patient discomfort and failure to localize and drain the abscess cavity [11].

On USG examination cellulitis shows ill-defined edges with heterogeneous pattern and a hyperechoic intensity along with increased thickness of the muscles involved. In case of abscess the edges are well defined with a homogenous pattern and hypoechoic intensity [12].

Similar protocol was followed in our study. Cases in which after USG examination of fascial space infection showed zero collection, increased thickness of the muscle involved diagnosis of cellulitis was made and in cases fluid presence was seen diagnosis of abscess was made. USG can precisely determine the relations of overlying skin with the underlying abscess along with the dimensions of the abscess cavity [13].

Odontogenic infections signify a noteworthy number of dental problems that present to any dental hospital. Pulp necrosis caused by caries, trauma, periodontal infections, pericoronitis or any of these may lead to most odontogenic infections in healthy patients.[14] In this study, the most frequently involved space was buccal space followed by submandibular space, that is in accordance with some studies [15].

**Research limitations.** Limited number of patients are involved in current study.

**Prospects for further research.** There is significant potential of USG as a diagnostic adjuvant particularly in developing countries where people could not afford other diagnostic tools and limited resources in rural sector.

## 5. Conclusion

USG could be a valuable adjuvant to clinical examination in patients with fascial space infection and help in delivering better treatment, after intervention 34 cases were found to be abscess while USG found 36 cases hence clearly proving the superiority of USG in diagnosis of abscess than clinical examination.

It has its own advantages like minimal cost, repeated examinations, and readily available in especially in developing countries where people could not easily afford better imaging modalities.

## Conflict of interest

The authors declare that they have no conflict of interest.

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