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ORIGINAL ARTICLE

One Incision Approach to Multiple Facial Spaces: Technical Note

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ABSTRACT

Infection of the deep facial spaces of the head and neck still represents a major challenge in hospitals. Although the complications are rare, they are serious and life threatening. The most critical point in the diagnosis of the facial space infections is the understanding of the common and uncommon signs and symptoms. Patients will often present with systemic signs and symptoms, such as fever, chills, malaise, and loss of appetite. Here, we demonstrate the benefit of one small incision approach to the multiple facial space infections with regard to the procedure time, postoperative recovery time, and the size and number of the scar formation.

Keywords: Facial spaces, Infections, Radiological examination.

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INTRODUCTION

Infection of the deep facial spaces of the head and neck still represents a major challenge in hospitals. Untreated infections may result in abscess formation that can spread through different levels in and between the facial spaces and result in life-threatening situations including mediastinitis, pericarditis, meningitis, septic shock, airway compromise, jugular vein thrombosis, and arterial erosion.[1,2]

The origin of facial space infections is often unclear, as the primary infection focus may have a diffuse presentation. Several studies written on parapharangeal space infections have shown that tonsillitis and pharyngitis are the predominant nidus in children, whereas dental infections are more common in adults. There are a number of causes of deep neck infections. Determining the site of origin or cause of deep neck infections varies widely in the literature, ranging from 30 to 90% of cases having an identified source of infection.[3,4] The submandibular space is the most common site of deep neck infections and they are caused by odontogenic sources in up to 85% of cases.[5]

In the situation of acute respiratory way depression, the need for immediate intervention is highly necessary to save the patient's life in the first hand, and then identifying the origin of infection can be performed depending on the patient emergency level. The various imaging techniques that are used to assist anatomically with regard to the airways in relationship to the nearby expanding abscess or any pathological process are ultrasound,[6] inspiratory lateral cervical radiography,[7,8] computed tomography (CT),[9] and magnetic resonance imaging.

Generally, the treatment of deep facial neck infections should undergo basically through incision, drainage, and antibiotic therapy, but not all these patients are in need of having an incision as mentioned in many studies. The incision can be made both extraorally and intraorally as in the submandibular space infections. Oral and Maxillofacial surgery text book described the incision to be made in healthy skin and mucosa when possible in a normal skin fold: Dissect bluntly, place a drain, followed by drain removal when the drainage becomes less.[10] Intraoral incisions are only indicated in uncomplicated infections limited to the sublingual compartment; otherwise an external approach is recommended.[11]

The external approach is through an incision approximately 3 to 4 cm below the angle of the mandible and below the inferior extent of swelling, it should follow relaxed skin tension lines. The incision should be carried down through skin and subcutaneous tissues to the platysma. The platysma can then be divided with electrocautery or sharp dissection. The superficial layer of deep cervical fascia should then be incised parallel to the inferior border of the mandible. Finger or blunt dissection is then used in a superior-medial direction to enter the submandibular space. Care should be taken to dissect toward the lingual aspect of the mandible in the area of the posterior molars, so as to avoid the facial vessels. Surgical drains should always be left in the space, or in multiple sites within the space.[4]

Drainage of the lateral pharyngeal space is approached mainly through an external approach.[11] Another approach to the lateral pharyngeal space is the anterior sternocleidomastoid muscle (SCM) approach, which should be

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used if access to the carotid artery or internal jugular vein may be necessary. The incision is oriented vertically along the anterior border of the SCM beginning 3 to 4 finger breadths inferior to the auricle. The incision is carried down to the superficial layer of deep cervical fascia, and the carotid sheath is identified and opened. Dissection is carried superiorly along the vessels as indicated. Once near the angle of the mandible, blunt dissection can be used in a superiomedial direction to enter the space, as described before.[4]

In cases where no access to the carotid artery, internal jugular vein, or mediastinum is anticipated, an approach similar to that of the submandibular space can be used. In some patients, there is extension of submandibular space infections into the lateral pharyngeal space and we approach both through the same incision. The only difference is that the superomedial vector of dissection is carried through aiming for the angle of the mandible and into the lateral pharyngeal space.[5]

AIM

To examine the benefit of one small incision approach to the multiple facial space infections regarding surgical procedure time, postoperative recovery time, and the size and number of scar formation. In this observational pilot study, we are going to illustrate the last method mentioned above to treat patients with deep facial infections including the parapharyngeal spaces.

MATERIALS AND METHODS

Materials

This study includes 7 patients who presented to the emergency causality at Al-Amiri Hospital, Kuwait City, Kuwait. Patients' age ranged between 9 and 48 years, which included 5 males and 2 females. These patients were diagnosed with deep facial infection with odontogenic infection as a cause as well as salivary gland infection. The inclusion criteria were patients with typical deep facial infection symptoms, fever, trismus, neck pain, and odynophagia. Patients were excluded if they exhibited superficial infections, limited intraoral abscesses, peritonsillar abscesses, cervical necrotizing fasciitis, and respiratory airway compression, contraindication for contrast material, or infections secondary to surgical neck trauma.

Lab monitoring includes count blood cells, temperature, and electrolyte status. All the patients were treated by the admission time with IV antibiotics (clindamycin 600 mg) three times per day except the child that was treated with specific antibiotic dose according to age and weight.

Methods

All patients were admitted to the Oral and Maxillofacial Department at Al-Amiri Hospital in Kuwait City, Kuwait. At admission time, continuous monitoring and IV antibacterial treatment administration were done.

Computerized tomography examination with contrast was applied to all patients. Radiologic examination of all the 7 patients showed abscess in different sizes and multiple space involvement as shown in Table 1.

Incision was given using a no. 15 blade; after incision and drainage, wound debridement and closure with corrugated drain placement was done with 3.0 silk following wound dressing with betadine. An initial follow-up evaluation was made with wound dressing changed every 6 hours after 24 hours, and a subsequent examination was done on the 3rd day for a reassessment and removal of the sutured drain (Figs 1 to 3).

Surgical Procedure

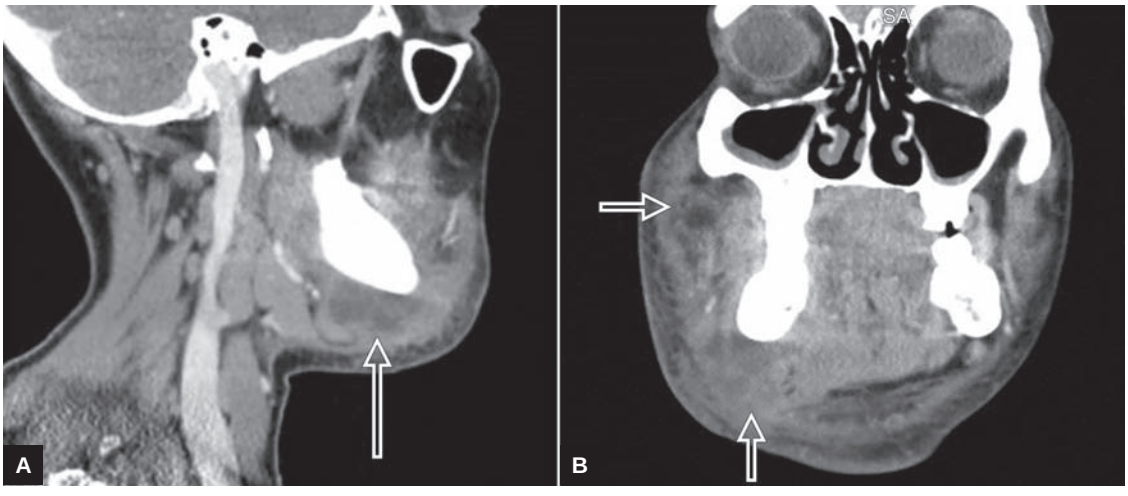
The surgical procedure was performed under general anesthesia, as the anesthesiologist examined all patients preoperatively. Preoperative planning for the incision site was achieved by thorough clinical and radiological examinations. All cases went by incision site decision.

Our surgical procedures were based on two incisions sites: Submental and submandibular or both, depending on the infection location in relation to the facial spaces. Submental incision introduces us to the submental space, sublingual space, and bilateral submandibular spaces as illustrated in Figures 4 and 5. As for submandibular incision, we divided it into two locations: Anterior submandibular incision and posterior submandibular incision. Through the anterior submandibular incision,

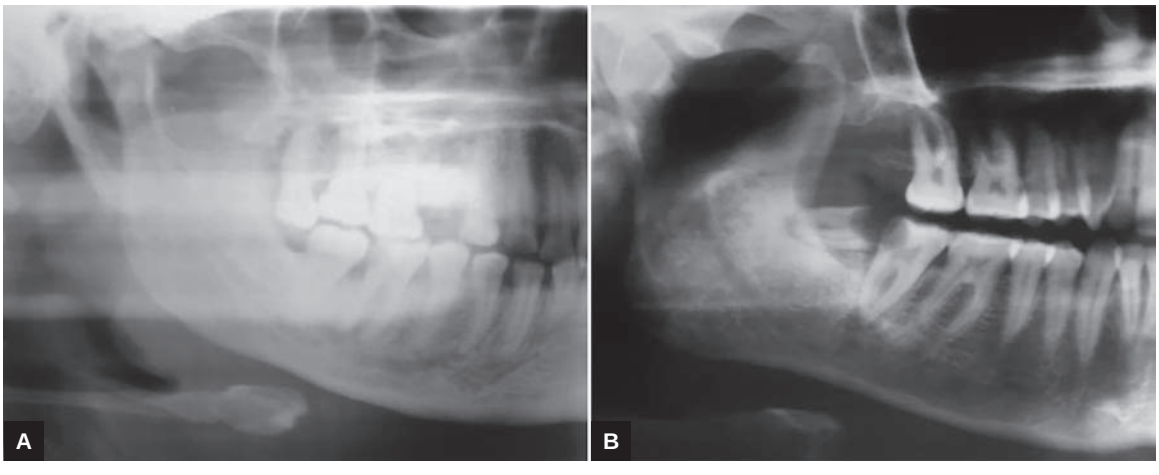
Table 1: Orientation of deep facial space infections

Patient no.	*Submental*	*Submandibular*	*Masticator*	*Parapharyngeal*
1		X-left	X-left	X-left
2	X-left	X-left	X-left	X-left
3		X-left		X-left
4		X-left		X-left
5	X-right	X-right	X-right	
6	X-bilateral	X-bilateral		X-bilateral
7		X-right		X-right

Figs 1A and B: (A) Clinical presentation of a 35-year-old male admitted with an odontogenic infection including the submandibular, sublingual, submasseteric, and parapharyngeal spaces; and (B) Clinical presentation of a 46-year-old man admitted with an odontogenic infection including the submandibular, sublingual, submasseteric, and parapharyngeal spaces



Figs 2A and B: Radiological examination (CT scan with contrast)



Figs 3A and B: Radiological examination (panoramic X-ray)

one can reach the submandibular space beneath and then the lingual space when blunt dissection anterosuperiorly was done. Through the posterior submandibular incision, one can reach the submandibular, submasseteric, pterygomandibular spaces, as well as the lateral pharyngeal spaces. Blunt dissection is also performed following the skin incision. Attempt has to be made to enter and open the spaces using artery forceps or finger dissection.

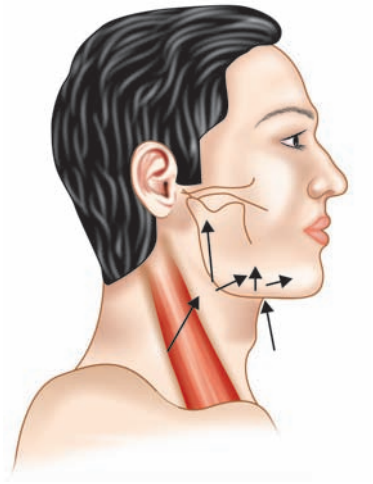


Fig. 4: Anterior and posterior submandibular incisions; the arrows show the directions of advancement through the anterior and the posterior submandibular entrée

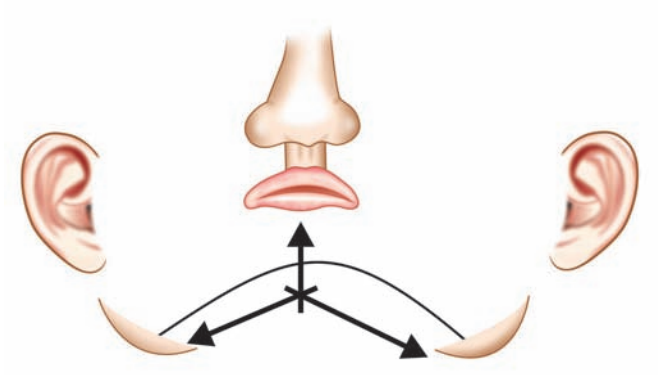


Fig. 5: A single incision in the mental region; the arrows show the direction of advancement through bilateral anterior submandibular entrée and the submental entrée

Anterior Submandibular Incision

Incision placed and marked between canine and first lower molar below the swelling, the marginal mandibular nerve should be considered below inferior border by 2 to 3 cm (Oral & Maxillofacial surgery Text book Approaches to facial skeleton). Skin incision (10–15 mm) is performed followed by blunt dissection through platysma muscle with artery forceps to reach inferior mandibular border to expose submandibular space, finger dissection.

Posterior Submandibular Incision

Incision placed and marked between first lower molar and third molar below the swelling, the marginal mandibular nerve should be considered below the inferior border by 2 to 3 cm (Oral & Maxillofacial surgery Text book Approaches to facial skeleton). Incision was performed through the skin below and parallel to the mandible. Blunt dissection was carried to the depths of the space and to its anterior and posterior margins. Deep abscess locations should be entered with a small closed clamp, probing in all directions while attempting to avoid damage to the submandibular gland, the facial artery, and the lingual nerve. The contralateral space should not be entered unless it is involved in the infection; if necessary, however, drains can be placed into both sides, as in the treatment of Ludwig's angina.

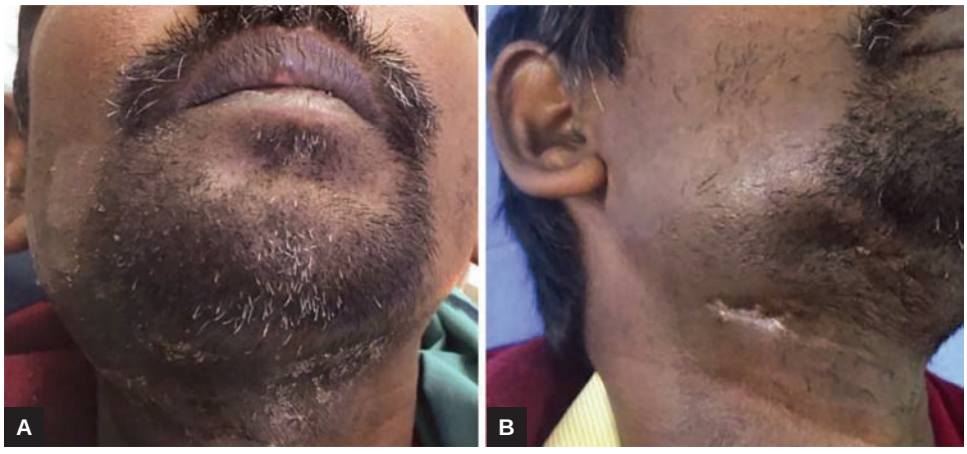
Long incisions and open dissection were not necessary for our patients. The dissection of the involved spaces can be done bluntly, with a closed hemostat inserted into the anatomic space. The hemostat is then opened and withdrawn through the incision, creating a pathway for the gravity-dependent egress of pus and infected tissue fluid. This process was repeated multiple times to explore the entire extent of the target anatomic space. At last, multiple drains had been used that were secured in place by sutures as shown in Figure 5. These drains were kept in place in the few days postoperatively.

RESULTS

Operation Time: Between 15 and 30 Minutes

The mean operation time ranges between 10 and 30 minutes excluding the time needed for the induction of anesthesia and the time needed for postoperative recovery (Fig 6).

Figs 6A and B: (A) Two drains – posterior submandibular entrée and anterior submandibular entrée; and (B) three drains through the sublingual and bilateral anterior submandibular entrée



Figs 7A and B: (A) Another patient with 1 week; and (B) 2 weeks

Figs 8A and B: One-year follow-up, after submandibular incision to the anterior and posterior submandibular compartments; clinically, there was minimal scar formation and maximum patient satisfaction

Recovery Time: 2 Days and up to 5 Days

All the patients were transported to the recovery department and then to the oral and maxillofacial surgery ward the same day. Postoperative observation had been undertaken through monitoring of vital signs, laboratory analysis, and continuous clinical assessment. The mean postoperative recovery time needed for our patients ranges between 2 and 5 days. No pre- and postoperative complications were reported. After leaving the hospital, all patients were examined at the Department of Oral and Maxillofacial Surgery on weekly basis. All the patients continued with antibiotic treatment per orally to the maximum of 10 days (Figs 7 and 8).

DISCUSSION

The general strategy in the treatment of deep facial space infections can be achieved through three main goals: Elimination of the source of infection, surgical drainage of the infection, and stabilization of the medical status of the patient. Most of the general surgeries and otolaryngology literature follow the principle of watchful waiting for the development of a clearly identified abscess before surgical drainage is attempted. This expectant approach may be based on the concept that antibiotic therapy plus the host defenses can eradicate the infection without requiring surgery. However, some oral and maxillofacial surgery literature questions that approach; some studies have been performed providing evidence that at least with odontogenic infections, early incision and drainage of all deep facial spaces affected by cellulitis or abscess can hasten resolution, appears to abort the spread of the infection into deeper anatomic spaces that involve a greater threat to the airway and other vital structures, and is not associated with increased complications. Surgical incision and drainage of the deep facial spaces of the head and neck is fairly straightforward, once the anatomy of those spaces has been understood.

The incision procedure is described thoroughly in the literature and varies between deep dissecting exploring

incisions and short blind incisions. A short incision drainage as described in the literature includes placing the incision in healthy mucosa or skin and in an esthetic area, if possible; obtaining gravity-dependent drainage; and performing blunt dissection during drainage to avoid damage to adjacent vital structures.[10] Long dissecting incisions and open dissection are usually not necessary, except perhaps in cases of necrotizing fasciitis or descending necrotizing mediastinitis, in which repeated surgical exploration, debridement, and drainage can be anticipated. Abscess, without question, requires incision and drainage, whereas the surgical management of cellulitis is more controversial. It is the opinion of these authors and others that there is benefit to aggressive surgical management of all facial spaces affected by cellulitis because it alters the bacterial milieu and hastens the resolution of infection.[12]

Flynn et al[13] published a case series of 37 severe odontogenic infections treated with a protocol of incision and drainage as soon as possible after hospital admission, with time between admission and surgery of 5.1 ± 7.3 hours, with a range of 0.2 to 23.3 hours. All deep facial spaces affected by cellulitis or abscess were surgically explored, and at least one drain was placed in each space. All subjects received IV penicillin G, except for three penicillin-allergic patients who received clindamycin. There were no deaths in the study. Pus was found at surgery (indicating abscess) in 76% of patients, and no pus (indicating cellulitis only) was found in 24%.[14]

Nazir et al[12] mentioned that such an early recognition strategy would decrease the morbidity associated with these infections, control hospital costs, and perhaps ultimately lead to a preventive program that would avoid the occurrence of these problems. The management of acute odontogenic infections in the hospital leads to considerable costs. Methods to lower the costs associated with hospitalization are proposed.

In this multiple case report, in our applied surgical method, all patients were admitted to the hospital as soon as clinical appearance and radiological examination confirmed. The surgical incisions were performed as short as possible in the submandibular region and then navigated further up to the other spaces that connected to it anatomically. The navigation stopped as soon as satisfying purulent discharge was gained. The average operating time was 15 minutes. The time of admission of all patients until to-be-discharged from the hospital was between 5 and 6 days. The overall results showed that submandibular incision and blind dissection actually are an effective pathway in the management of patient with deep facial infection considering the minimizing of the need for emergency airway saving procedure, minimal injury to the vital structures, minimal risk for nerve injury or extensive bleeding, minimal or no scar formation, minimal operating time, and minimal hospital admission time.

CONCLUSION

This multiple case study showed that extraoral small incisions and drainage of infections related to the deep facial spaces were found to be a positive significant factor in the patient recovery and positively affect the overall duration of hospital stay, though it is an economic burden for the health sector. However, further studies should be conducted in the future to confirm this result as the number of patients in this study is relatively low. It is true that airway compression due to the odontogenic infections is rare, but it is absolutely a fatal complication.

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