

## Review Article

### Strategies in Management of Maxillofacial Space Infections

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#### ABSTRACT:

Major source of oro-facial infections is from the dento-alveolar structures. The mainstay for the management of oro-facial infections remains as the surgical drainage, antimicrobial therapy and the removal of infective sources. In most of the severe cases, the surgical incisions and drainage along with antibiotic therapy are necessary for good result.

**Keywords:** Oro-facial infections, management of maxillofacial space infections,

**Received:** 02/06/2020

**Modified:** 20/07/2020

**Accepted:** 24/07/2020

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**This article may be cited as:** Bali P, Sanaka SR, Anand R, Hiremath A, Gulia SK, Mohan S. Strategies in Management of Maxillofacial Space Infections. J Adv Med Dent Scie Res 2020;8(9):60-62.

**INTRODUCTION:** Most commonly the orofacial infections arise either from the dental caries or the periodontal infections that have extended beyond the alveolar bone and have involved the fascial spaces around face and oral cavity. From the supporting structures of the affected tooth, these space infections tend to spread along the planes of least resistance. The buccal side is weakest throughout in the maxilla whereas, in the mandible, the alveolar bone is weakest in the lingual aspect posteriorly affecting the molar teeth and on the buccal side more anteriorly involving the incisors and the canine teeth. Thereby, basically the location of the affected tooth predicts the route of the infection spread and also which orofacial spaces could become infected. The oro-facial or maxillofacial infections may also lead to very dreadful consequences. Moreover, the odontogenic infections can travel

downwards as far as the subphrenic space causing the subphrenic abscesses.<sup>1</sup> They may also spread into the cavernous cavity causing the thrombosis of the area. The cases had been reported of the systemic spread of the infections from oro-facial regions may result in the disseminated intravascular coagulation (DIC) and can also cause septic shock.<sup>2</sup>The mainstay of the management of the oro-facial space infections remains as surgical drainage, antimicrobial therapy and removal of the source of infection. The choice of antimicrobials for the empirical therapy include a broad spectrum usually of the penicillin group plus metronidazole targeting the anaerobic organisms. The predisposing factors include sugar-rich diet (dental caries), poor oral hygiene, advancing age, use of tobacco, the effects of hormonal changes like menstruation, puberty and pregnancy (periodontal disease), comorbidities such as

diabetes mellitus, neutropenia, rheumatoid arthritis, steroids.

**Therapeutic considerations:** Although the surgical drainage of loculated pus and the dental extraction are the mainstay of the therapy for the space infection, the antibiotic treatment is required to halt the local spread of infection and also to prevent the hematogenous dissemination. Moreover, generally the anti-infective agents are indicated if there is fever and regional lymphadenopathy or when the infection has perforated the bony cortex and spread into the surrounding soft tissues.<sup>2,3</sup> The severely immunocompromised patients are particularly at risk for the rapidly spreading orofacial infections as well as bacteremia. The empiric antimicrobial therapy should be initiated promptly in such patients. The choice of specific antimicrobial regimens for the odontogenic orofacial infections is empirical based on the anticipated causative pathogens and also the immune status of the body of host. Usually the orofacial space infections are polymicrobial involving both the strict anaerobes and also the facultative bacteria within a unique ecosystem of dental plaque and the gingival crevice. Thereby, penicillin monotherapy is no longer recommended. Hence, penicillin together with metronidazole or a  $\beta$ -lactam- $\beta$ -lactamase inhibitor combination (e.g., ampicillin-sulbactam) is recommended. Clindamycin, doxycycline, or moxifloxacin is an alternative for penicillin-allergic patients. Erythromycin and tetracycline are not recommended due to their lack of optimal anaerobic activity and thereby increasing the resistance among some strains of the streptococci.<sup>4</sup> In case of immunocompromised hosts, a broad-spectrum coverage for the facultative gram-negative bacilli should be included. The combination therapy is indicated with a third or fourth generation cephalosporin together with the metronidazole, or monotherapy with the piperacillin-tazobactam or a carbapenem such as imipenem or meropenem.<sup>4,5</sup>

**Some strategies for the management of space infection-** certain strategies if kept in mind can give a desired outcome:

**1-**The treatment timing is the most crucial and important factor in the management of the space infections in order to prevent the subsequent airway complication. Dr. Guralnick in 1974 applied the principles of initial establishment of the airway security, followed by the early and vigorous surgical drainage of all the anatomic spaces affected by the cellulitis or abscess under adequate antibiotic coverage.

**2-** The oral and maxillofacial infection is a routine case in the dental clinic ranging from a periapical abscess to the infection of maxillo-fascial space. The deep neck space infections can also spread along the

fascial spaces of head and neck, which can induce a life-threatening deep space infection associated with a high risk of complications. Morbidity and mortality or oral and maxillofacial infection ranges from the airway obstruction to cerebral abscess, Lemierre's syndrome and can also lead to death. Most of the complications result due to delay on the treatment or inaccurate inference. The dentists should always be alert in order to identify the potential complication of the infection that can be life threatening. The rapid deterioration of the patient with odontogenic infection can easily be happened, especially in the immunocompromised patients such as diabetic patients.

**3-** The keystone in the management of the infection is having knowledge of the micro-organisms causing the odontogenic infection. Inappropriate or wrong selection of the antibiotic would not add any benefits for the patient but can also worsen the case. Even the application of empirical antibiotic should be based upon the sound scientific bases. There is mixed aerobic-anaerobic infections in the orofacial infections are mixed. Among the aerobic-anaerobic infections, the aerobic bacteria represent 25% of total number of the bacteria causing the odontogenic infection while 75% represented by anaerobic bacteria. The widely accepted empirical regimen for infections of odontogenic spaces is the combination of amoxicillin/clavulanate and metronidazole.

**4-**Detailed knowledge of the fascial planes as well as the anatomical routes of spread of the infection is critically important requirement, which will help in understanding the appropriate management of these infections, the clinical manifestations and also the potential complications. In order to determine the location and course of spread of the odontogenic infections, the fascia plays an important role. The prediction about the possible fascial space involvement by odontogenic infection and the subsequent complication is based on the anatomy knowledge.<sup>6</sup>

**5-**It is very important step in diagnosing the odontogenic infection to take a proper patient history. The patient can tell a word to the dentist which could be a guide to the correct diagnosis of the cause of infection. Thereby; careful history taking with the analysis of patient story plays an important role in the diagnosis of cause of infection.<sup>7</sup>

**6-**With the advent in the technology for imaging studies, the radiographic evaluations became an essential part in the patient examination. MRI and Contrast-enhanced CT are commonly used now for the diagnosis of infection and also its spreading route. The treatment plan for the patient with deep space infection is mainly based upon the examination and the detection of involved spaces for an adequate drainage.

**7-**One must not miss the cause of the infection. The eradication of infection can be achieved by the removal of the etiological factor either by root canal treatment or by extraction of the offending tooth or teeth. The persistence of the offending tooth or teeth results in the failure of treatment with the possibility of the recurrence of infection.

**8-**The antibiotic therapy is an adjunctive therapy and not an alternative to the dental intervention. The drainage of infection can be achieved through the canal of root by doing root canal treatment or through the socket by extraction of the offending tooth. The intraoral as well as extraoral incisions are required for an adequate drainage of fascial space. The art and science of using the antibiotic is the key of success in order to prevent the antibiotic catastrophe. Application of the Antimicrobial Stewardship principle is important in order to optimize the clinical outcomes while minimizing the unintended consequences of the antimicrobial use. The Antimicrobial Stewardship consisted of 4 rights, i.e., using the right antibiotic at the right time at the right dose for the right duration.

**Complications & Prognosis:** The complications of the orofacial space infections can be: Deep fascial space infections (e.g., Ludwig's angina, lateral and retropharyngeal space infections, etc.), Osteomyelitis of the jaw, Hematogenous dissemination (brain, lung, heart valves), Cavernous sinus thrombosis, Association of poor oral health with cardiovascular diseases (stroke, myocardial infarction).<sup>1, 8</sup>The severity score of the fascial space infections is important to know in order to assess the risk of the airway involvement by the infection:

**Severity score 1:** which include fascial spaces with low risk to airway or vital structures. The fascial spaces are vestibular, subperiosteal, infraorbital, and buccal spaces.

**Severity score 2:** which include fascial spaces with moderate risk to airway or vital structures. The fascial spaces are submandibular, submental, sublingual, pterygomandibular, submasseteric, superficial and deep temporal spaces.

**Severity score 3:** includes the fascial spaces with high risk to airway or vital structures. The fascial spaces are lateral pharyngeal, retropharyngeal, and pretracheal spaces.

**Severity score 4:** which include fascial spaces with extreme risk to airway or vital structures. The fascial spaces are Danger space (space 4), mediastinum, and intracranial infection. The prognosis is good if the orofacial space infection is superficial (e.g., buccal, canine, submental), prognosis is poor if the orofacial space infection is deep with potential for spread to lateral or retropharyngeal spaces (e.g., submandibular, sublingual, masseteric, infratemporal) while it can be

life-threatening if the airway is compromised i.e., Ludwig's angina, lateral or retropharyngeal space involvement.<sup>8,9</sup>

**CONCLUSION:** Although the prevalence and complications of the orofacial space infection has decreased with the advancements of the diagnostic techniques, availability of effective antibiotics and by the improvement in oral hygiene, but still the oro-facial or maxillofacial space infections remain potentially life threatening. Even though adequate antibiotic therapy and incision and drainage of abscess were given, immune-compromised patients carry a higher risk of life-threatening complications, and also the treatment strategy should be aggressive for these patient

#### **ACKNOWLEDGEMENTS:**

We thank Dr. Anam Raza, BDS, MS, Baqai Medical University, Pakistan. University of Denver-CO, USA for helping in literature collection of manuscript

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