Management of severe orofacial infections: Report of two cases and literature review

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ABSTRACT

**Background:** Severe orofacial infections are end results of initially long and slow disease process, usually of odontogenic origin. The outcome of the management of these conditions is to a large extent affected by the duration of the disease and extent of spread prior to presentation in the hospital. Mediastinitis, pleuritis, cerebral abscess and meningitis are documented complications secondary to spreading odontogenic infections. Odontogenic infections should therefore, be handled as an urgency to prevent acute emergency situations. **Methods:** We present two cases of severe orofacial infections that were seen and managed at our center. **Findings:** Apart from the advanced age of the case 2, there was no systemic co-morbidity that usually predispose to severe orofacial infection, and while normal oral flora was found in case 1, microscopy culture and sensitivity did not yield any growth in case 2. Successful management of the two cases was, however, achieved with aggressive serial surgical debridement. **Conclusion:** Successful management of these patients through serial surgical debridement further lends credence to the importance of less dependence on waiting to know the microbiology and its potentially harmful sensitive medications in the management of severe orofacial infections.

**Key words:** Odontogenic infections, fascial spaces, orofacial infections, surgical debridement, dental decay, trismus

INTRODUCTION

Oral and maxillo-facial infections are common health issues and major causes of dental consultation globally.\(^1\,2\) They are of importance due to the associated high rate of morbidity and probable mortality.\(^2,3\) Despite enhanced socioeconomic status of people and advents in antibiotic therapy, there still exists numerous cases of severe maxillofacial infections. “The
high numbers of connecting spaces in the head and neck region allow fast spread of inflammation in case of late or improper treatment of these infections.\(^{[2,3]}\)

Microbial-induced inflammatory disease in the orofacial or head and neck region could be odontogenic arising from dental tissues, or non-odontogenic arising from non-dental tissues. Huang et al.\(^{[4]}\) found that 50 per cent of 185 cases of deep neck infections were odontogenic in origin. Similarly, Bridgeman et al.\(^{[5]}\) reported 53 per cent in their 107 cases,\(^{[6]}\) while Bross-Soriano et al.\(^{[7]}\) and Juang et al.\(^{[8]}\) reported as high 89 and 86 per cent respectively in their studies.\(^{[6,7]}\)

Severe odontogenic infections are usually polymicrobial and are a combination of aerobic, facultative anaerobes and strict anaerobes.\(^{[8,9,10]}\)

“Generally, the more skilled and intensive the microbiologic study, the greater the range and type of bacteria demonstrated”.\(^{[8]}\) It has been documented that the commonest bacteria found in odontogenic infections are streptococci, which are aerobes, peptostreptococci, pigmented and non-pigmented prevotella, and fusobacterium, which are anaerobes.\(^{[9]}\)

“Severe odontogenic infections are end results of initially long and slow disease process”.\(^{[4]}\) The microorganisms involved in dental decay take months if not years to reach the dental pulp to cause pulp necrosis and then periapical abscess and similarly, symptoms from partially erupted teeth are initially subtle before a serious symptom ensues.\(^{[11]}\) Bridgeman et al.\(^{[10]}\) reported that all infected patients experienced pain prior to presentation.\(^{[8]}\) This is usually intermittent and the patients fail to seek medical attention.\(^{[5,6]}\)

The predisposing factors to severe orofacial infections are generally agreed to be local and systemic.\(^{[2,12]}\)

Low socio-economic status, low level of education, neglect, self-medications and ignorance are also contributory factors to the development, progress and outcome of orofacial infections.\(^{[2,13]}\) Diabetes mellitus, obesity,[14] and recently, low social economic factor,\(^{[15]}\) especially have been shown to predispose for maxillofacial space infections.\(^{[4]}\) These factors influence the spread of the infection and are dependent on the balance between patient- and microorganism-related conditions.\(^{[14]}\) Patient-related conditions include systemic factors that influence host resistance, which may be impaired in some conditions (table 1), as well as local factors that also determine the spread of the infection.\(^{[15]}\) Consequently, the severity of orofacial infection is determined by the number and virulence of micro-organisms and resistance of the host.\(^{[12]}\)

The maxillofacial spaces related to the mandible include submandibular, sublingual, submental spaces, sub- and supra-masseteric, pterygomandibular and lateral pharyngeal while those related to the maxilla are canine fossa, buccal space, maxillary antrum, infratemporal space, and subtemporal space.\(^{[12]}\) The most common fascial spaces affected are the submandibular (20.3% - 68%) and the buccal space (8.5% - 96%),\(^{[16,17,18]}\) followed by lateral pharyngeal space, submental space, sublingual space and the canine space.\(^{[7]}\) Children have been shown to more likely develop maxillary infections than mandibular infections.\(^{[17,19]}\) In addition, multiple space involvement is currently more common than single space involvement compared to the past.\(^{[16]}\) This, however, might be due to emerging new strains of microorganisms.

Odontogenic infections generally pass through three stages before they resolve.\(^{[20]}\) During the first 1 to 3 days the swelling is soft, mildly tender, and doughy in consistency. Between days 2 and 5 the swelling becomes hard, red, and exquisitely tender. Its borders are diffuse and spreading.\(^{[20]}\) Between the fifth and seventh day the center of the cellulitis begins to soften and the underlying abscess undermines the skin or mucosa, making it compressible and shiny.\(^{[21]}\) All these might be seen in the presenting clinical features. The typical signs and symptoms of severe/spreading odontogenic maxillofacial infections, however, include trismus, fever, dysphagia, pain, swelling, leucocytosis, dehydration, airway compromise, and respiratory distress.\(^{[17,21]}\)

The outcome of the management of these conditions is to a large extent determined by the duration of the disease and extent of spread.
prior to presentation in the hospital, virulence of causative organisms, as well as the presence and control of local and systemic diseases.\textsuperscript{12} It is worthy to note that severe odontogenic infection is now found with higher incidence in seemingly immunocompetent patients.\textsuperscript{1} Little time should be wasted in waiting to know the microbiological profile of the aspirate or drainage as aggressive surgical intervention is still the mainstay of management. Odontogenic infections should therefore, be handled with every sense of urgency, otherwise within a short period of time, they might result in acute emergency situations.\textsuperscript{5}

We present two cases of severe maxillofacial space infections that occurred in seemingly immunocompetent subjects managed by our unit.

**CASE REPORTS**

**Case 1**

An 18-year old female student of BU that presented with a 2-day history of left sided facial swelling. She gave a history of sore throat that made her present at the accident and emergency one week prior to the swelling where she was managed for tonsillitis. Medical history was not remarkable.

At presentation, patient was clinically stable. There was a diffused swelling at the lower part of left side of the face extending into the left submandibular region (figures 1a and 1b). Swelling was brawny hard, slightly warm and slightly painful. There was marked trismus of about 10mm. Intraoral examination was limited, but the lower left wisdom tooth was seen to be impacted. A provisional diagnosis of left submasseteric and submandibular fascial space abscess was consequently made. Random blood glucose check, electrolyte, urea and creatinine, and full blood count were within normal range as shown in table 2.

Intravenous ceftriaxone 2g stat and 500mg metronidazole was immediately given, and incisions and drainage instituted. Pus was aspirated and sent for microscopy culture and sensitivity. Intraoral drainage was done for submasseteric space by making a mucosal incision of about 1cm along the ascending mandibular ramus and thereafter passing a curved artery forceps lateral to the ramus to enter deep to the master muscle. The submandibular space was drained extra-orally through a 2cm skin incision placed 2cm below the lower border of the mandible. A curved artery forceps was also introduced and passed to enter both the submandibular and sublingual spaces on that side. Drains were placed and left in-situ. Patient was allowed to go home to be seen on out-patient basis because there was no immediate threat to the airway, and was placed on tablet augmentin 625mg 12-hourly and tablet metronidazole 400mg 8-hourly for seven days. Re-exploration coupled with jaw exercise was done daily for 4 days and the patient mouth opening improved (figures 2a and 2b) and later on alternate basis till the swelling resolved (figures 3a, 3b and 3c). Patient was then subsequently discharged.

**Case 2**

An 83-year old male that presented to accident and emergency section of the institution with facial and neck swelling of a day duration. He gave a history of hitting his lower jaw on the concrete floor of the house following a slip. Medical history was not significant.

At presentation, there was gross diffused lateral facial swelling that was more severe on the left side, and the upper part of the neck. Swelling was brawny hard mostly on the face, but fluctuant on the neck (figures 4a, 4b and 4c). Mouth opening was about 20mm. The tongue was raised almost to the palate and the sublingual folds were ballooned out (figure 5). There were numerous retained roots and the lower left 2nd premolar, and 1st and 2nd molars were grossly mobile. A provisional diagnosis of Ludwig’s angina and left buccal space infection was subsequently made.

Intravenous ceftriaxone 2g stat followed by 1g 12-hourly and intravenous metronidazole 500mg 8-hourly was immediately commenced. Pus was aspirated and sent for microscopy culture and sensitivity. Incision and drainage of bilateral submandibular and submental spaces was instituted, as described for case 1, and multiple incisions were also made on the neck to drain the lateral pharyngeal spaces. Drains were placed and left in-situ. Electrolyte urea and
creatinine were within normal range but the white cells count was very high, 28,000/l (as shown in table 3). Patient was subsequently admitted and daily exploration with twice daily dressing regimen was instituted. Culture and sensitivity did not yield any microorganism after two attempts. Medication was however changed to intramuscular benzyl penicillin 1.2MU 12-hourly for 1 week when copious drainage persisted after 4 days of intravenous ceftriaxone. This however improved significantly after (figure 6a, 6b and 6c), and patient was discharged after 10 days.

Table 1: Local and systemic predisposing factors to severe orofacial infections

<table>
<thead>
<tr>
<th>Local factors</th>
<th>Systemic factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Caries, impaction, pericoronitis</td>
<td>Human immunodeficiency virus</td>
</tr>
<tr>
<td>2. Poor oral hygiene, periodontitis</td>
<td>Alcoholism</td>
</tr>
<tr>
<td>3. Trauma</td>
<td>Measles, chronic malaria, tuberculosis</td>
</tr>
<tr>
<td>4. Foreign body, calculi</td>
<td>Diabetes mellitus, hypo- and hyperthyroidism</td>
</tr>
<tr>
<td>5. Local fungal and viral infections</td>
<td>Liver disease, renal failure, heart failure</td>
</tr>
<tr>
<td>6. Post extraction/surgery</td>
<td>Blood dyscrasias</td>
</tr>
<tr>
<td>7. Irradiation</td>
<td>Steroid therapy</td>
</tr>
<tr>
<td>8. Failed root canal therapy</td>
<td>Excessive antibiotics</td>
</tr>
<tr>
<td>9. Needle injections</td>
<td>Malnutrition</td>
</tr>
<tr>
<td>10. Secondary infection of tumours, cyst, fractures</td>
<td>Anaemia</td>
</tr>
<tr>
<td>11. Allergic reactions</td>
<td>Sickle cell disease</td>
</tr>
</tbody>
</table>

Table 2: Case 1 laboratory investigations and results

<table>
<thead>
<tr>
<th>Laboratory test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random blood glucose</td>
<td>80mg/dl</td>
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<tr>
<td>Sodium</td>
<td>139mmol/l</td>
</tr>
<tr>
<td>Potassium</td>
<td>3.7mmol/l</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>22mmol/l</td>
</tr>
<tr>
<td>Chloride</td>
<td>97mmol/l</td>
</tr>
<tr>
<td>Urea</td>
<td>20mg/dl</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1.0</td>
</tr>
<tr>
<td>Microscopy, culture and sensitivity</td>
<td>Normal oral flora</td>
</tr>
<tr>
<td>White cell count</td>
<td>6000/l</td>
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</tbody>
</table>

Table 3: Case 2 laboratory investigations and results

<table>
<thead>
<tr>
<th>Laboratory test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random blood glucose</td>
<td>88mg/dl</td>
</tr>
<tr>
<td>Sodium</td>
<td>145mmol/l</td>
</tr>
<tr>
<td>Potassium</td>
<td>3.5mmol/l</td>
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<tr>
<td>Chloride</td>
<td>110mmol/l</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>23mmol/l</td>
</tr>
<tr>
<td>Urea</td>
<td>28mg/dl</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1.0</td>
</tr>
<tr>
<td>White cell count</td>
<td>28000/l</td>
</tr>
<tr>
<td>Microbiology and sensitivity</td>
<td>No growth after 48hrs</td>
</tr>
</tbody>
</table>
Table 4: Eight steps of management of orofacial infection\textsuperscript{[10]}

<table>
<thead>
<tr>
<th>No</th>
<th>Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Determine the severity of infection.</td>
</tr>
<tr>
<td>2.</td>
<td>Evaluate host defenses.</td>
</tr>
<tr>
<td>3.</td>
<td>Decide on the setting of care.</td>
</tr>
<tr>
<td>4.</td>
<td>Treat surgically.</td>
</tr>
<tr>
<td>5.</td>
<td>Support medically.</td>
</tr>
<tr>
<td>6.</td>
<td>Choose and prescribe antibiotic therapy.</td>
</tr>
<tr>
<td>7.</td>
<td>Administer the antibiotic properly.</td>
</tr>
<tr>
<td>8.</td>
<td>Evaluate the patient frequently.</td>
</tr>
</tbody>
</table>

Figure 1: Patient immediately after the 1st surgical intervention (Case 1)

Figure 2: Patient mouth opening after 4 days of surgical intervention and jaw exercise (Case 1)
Figure 3: Final appearance (Case 1)

Figure 4: Patient at presentation (Case 2)
DISCUSSION

Odontogenic infections are conditions often managed by oral and maxillofacial surgeons. A large number of people are affected by these infections which is associated with serious complications if not promptly and adequately treated. Thus, the significance of infections of dental origin is their high incidence and morbidity, and more importantly the potential of spreading to the orofacial spaces.

Orofacial infection has been said to affect males or females in equal proportion. The two cases seen and managed in our unit would seem to fit into this assertion. Marina-George and Frank and Dailey et al. also reported that there was no significant gender difference for clinic visit rate due to orofacial infections in their study. However, Akinbami et al. recently reported a female preponderance in their study while Abdulazziz et al. reported a male preponderance. Geographical differences in the study cohorts may explain these disparities. Various studies on orofacial infections have put the mean age of patients with severe orofacial infections at 37.5 years, but the consensus is that orofacial infections occur in a broad age range. Our patients’ ages were 18 years and 83 years respectively.

Our patients presented within 3 days of onset of the orofacial swelling. Abdulazziz. Flynn et al., and Ulibau also reported that most cases of orofacial infections seen in their studies presented within 1-10 days of noticing the swelling. A plausible reason for this is that most patients are alarmed to see a rapidly developing facial swelling, even though they have had recurring symptoms much before the onset of space infection. This is also echoed by George et al. and consequently, swelling is a ubiquitous complaint in maxillofacial infections. The two patients in this report presented with submandibular space infection. Swelling of the submandibular spaces is said to be the most common presentation followed by the buccal space swelling. However, Abdulazziz et al. found the buccal space to be the most affected in their study. This two reported cases seem to support the finding of the former study.

Trismus (limitation in mouth opening) is another common finding in maxillofacial space infection. This indicates that the infection has involved the masticatory spaces. Both cases in this report presented with trismus. Trismus in patients with an odontogenic infection is said to be a danger sign according to the study of 212 cases by Zhang et al. where significant
number of the cases developed airway obstruction associated with trismus. Thus, deeper examination of the patient is necessary for clinical manifestations of upper airway compromise such as tongue elevation, stridor, difficulty in swallowing saliva, and breathlessness. Only one of the two cases in this report developed signs of airway obstruction. This, however, improved quickly following incision and drainage of the facial swelling.

Infection of the lower posterior teeth is considered the most common source of infection. Both cases in this report were found to have infection of the lower posterior teeth. Posterior teeth are known to have wider surface area, and are used for mastication, hence vulnerable to occlusal stress, more micro/macro-trauma, more caries, more impaction and stagnation of food debris and also have reduced accessibility to thorough hygiene. “Treatment failure and recurrent treatment are also more common with posterior teeth” These factors predispose them to infections.

Imaging studies are useful to determine the extent of orofacial infections particularly when there is an abscess formation, however diagnosis is made on the basis of clinical findings. Consequently, treatment must be prompt, vigorous and initiated early with the administration of antibiotics and prophylactic debridement of the spaces involved, without waiting for fluctuation to appear; the airways must also be assessed for potential obstruction.

The eight steps in the management of odontogenic infections as outlined by Flynn et al are as shown in table 4.

Surgery in form of incision and drainage of the spaces affected and removal of the source of infection is the mainstay of treatment of orofacial infections. Following assessment of the two cases in this report, drainage of the spaces was instituted and antibiotics were given empirically. There was significant improvement and consequent resolution of the facial swelling. This treatment protocol is widely accepted. However, Dailey and Martin and Marina-George and Frank in their reviews noted that medical treatment alone, without removing the focus of infection produced a resolution of the odontogenic infections. This, however, could be due to the fact that the majority of the cases seen in their reviews were ordinary pulpitis. Also, patients were not followed up to know if possible recurrences or complications occurred. It still remains a controversy whether drainage should be performed when the patient has only cellulitis. “The issue of cellulitis being managed differently is a carryover from a pre-antibiotic era, during which time there was a risk that surgical intervention could make the condition worse”. Currently, there is an evolving consensus that the difference between cellulitis and abscess is no longer clinically relevant and that both need to be drained. As echoed by George et al, high treatment success rate is only guaranteed by active surgical intervention.

The relevance of odontogenic infection lies in that it can cause infections that compromise more distant structures (via direct spread and distant spread), as stated previously. Much more, studies have documented mediastinitis, pleuritic, cerebral abscess and meningitis secondary to spreading odontogenic infections.

CONCLUSION

In conclusion, ignoring a toothache can pose a threat to more than a person’s dental health. The tooth chamber acts as an incubator for the bacteria proliferation once tooth decay destroys the pulp or inner chamber of the tooth. The resultant inflammation and infection can spread to contiguous parts of the body and through the blood stream to distant parts of the body, leading to significant morbidity and sometimes, mortality. While it might be difficult to prevent the occurrence of toothache, it is important to enlighten people on early presentation at the dental facility if affected, in order to avoid progression to severe orofacial infection with its attendance morbidity and mortality. As shown by the management of these cases, the clinician needs to know that medications are only complimentary in odontogenic infection, and much less in severe orofacial infections. Aggressive surgical management remains the mainstay of severe orofacial infections.
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REFERENCES

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Conflict of Interest: None declared

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