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ODONTOGENIC FASCIAL SPACE INFECTIONS: A CASE SERIES

Original Research

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ABSTRACT

Background: Fascial space infections are potentially life-threatening complications of odontogenic infections that arise due to delayed or inadequate treatment. These infections can rapidly spread through facial planes, particularly in immunocompromised individuals, and may involve multiple anatomical spaces such as the buccal, submandibular, and canine regions. Prompt recognition and surgical management are critical to prevent serious outcomes like cellulitis, airway obstruction, or Ludwig's angina.

Case Presentation: This case series describes three patients with distinct presentations of fascial space infections. The first case involved a 40-year-old woman who presented with a four-day history of pain and brany swelling in the upper right posterior maxilla, diagnosed as a buccal space infection secondary to a carious maxillary first molar. The second case was a 60-year-old woman undergoing radiotherapy for breast cancer, who presented with a six-day history of left facial swelling and was diagnosed with a canine space infection linked to an upper left canine beneath a prosthetic bridge. The third case involved a 40-year-old woman with left lower facial swelling and trismus. Examination revealed a carious mandibular third molar and a diagnosis of buccal and submandibular space infection.

Intervention and Outcome: All patients were managed with surgical incision and drainage, supported by systemic antibiotics. The offending teeth were either extracted or treated endodontically. Follow-up showed full clinical recovery in all cases, with no recurrence of infection. Immunocompromised status in one case necessitated cautious monitoring and intravenous antibiotic therapy.

Conclusion: These cases highlight the importance of timely diagnosis and management of odontogenic infections to prevent their progression into deep fascial spaces. Early surgical intervention, appropriate antibiotic coverage, and individualized care based on comorbidities are crucial for favorable outcomes.

Keywords: Buccal space infection, Canine space infection, Submandibular infection, Odontogenic infections, Fascial space infections, Case series.

INTRODUCTION

Deep fascial space infections originating from odontogenic sources remain a significant clinical challenge in dental and maxillofacial practice due to their rapid progression, potential for life-threatening complications, and complex management requirements. Odontogenic infections, particularly those arising from periapical abscesses and pericoronitis, are among the most common sources of these infections (1). If not promptly treated, such localized infections can extend into adjacent fascial spaces, leading to cellulitis, trismus, airway compromise, or even mediastinitis in severe cases. The anatomical continuity and loose connective tissue within fascial planes provide a conducive pathway for infection to spread, making early identification and intervention critical (2,3). Fascial spaces in the head and neck region are broadly categorized into primary and secondary spaces based on their anatomical location and relationship with the source of infection (4). Primary spaces include the canine, buccal, and infratemporal spaces, typically involved in early stages of infection, while secondary spaces such as the submandibular, submental, sublingual, and pterygomandibular regions are often affected as the disease progresses (5). The mandibular third molars, particularly when grossly carious or partially erupted, are frequently implicated in initiating infections that spread to these deeper spaces. Conversely, maxillary infections are more commonly associated with the involvement of the buccal space (6,7).

The progression and severity of fascial space infections are influenced by several interrelated factors. Local anatomical considerations, the virulence of the infecting organism, and the host's immune response all play pivotal roles. Systemic factors such as diabetes mellitus, immunosuppressive therapy, malnutrition, and bleeding disorders further compromise the body's ability to contain and respond to infection. Social determinants of health, including socioeconomic status and access to dental care, also significantly affect the timely recognition and treatment of odontogenic infections, often leading to delayed presentation and more complicated clinical scenarios (8,9). Management of fascial space infections depends on the stage and severity of the condition. Early cases may respond to the removal of the infection source through dental extraction or root canal therapy (10). However, advanced infections with abscess formation typically necessitate surgical intervention. Incision and drainage remain the cornerstone of treatment for deep space infections, usually combined with broad-spectrum antibiotic coverage tailored based on microbiological culture and sensitivity reports. Ensuring airway patency and systemic stabilization is a priority in patients presenting with signs of systemic toxicity or respiratory distress (11,12).

This case report contributes to the existing literature by emphasizing the importance of recognizing atypical presentations and understanding the diverse anatomical pathways through which odontogenic infections can spread. Although the pathophysiology of fascial space infections is well-established, the variability in presentation due to host factors and anatomical nuances can complicate clinical judgment and delay effective intervention. Reporting such cases serves to underline the critical importance of early diagnosis, appropriate imaging, and prompt surgical management in preventing life-threatening complications. Furthermore, it brings attention to the need for better public awareness, improved dental hygiene practices, and accessible dental care to reduce the incidence of advanced odontogenic infections in resource-limited settings. The primary objective of this case report is to detail the clinical course, diagnostic findings, and treatment approach in a patient with a deep fascial space infection originating from an odontogenic source. By doing so, it aims to reinforce existing clinical protocols while offering insights into potential pitfalls in diagnosis and management. Additionally, the report seeks to inform dental and medical professionals about the importance of interdisciplinary collaboration, especially in cases that may require hospitalization or airway management. Through this case, the report hopes to enhance awareness of the complexities of fascial space infections and contribute to improved clinical outcomes through early recognition and evidence-based intervention.

CASE PRESENTATION

Case 1: Buccal Space Infection

A 40-year-old female presented with a four-day history of progressively increasing pain and swelling in the upper right posterior region of the face. The pain was localized and associated with a firm, brany, and tender swelling over the buccal area. There was no history of trauma or systemic illness. On intraoral examination, a grossly carious upper right first molar was identified, with surrounding gingival inflammation and tenderness on percussion. The buccal swelling was non-fluctuant and extended from the infrazygomatic region to the upper buccal sulcus. Radiographic evaluation using periapical imaging confirmed periapical involvement of the right first molar. A

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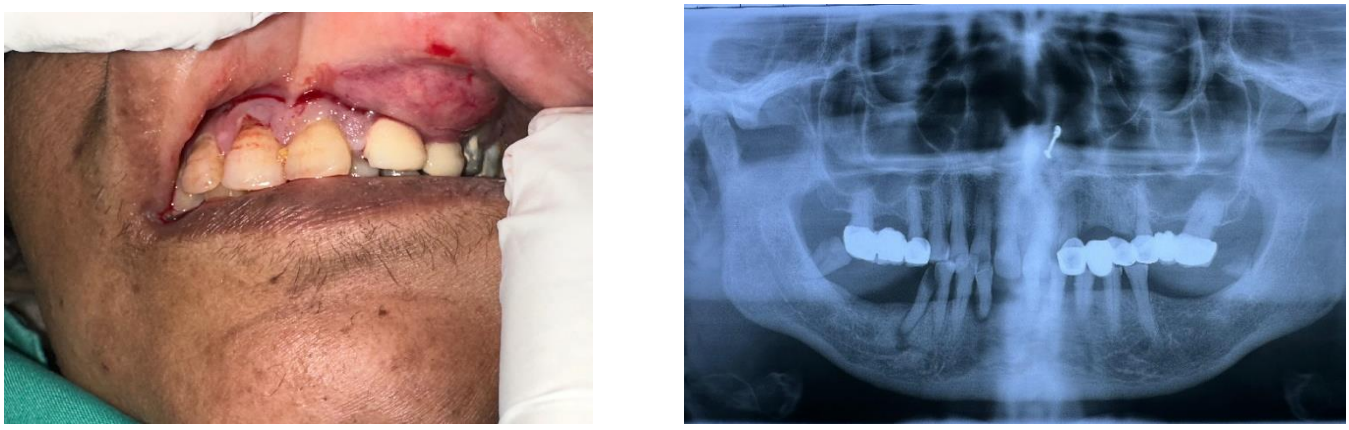
diagnosis of buccal space infection of odontogenic origin secondary to the carious maxillary molar was established. The patient underwent incision and drainage under local anesthesia, with adequate evacuation of purulent material. Postoperative care included antibiotic coverage and analgesics. The patient responded well to the treatment, and subsequent follow-up showed complete resolution of the infection. This case aligns with findings in recent literature that recognize maxillary molars as common sources of buccal space infections due to their close proximity to the buccinator muscle insertion (12).

Clinical and radiographic presentation of a patient with Buccal space infection

Case 2: Canine Space Infection

A 60-year-old woman with a medical history significant for breast cancer, currently undergoing radiotherapy, reported to the clinic with complaints of persistent facial swelling and pain on the left midface region for the past six days. The patient denied any systemic symptoms such as fever or malaise but reported gradual worsening of pain and discomfort. Clinical examination revealed a tender, warm, and indurated swelling in the region of the left nasolabial fold, suggestive of a canine space infection. Intraoral examination showed a fixed dental prosthesis (bridge) in the upper left quadrant. Radiographic assessment via orthopantomogram revealed periapical radiolucency around the left maxillary canine, indicating endodontic pathology. A diagnosis of left canine space infection was made, secondary to a concealed infection beneath the prosthetic bridge. Given the patient's immunocompromised state, incision and drainage were performed under local anesthesia, followed by intravenous antibiotic therapy. The patient was carefully monitored, and after clinical improvement, the prosthesis was removed to facilitate root canal therapy on the offending tooth. Timely intervention was crucial due to the patient's immunosuppressed condition, as such patients are at higher risk of complications from odontogenic infections (13,14).



Intra-oral picture and radiographic presentation of Canine space infection

Case 3: Buccal and Submandibular Infection

A 40-year-old female presented with complaints of pain and facial swelling over the lower left jaw region, which had developed over the preceding four days. The pain was described as throbbing, persistent, and exacerbated by chewing and jaw movement. Clinical examination revealed an indurated, warm, and tender swelling extending from the left buccal to submandibular region. Trismus was present, limiting mouth opening. Intraoral inspection identified a carious and tender lower left third molar with associated gingival inflammation. The swelling crossed the inferior border of the mandible, suggestive of involvement of both buccal and submandibular

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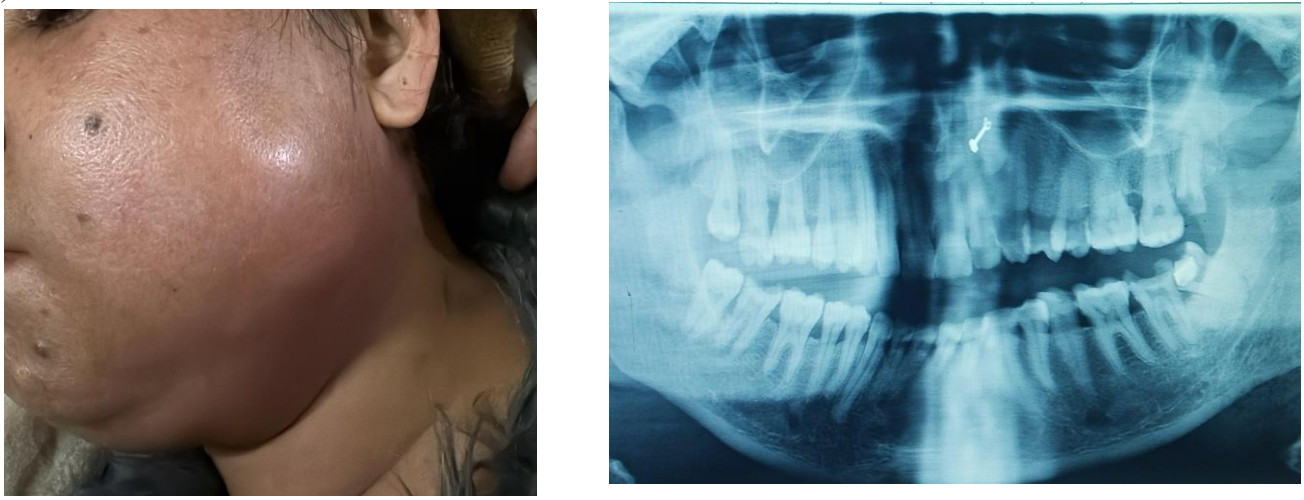
fascial spaces. Radiographic analysis confirmed the third molar's extensive decay with apical radiolucency, supporting the clinical diagnosis of a dual-space infection. Due to the extent of the infection and presence of trismus, incision and drainage were performed under general anesthesia, and the infected molar was extracted during the same procedure. Empirical intravenous antibiotic therapy was initiated and later tailored based on culture sensitivity results. The patient responded positively to treatment and showed marked improvement within days of intervention. This case reinforces the importance of early surgical management in multi-space infections, particularly those involving the submandibular space, which poses a higher risk of complications due to its proximity to vital structures (15,16).



Clinical examination and radiographic presentation of patient with buccal and sub-mandibular infection

TREATMENT / INTERVENTION

Case 1: Buccal Space Infection

The treatment approach for the patient with a buccal space infection secondary to a carious maxillary first molar involved prompt surgical intervention aimed at controlling the localized infection and preventing its spread. Under strict aseptic conditions and local anesthesia, an incision was made intraorally along the buccal vestibule to access the infected space. Upon incision, purulent discharge was noted and evacuated using blunt dissection and irrigation with saline. A rubber drain was placed to facilitate continued drainage, and systemic antibiotic therapy with amoxicillin-clavulanate and metronidazole was initiated postoperatively. The patient was advised on oral hygiene and prescribed analgesics for pain control. At 72-hour follow-up, significant reduction in swelling and improvement in pain were observed, with the drain subsequently removed. No adverse effects or complications were encountered, and the patient made a full recovery. This approach aligns with current guidelines that emphasize early drainage and source control in fascial space infections (12).

Case 2: Canine Space Infection

Given the patient's immunocompromised status due to ongoing radiotherapy for breast cancer, the management strategy for the left canine space infection was both timely and cautious. Local anesthesia was administered, and an intraoral incision was made in the canine fossa region to allow for decompression. Pus was drained and the cavity was thoroughly irrigated with antiseptic solution. A Penrose drain was positioned to maintain drainage. The patient was admitted for observation and administered empirical intravenous antibiotics including piperacillin-tazobactam due to the high risk of infection progression in immunosuppressed individuals. Once clinical improvement was noted, the patient was recalled for removal of the existing fixed bridge. The infected maxillary canine was accessed for root canal treatment, which was performed over two visits using rotary endodontic instrumentation and calcium hydroxide dressing. Final obturation was carried out following complete resolution of infection. The patient showed excellent post-treatment recovery, and the infection did not recur during follow-up. This staged, multidisciplinary approach underscored the need for tailored intervention in medically compromised patients to reduce complications and improve outcomes (13,14).

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Case 3: Buccal and Submandibular Infection

In this case involving dual-space infection, the decision was made to proceed with surgical management under general anesthesia due to the extent of the swelling, patient discomfort, and limited mouth opening. The procedure began with extraoral and intraoral incisions in the buccal and submandibular regions respectively. Blunt dissection was used to break down loculations, and purulent material was evacuated from both fascial planes. The carious lower left third molar, identified as the source of infection, was extracted in the same surgical session. Postoperative management included intravenous antibiotics—ceftriaxone and metronidazole—and adequate hydration, analgesia, and anti-inflammatory therapy. The patient remained hospitalized for 48 hours for close monitoring. Drains were removed once output decreased and signs of infection subsided. The recovery was uneventful, and no systemic complications were recorded. This aggressive yet necessary approach is supported by current recommendations for multi-space infections, especially when airway compromise or systemic spread is a concern (15,16).

OUTCOME AND FOLLOW-UP

Case 1: Buccal Space Infection

Following the surgical intervention involving incision and drainage, the patient demonstrated rapid clinical improvement. Within 48 hours, facial swelling had notably decreased, and pain levels subsided significantly with supportive antibiotic and analgesic therapy. By the one-week follow-up, the swelling had completely resolved, and there was no residual tenderness or functional impairment. The drain was removed on the third postoperative day, and no purulent discharge or secondary infection was observed thereafter. At the one-month follow-up, the surgical site was fully healed, and the patient had resumed normal oral functions without recurrence of infection. This favorable outcome aligns with standard recovery timelines reported in literature for localized buccal space infections managed promptly with source control and drainage (12).

Case 2: Canine Space Infection

The patient responded well to surgical drainage and systemic antibiotic therapy despite her immunocompromised condition. Swelling and tenderness began to diminish within 72 hours post-intervention, and her pain levels decreased markedly. During hospitalization, inflammatory markers showed a downward trend, and the patient's clinical condition stabilized. By the ten-day follow-up, the intraoral swelling had completely resolved, and the drain was removed without incident. Subsequent bridge removal and root canal treatment were performed successfully, with no procedural complications. At the three-month follow-up, the tooth remained asymptomatic and radiographically stable, with no signs of reinfection or periapical pathology. Given the patient’s compromised immune status, this outcome was better than anticipated and demonstrates that timely intervention and coordinated dental-medical care can yield optimal results even in high-risk individuals (13,14).

Case 3: Buccal and Submandibular Infection

Postoperative recovery was uneventful in this patient who underwent dual-space drainage and extraction of the infected third molar. Facial swelling began to recede within 72 hours of the procedure, and complete resolution was noted by the end of the first week. The drains were removed on the fourth postoperative day, and the extraction socket showed healthy healing. No complications such as hematoma, reinfection, or impaired mandibular function were reported. The patient was reviewed at one month and again at three months, during which she remained symptom-free with no evidence of residual or recurrent infection on clinical or radiographic assessment. The healing course and lack of complications were consistent with outcomes documented for early and aggressive intervention in multi-space odontogenic infections (15,16).

DISCUSSION

The present case series highlights three distinct presentations of odontogenic fascial space infections—buccal, canine, and combined buccal-submandibular involvement—each managed successfully through timely surgical intervention and antimicrobial therapy. These cases collectively underscore the diversity of clinical manifestations and anatomical complexity associated with deep space infections of dental origin, while also emphasizing the critical role of early diagnosis and tailored treatment in preventing systemic spread and morbidity. The first case involved a 40-year-old female diagnosed with a buccal space infection stemming from a carious maxillary first molar. Notably, the swelling was described as brany and indurated, indicating early fascial space involvement without abscess

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fluctuation. This presentation aligns with previously reported cases, including that of a 7-year-old male who developed a buccal space infection following pulpectomy of a deciduous second molar. In that case, the swelling extended from the angle of the mouth to the angle of the mandible, despite prior dental treatment, demonstrating how rapidly odontogenic infections can progress when confined spaces such as the buccal space are involved (17,18). Comparatively, the present case underscores the importance of recognizing subtle clinical signs early—even in adult patients—to prevent more extensive facial space involvement.

The second case highlighted a 60-year-old immunocompromised woman undergoing radiotherapy, who presented with a canine space infection of the left maxilla. The infection was traced to a tooth concealed beneath a fixed bridge, illustrating the diagnostic challenges that prosthetic restorations can pose. This case bears resemblance to a previously reported scenario involving a 54-year-old male who presented with bilateral swelling in the upper anterior maxillary region. Radiographic imaging revealed periapical pathology associated with both maxillary canines, and a diagnosis of canine space infection was established (19). Both cases required incision and drainage; however, the current patient's immunosuppressive status introduced additional complexity, reinforcing the need for heightened clinical vigilance and aggressive management in at-risk populations. The third case involved a 40-year-old female with a dual-space infection—buccal and submandibular—originating from a carious mandibular third molar. This extensive spread necessitated general anesthesia for incision, drainage, and tooth extraction, which proved effective. A comparable case reported in the literature described a 60-year-old male who developed bilateral mandibular swelling following the extraction of a carious first premolar with a periapical abscess (20). That patient's symptoms included pain on palpation and limited mouth opening, and a diagnosis of submandibular and submental space infection was made. Similar to the current case, surgical drainage and antibiotics facilitated recovery. These parallels demonstrate that even after removal of the infection source, residual infection in fascial spaces may require aggressive surgical management, particularly when involving multiple compartments.

The underlying pathophysiology of fascial space infections is rooted in the anatomical continuity of facial planes and the presence of loose areolar tissue, which facilitates the spread of odontogenic pathogens. Immunological status, oral hygiene, and access to timely dental care are crucial factors that influence both the onset and progression of such infections (21). In the cases presented, the favorable outcomes can be attributed to prompt diagnosis, anatomical localization through imaging, and timely incision and drainage—interventions supported by current best practices in oral and maxillofacial infection management (22). While these cases provide valuable clinical insights, several limitations must be acknowledged. As single-patient reports, they cannot establish causality or generalizability. Additionally, no standardized outcome scoring system was applied to assess resolution, and long-term outcomes beyond three months were not monitored. Nevertheless, the strength of this series lies in its demonstration of varied anatomical presentations and successful therapeutic strategies, particularly in the context of immunosuppression and delayed presentations. Future research should focus on prospective cohort studies and randomized trials that explore optimized antibiotic regimens, role of imaging modalities in early detection, and minimally invasive drainage techniques. There is also a need to investigate the impact of patient education and access to dental care on the incidence of advanced odontogenic infections, especially in underserved populations.

CONCLUSION

This case series emphasizes the clinical significance of early identification and precise management of odontogenic infections to prevent their progression into deep fascial space involvement. Each case illustrated a different anatomical manifestation—buccal, canine, and buccal-submandibular infections—arising from untreated or inadequately treated dental pathology. The outcomes reaffirm the necessity for timely intervention, especially in immunocompromised individuals or those with delayed presentation, to avoid life-threatening complications such as cellulitis or Ludwig's angina. These cases serve as a reminder for clinicians to maintain a high index of suspicion for fascial space involvement when evaluating dental infections and to adopt a multidisciplinary and evidence-based approach in their management. Future studies should explore the predictors of spread and long-term outcomes in such infections to better inform clinical protocols.

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AUTHOR CONTRIBUTION

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Talha Ahmad	Literature review
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Javeria Lateef	Literature review & Manuscript write-up
Maria Jabbar	Data Collection, concept and design & manuscript write-up
Muhammad Abdullah	Literature review
Hira butt*	Data Collection, concept and design, Manuscript write-up, critical revision, supervision and final approval

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