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Case Report

Periapical Periodontitis Presenting as a Cervical Mass: A Case Report with Long-term Follow-Up

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Abstract

Background: Odontogenic infections of the head and neck region are clinically significant due to their proximity to vital structures. Periapical lesions from untreated dental caries or trauma, may progress beyond the periapical area into deep fascial spaces of the neck, leading to cellulitis, abscess formation, or potentially life-threatening complications such as Ludwig's angina.

Case Presentation: A 20-year-old female patient who presented with recurrent pain and firm swelling on the right side of her neck, ultimately identified as being caused by a periapical periodontitis infection originating from a mandibular right lateral tooth (#26). Despite undergoing multiple neck surgeries over a 5-month period, the underlying dental cause remained undiagnosed. Root canal therapy on the affected tooth successfully resolved both the dental infection and the recurrent neck swelling. The patient was followed up for 7 years with no recurrence of the symptoms.

Conclusion: Odontogenic diseases, particularly those emerging from periapical lesions, may spread into deep cervical spaces and cause serious complications. Timely conclusion, proper dental care, and multidisciplinary administration are crucial to prevent life-threatening outcomes. The present case emphasizes the require for exact determination, successful treatment, and close follow up in achieving complete recovery

Key Words: Abscess; Case Reports; Diagnosis, Head and Neck Infections; Odontogenic Infections; Periapical Periodontitis; Root Canal Therapy; Treatment Outcome.

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Introduction

Inflammatory conditions of the head and neck, particularly those originating from odontogenic sources, are a notable cause of morbidity and potential mortality due to their proximity to critical anatomical structures and the ability of infections to spread rapidly [1, 2]. Periapical lesions, commonly associated with untreated dental caries or trauma, often lead to localized infections which, if left unaddressed, can extend into deeper soft tissues and spaces in the neck, manifesting as cellulitis, abscesses, or even life-threatening conditions such as Ludwig's angina [3, 4]. Periapical abscesses are typically confined to the apical region of a non-vital tooth but can result in more complex infections when the surrounding tissues are affected, especially in the mandibular arch due to its proximity to critical anatomical structures [5].

The mandibular region is a critical site for infections. Due to the anatomical proximity of the teeth to the submandibular and sublingual spaces, the infection can rapidly spread to these areas, causing extensive inflammation and swelling [6]. Infections in these spaces may also involve the masticator and parapharyngeal regions, leading to the further exacerbation of symptoms and complications. As the

infection advances, symptoms such as fever, trismus, dysphagia, and significant facial and neck swelling can occur, making diagnosis and management more complex [3]. A crucial aspect of these infections is the immune response, particularly the role of lymphadenopathy in the neck [5]. When a dental infection occurs, such as apical periodontitis, bacteria trigger an immune reaction, which leads to the recruitment of immune cells [7]. Dendritic cells from the dental pulp migrate to regional lymph nodes, where they present antigens to T-cells, thus activating the adaptive immune system [8]. This process often results in lymphadenitis, or inflammation of the lymph nodes, which manifests as swelling in the neck. The lymph nodes act as filters, trapping bacteria and pathogens, helping prevent the spread of infection. Swollen lymph nodes, often called "swollen glands," signal that the immune system is actively trying to contain the infection [9] . Persistent or severe lymphadenopathy, however, may indicate that the infection has become more chronic or widespread, necessitating further medical intervention. Severe infections can cross facial planes and extend into multiple deep cervical spaces, posing risks of airway compromise or mediastinal spread, significantly impacting prognosis [10, 11]. Despite the growing understanding of the pathophysiology of these infections, timely diagnosis remains crucial. Misdiagnosis is common due to symptom overlap with other conditions such as temporomandibular joint disorders or skin lesions, which can lead to delayed treatments or unnecessary interventions [12, 13].

Despite extensive knowledge on odontogenic infections, cases illustrating the progression of periapical lesions in anterior mandibular teeth leading to extensive cervical inflammation remain underreported. Reporting such cases provides valuable insight into diagnostic challenges, immune response, and effective management strategies, highlighting the importance of early recognition and multidisciplinary intervention.

This case report explores an instance of significant inflammation in the neck area, originating from a periapical lesion on the right lateral mandibular incisor, highlighting the diagnostic process and therapeutic interventions required for successful resolution of such infections.

Case Presentation

A 20-year-old female presented with complaints of pain and swelling on the right side of her neck. She had a history of recurrent neck swelling over the past 5 months, which had led to two previous surgical interventions aimed at treating the inflamed neck region. However, each surgery was followed by a relapse of the swelling, and the underlying cause of the pain remained undiagnosed. The patient did not have any significant systemic medical conditions and was otherwise healthy. She reported that the firm swelling and discomfort were localized to the right side of her neck, with no other signs of systemic infection such as fever, malaise, etc. (Fig 1). Despite undergoing surgical procedures to remove the swollen tissue, the recurrent nature of her symptoms raised suspicion for a deeper, undiagnosed condition.

Upon examination and further investigation, a periapical X-ray of the patient's dental structure was obtained. The radiographic image revealed that the mandibular right lateral incisor showed signs of a periapical lesion, suggestive of periapical periodontitis (Fig 2). The lesion, measuring 15.86mm × 14.50mm, was found to be associated with a localized dental infection that had spread into the neck area, causing the swelling and persistent pain (Fig 3). Notably, the mandibular incisors in this patient presented an additional lingual canal (Vertucci's Type-Ⅳ), which was particularly difficult to locate due to its smaller and more concealed nature. This anatomical variation could have complicated access during treatment, potentially leading to incomplete cleaning and treatment failure. Based on the patient's symptoms, medical history, and diagnostic imaging, the diagnosis of periapical periodontitis with secondary spread of infection to the cervical region was established.

The patient was referred to an endodontist for appropriate management of the dental infection. Non-surgical root canal treatment (NS-RCT) was contemplated and initiated for the patient. During the initial visit, the canal was cleaned and thoroughly rinsed with a 5.25% sodium hypochlorite (NaOCl) solution, delivered through a side-vented 30-gauge irrigation needle. A smooth paste made of calcium hydroxide mixed with saline was then placed into the canal spaces after thorough mechanical

Figure 1. Intraoral and extraoral images, year 2013

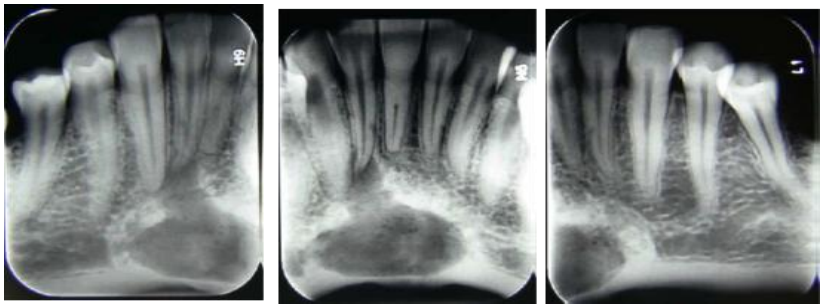
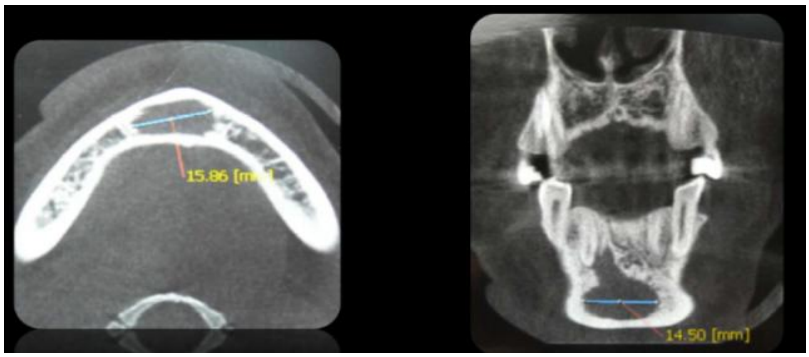


Figure 2. Periapical radiographs representing a well-defined radiolucent lesion



A **B**

Figure 3. CBCT images of lesion, year 2013

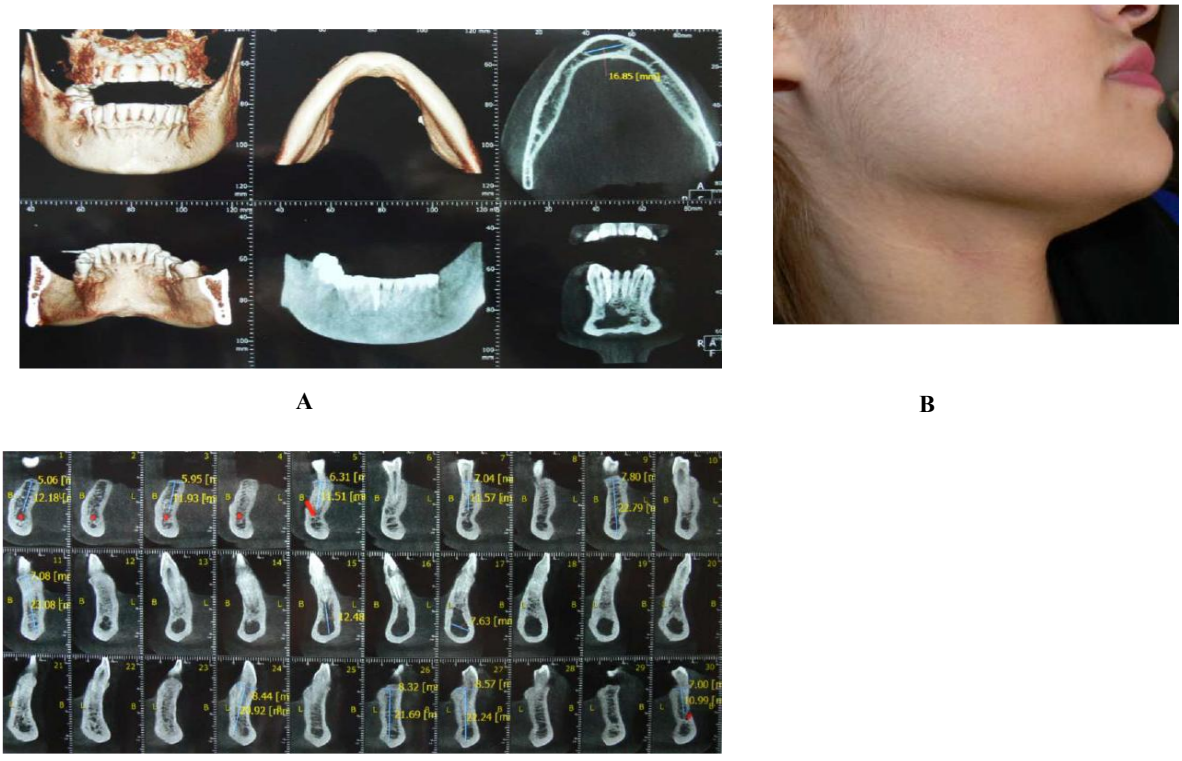
prep aration of the root canal system. Two weeks later, the canal was further disinfected using passive ultrasonic activation with the same 5.25% NaOCl solution. A triple antibiotic paste (TAP), consisting of ciprofloxacin, metronidazole, and minocycline in equal proportions (1:1:1), was applied as an intracanal medication. After one week, the medication was removed, and the canal was dried using sterile paper points (company, country). It was then filled with 0.02 tapered gutta-percha points (Meta BioMed, country) and AH26 root canal sealer (Dentsply, Maillefer, country) using cold lateral compaction technique. Finally, the tooth was permanently restored with a composite resin material (company, country) (Fig 4).

The patient was monitored after the treatment on a regular basis. Over the course of 6 months, the neck swelling gradually subsided, and the pain resolved completely. After completing the root canal therapy, the patient showed significant improvement, and the need for any additional neck surgeries was ruled out. Following the root canal therapy, the patient was

advised to return for routine follow-up visits. Over the 24 months, the cervical swelling progressively diminished until it completely resolved (Fig 5). The patient was reassured that no further surgical intervention for the neck was necessary. The dentist and the attending otorhinolaryngologist agreed that the infection was fully controlled. To ensure the long-term resolution of the issue, the patient continued follow-up care for the next 7 years. During this period, there was no recurrence of neck swelling or any other symptoms related to the previous dental infection (Fig 6). The patient remained asymptomatic, and the periapical periodontitis was considered resolved.

A B

Figure 4. (A)Occlusal and (B)Panoramic images. Year 2013



A B C

Figure 5. (A, B) CBCT images. C)Extra-oral image. Year 2015

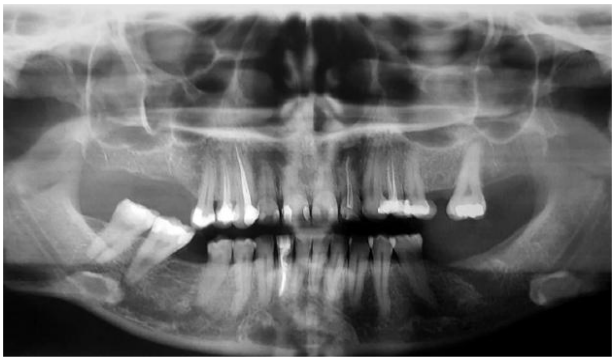


Figure 6. Panoramic image, year 2020

Discussion

Inflammatory conditions arising from odontogenic sources, particularly those involving periapical lesions, are significant contributors to head and neck morbidity [14]. As illustrated by this case, the potential for these infections to spread to deeper cervical spaces can result in complex and potentially life-threatening conditions as well as unnecessary treatments due mainly to misdiagnosis of the underlying etiology. The spread of infection from the periapical region, especially in the mandibular arch, is of utmost importance due to its anatomical proximity to critical structures, including the submandibular, sublingual, and masticator spaces [5, 15]. In this case, the patient's recurrent neck swelling, despite previous surgical interventions, ultimately pointed to a dental origin, which was confirmed through radiographic evidence of periapical periodontitis.

The pathophysiology of infections originating from the periapical region often involves the spread of bacteria (e.g. *Bacteroidetes*, *Firmicutes*, *Spirochaetes*, *Fusobacteria*, *Actinobacteria*, *Proteobacteria*) from the infected pulp into the surrounding soft tissues, causing inflammation and swelling [16, 17]. Bacteria can trigger an immune response that involves recruiting immune cells like neutrophils, macrophages, and lymphocytes to the infected site. As part of this immune response, dendritic cells from the dental pulp migrate to regional lymph nodes, where they present antigens to T-cells, activating the adaptive immune system. This process can lead to lymphadenitis, or inflammation of the lymph nodes, which is often observed as swelling in the neck area and spread of the infection along tissue pathways to areas of drainage [18]. This case emphasizes the importance of early detection and appropriate management of dental infections, which, if left untreated, may progress into more severe conditions such as cellulitis, abscess formation, and even Ludwig's angina [19].

The recurrent nature of the patient's symptoms raised concern for a deeper, undiagnosed condition, highlighting a common diagnostic challenge. The overlap of symptoms between odontogenic infections and other conditions may obscure the underlying dental origin of disease [20-22]. In this case, the correct diagnosis of periapical periodontitis with secondary cervical infection was made after a thorough evaluation, including a periapical X-ray, which revealed the lesion on the right lateral incisor. Radiographic imaging plays a crucial role in diagnosing periapical infections and in assessing the extent of the lesion, enabling appropriate treatment planning [23].

Several similar reports have described the progression of periapical lesions into deep cervical spaces, illustrating comparable diagnostic challenges and management strategies. For example, Ismi et al. reported several difficult cases of odontogenic deep neck infections, where delayed recognition of the dental source led to extensive soft tissue involvement [24]. Similarly, Furst et al. (2001) presented a case of Ludwig's angina arising from an untreated tooth abscess, in which delayed diagnosis and lack of early dental consultation led to severe airway compromise [25]. Both reports reinforce the critical importance of prompt identification and management of odontogenic infections to prevent life-threatening complications. Compared to these reports, the present case demonstrates recurrent cervical swelling despite prior interventions, highlighting the critical role of thorough dental evaluation to identify the primary odontogenic source.

The management of periapical periodontitis with secondary soft tissue involvement, as seen in this case, often requires a multidisciplinary approach involving both dental and medical professionals [26, 27]. RCT is the definitive treatment for periapical abscesses, aiming to eliminate the source of infection and prevent further spread [28]. In this case, the RCT, which included meticulous cleaning and

disinfection of the root canal, was successful in controlling the infection. The use of a triple antibiotic paste (TAP) further ensured the elimination of bacteria such as *Streptococcus*, *E. faecalis*, and *Actinomyces* within the canal and provided effective intra-canal medication [29]. Post-treatment monitoring showed a significant resolution of the patient's symptoms, with the complete resolution of neck swelling, confirming the efficacy of the dental intervention.

Despite the successful clinical outcome, several limitations should be acknowledged. The diagnosis of the underlying odontogenic origin was delayed despite recurrent neck swelling and multiple prior surgical interventions, highlighting a potential missed opportunity for earlier dental evaluation. Early periapical imaging or interdisciplinary consultation with dental professionals could have expedited diagnosis and potentially prevented unnecessary procedures. Additionally, while RCT ultimately resolved the infection, the prolonged diagnostic timeline underscores the challenges in differentiating odontogenic infections from other head and neck conditions. Recognizing these limitations emphasizes the importance of a comprehensive, multidisciplinary approach in managing complex cervical infections of dental origin.

The case also underscores the importance of follow-up care in ensuring the long-term resolution of odontogenic infections. Regular monitoring after RCT is essential to detect any recurrence of infection early, as infections that remain unresolved or undiagnosed can lead to complications in other anatomical regions [30, 31]. In this case, the patient remained asymptomatic over the seven years following treatment, with no recurrence of neck swelling or dental infection, illustrating the effectiveness of timely intervention and follow-up care in preventing further complications.

Conclusion

In conclusion, odontogenic infections, particularly those involving periapical lesions, pose a significant risk of spreading to deeper cervical spaces, leading to severe complications if not promptly diagnosed and managed. Early identification, appropriate dental treatment, and multidisciplinary management are critical in preventing life-threatening conditions and ensuring complete recovery. The successful resolution of the infection in this case highlights the importance of thorough diagnostic procedures, effective treatment strategies, and long-term follow-up in managing odontogenic infections.

Declarations

Ethical Approval and Consent to Participate

Ethical approval was not required for this case report in accordance with local institutional policies, as it described a single patient without experimental intervention. Written informed consent was obtained from the patient for participation and for the publication of clinical details and any accompanying images. The patient's anonymity was strictly preserved, and no identifying information was included in the report. All procedures were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the principles of the Declaration of Helsinki.

Competing Interests

The authors declared that they had no competing interests. The authors reported no financial, personal, or professional relationships that could have been perceived to influence, or that could have appeared to influence, the work reported in this case study. No funding, sponsorship, or external support was received from any organization that had a direct or indirect interest in the subject matter of this report. The clinical evaluation, diagnosis, management, interpretation of findings, and preparation of the manuscript were conducted independently without any commercial or institutional bias. All authors confirmed that they had no conflicts of interest related to the materials, methods, or conclusions presented in this article.

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influence.

Authors' Contributions

Arvand Malek (A.M.) contributed to the conception and design of the case report, performed the endodontic treatment, managed the clinical case, and was the primary contributor in drafting and critically revising the manuscript. Hadi Assadian (H.A.) contributed to clinical supervision, interpretation of findings, and critical revision of the manuscript for important intellectual content. Tara Naghshbandi (T.N.) contributed to data collection, literature review, and manuscript preparation. Zeynab Afzali (Z.A.) contributed to literature review, documentation of clinical data, and assisted in manuscript drafting. All authors read and approved the final manuscript and agreed to be accountable for all aspects of the work.

Declaration of Generative Artificial Intelligence (AI) Utilization

The authors declared that generative artificial intelligence (AI) tools were not used in the conception, data collection, clinical management, analysis, or interpretation of this case report. AI-based tools were used solely in the final stages of manuscript preparation to improve language clarity, grammar, and readability, without generating or altering any clinical content or scientific interpretation. All clinical decisions, documentation, and intellectual content were developed and verified by the authors. The authors took full responsibility for the accuracy, integrity, and originality of the final manuscript.

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