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CASE REPORT

When a diagnostic challenge reveals a simple diagnosis: the role of the operating microscope in Oral Medicine – a case report

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Abstract:

Magnification has been widely established in some fields of dentistry. However, its use in Oral Medicine is still incipient, and the available literature is scarce. This report describes the case of a 25-year-old male patient who was referred to our Oral Medicine clinic after a two-year diagnostic delay, presenting with a nodular lesion in the anterior maxilla and a history of severe pain and purulent drainage. Conventional radiographic examination was inconclusive, while cone-beam computed tomography and ultrasonography suggested either a cystic lesion or a chronic inflammatory process but failed to identify a clear etiological factor. During exploratory microsurgery, the magnification and illumination provided by the dental operating microscope facilitated the identification of an untreated accessory canal, while histopathological analysis confirmed a lateral radicular cyst. In this case, conventional clinical and imaging examinations were insufficient to establish a definitive diagnosis. The dental operating microscope functioned as a valuable complementary tool during exploratory surgery, enabling identification of the lesion's underlying cause and supporting appropriate referral for treatment. This case highlights the potential value of magnification as a diagnostic adjunct in Oral Medicine.

Keywords: Magnification; Oral medicine; Dental operating microscope; Case report.

INTRODUCTION

Oral cavity examination has long been a challenge for dental professionals[1]. Effective assessment and treatment of oral conditions depend on achieving a clear and broad visualization of the area of interest and enhanced visual acuity is therefore essential for comprehensive oral cavity inspection[2,3]. Within this context, magnification offers practitioners the means to increase their observational capabilities. Certain specialties in dentistry, such as endodontics and periodontics, have demonstrated and acknowledged the benefits associated with the use of surgical loupes and dental operating microscopes (DOM), including better visualization, precision, gentle tissue manipulation, and predictability[3,4].

Although magnification techniques are widely used in these areas, only few studies have suggested that surgical loupes could be beneficial for the diagnosis and treatment of oral mucosa lesions[5,6]. Some authors also describe the use of colposcopes for evaluating oral mucosa and oral lesions, especially oral potentially malignant disorders[7,8,9]. The aim of this case report is to describe the potential role of DOM as complementary tool during diagnosis, surgical exploration, and biopsy in Oral Medicine.

Statement of Clinical Significance
This case highlights that a straightforward diagnosis may emerge from a complex diagnostic pathway. In Oral Medicine, when persistent symptoms and inconclusive clinical and imaging findings fail to reveal etiology, the dental operating microscope may play a decisive role.

CASE REPORT

A 25-year-old male patient was referred to the Oral Medicine clinic for evaluation after a two-year history of severe pain associated with recurrent purulent exudate drainage. Extraoral examination showed no significant alterations. Intraoral examination revealed

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a nodular lesion that was firm upon palpation and measured 1 cm on the gingiva and oral mucosa in the anterior segment of the maxilla without gingival probing depth (Figure 1A–C).

Despite a satisfactory radiographic result following endodontic treatment 4 years earlier (Figure 1D–E), a cone-beam computed tomography (CBCT) scan ordered 6 months ago by another dentist revealed buccal bone loss in the coronal and mid-third of the root of the maxillary right central incisor. There was no evidence of a periapical lesion. His medical history revealed arterial hypertension regularly treated with amlodipine and hydrochlorothiazide, and previous anemia.

During this two-year period, the patient was evaluated on multiple occasions by endodontic specialists, and the nodular swelling with recurrent purulent drainage was initially interpreted as a parulis of presumed endodontic origin. However, despite the persistence of symptoms, the specialists subsequently considered an endodontic etiology unlikely because of the favorable CBCT and radiographic findings. A recent periapical radiograph of the maxillary central incisors confirmed this assessment, showing technically sound root canal treatment, no evident signs of periapical pathosis, and normal appearance of alveolar bone (Figure 1E). Considering the patient's history and the lack of substantial clinical and radiographic evidence of periodontal or endodontic involvement, the patient underwent a new CBCT (OP300; Instrumentarium, Finland) using the Endo protocol (90 kV, 10 mA, 6x4 cm FOV, 85 µm voxel size, and metal artifact reduction tool) and ultrasonography (EVUS5; SAEVO, Ribeirao Preto, Brazil) examinations. CBCT confirmed the buccal cortical bone loss in the maxillary right central incisor up to the apical third, which appeared to be associated with

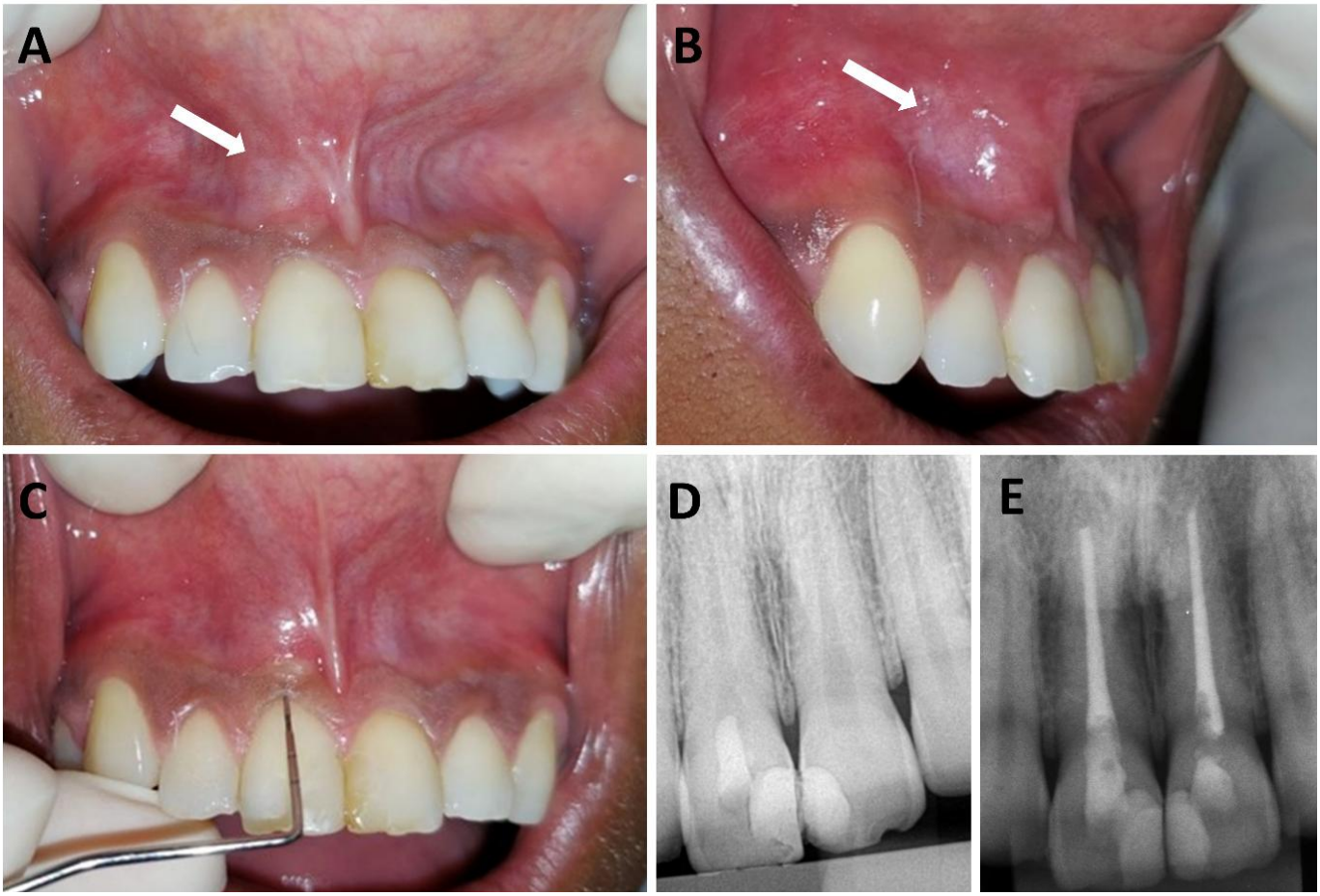

Figure 1. Initial frontal and lateral photographs showing a nodular lesion (arrows) that measured approximately 1 cm over the root of the maxillary right central incisor (**A** and **B**). Normal probing depth (**C**). Periapical radiographs before (**D**) and 04 years after endodontic treatment (**E**), showing technically sound obturation, no evident signs of periapical pathosis, and normal alveolar bone appearance.

a hypodense unilocular lesion with a diffuse sclerotic rim and sparse hyperdense flecks (Figure 2A–C).

Ultrasonographic evaluation demonstrated a unilocular, anechoic image characterized by subtle posterior acoustic enhancement. The lesion exhibited well-defined contours, with its superficial boundaries located within the oral mucosa. Additionally, hyperechoic debris or fragments were identified within the lesion itself. Color Doppler imaging further revealed an absence of internal vascularization, while peripheral vascularization was detected in the more superficial portion of the lesion's contour (Figure 2D–E). The imaging findings thus suggested either a cystic lesion or a chronic inflammatory process. Therefore, although CBCT and ultrasonography contributed to the morphological characterization of the lesion, neither examination identified its etiological source. The differential diagnoses included root fracture, cemental tear, connective tissue neoplasm, small salivary gland tumor, and untreated accessory root canals.

After extensive deliberation, exploratory surgery and biopsy were proposed as a last resort to establish a definitive diagnosis through histopathological analysis. Given the increased risk of esthetic impairment, this approach was performed by a periodontist with microsurgery training using a DOM (M900; DFVasconcellos, Rio de Janeiro, Brazil). An incision was made, preserving the lesion at the flap's movable portion, and buccal bone loss was confirmed (Figure 3A).

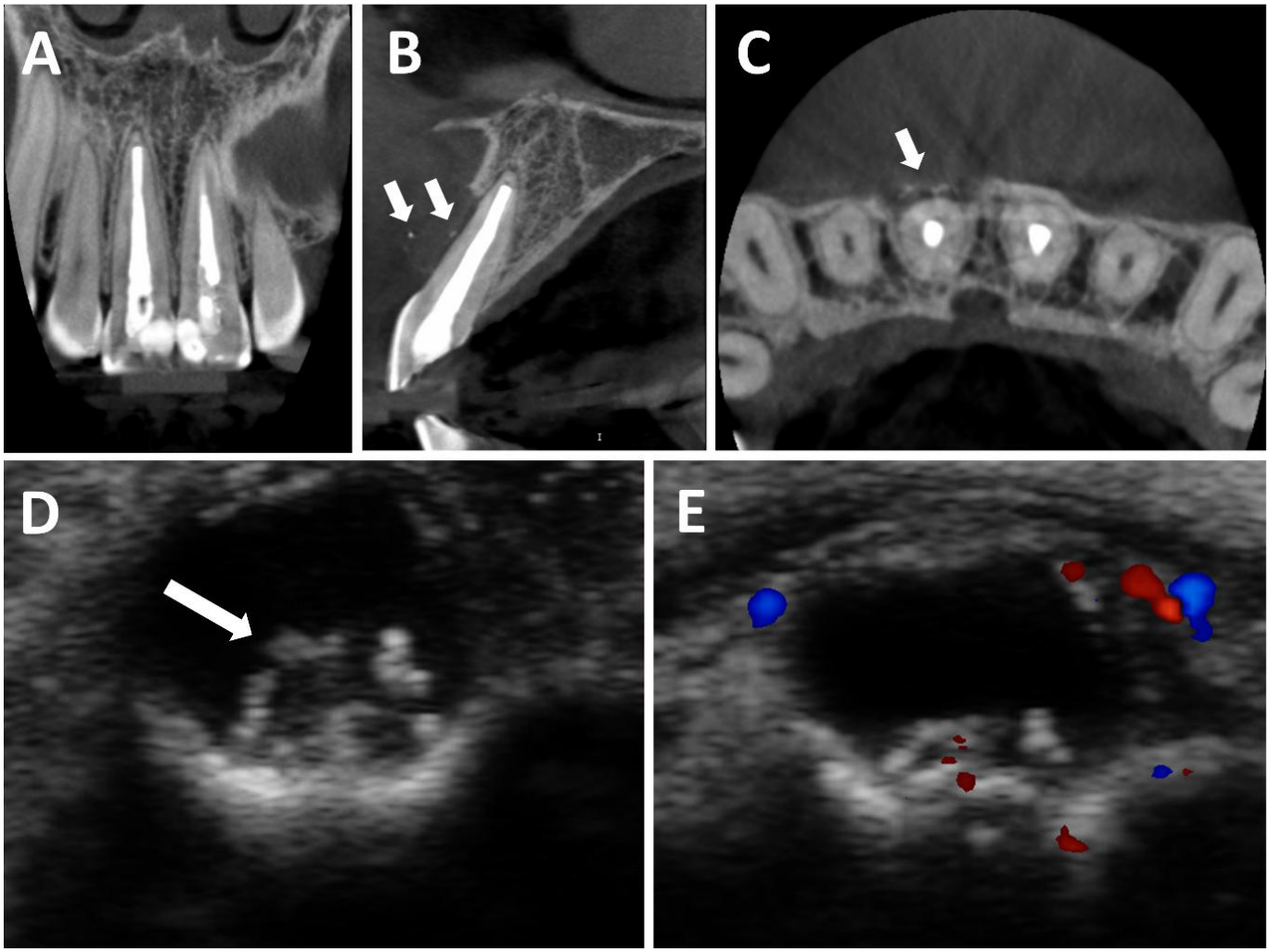

Figure 2. Coronal CBCT slice showing normal apical tissue in the maxillary central incisors (**A**). Sagittal and axial CBCT slices showing buccal bone loss in the coronal and middle thirds of the root of the maxillary right central incisor, associated with a hypodense unilocular lesion with a diffuse sclerotic rim and sparse hyperdense flecks (arrows) (**B** and **C**). Ultrasonographic image showing an unilocular, anechoic lesion with subtle posterior acoustic enhancement, well-defined contours, superficial boundaries in the oral mucosa, and hyperechoic debris or fragments (arrow) within the lesion (**D**). Color Doppler imaging shows absence of internal vascularization and presence of peripheral vascularization in the more superficial portion of its contour (**E**).

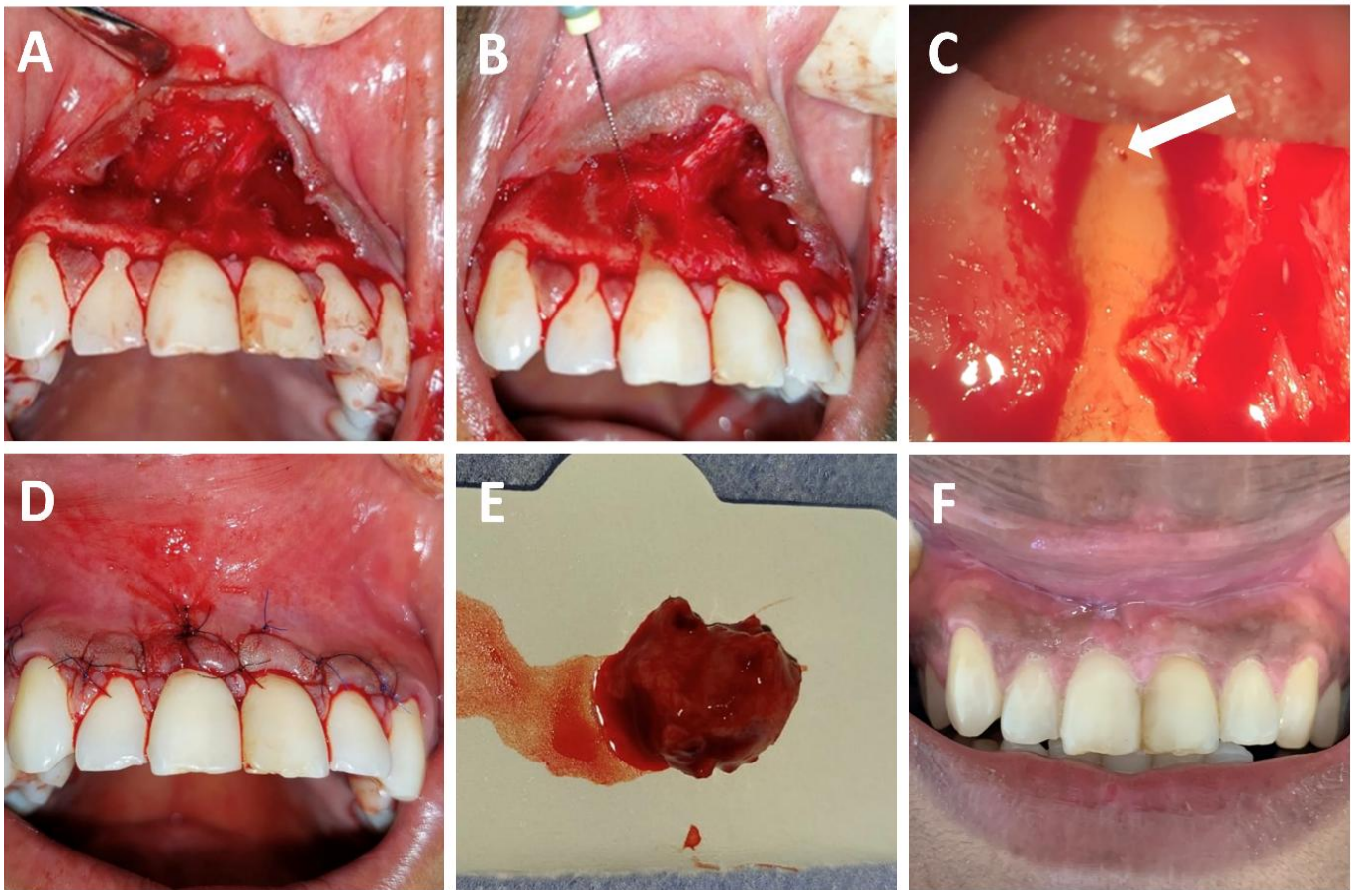

Figure 3. Full-thickness flap with preservation of the lesion in its mobile part (**A**). Insertion of an endodontic #8 K-file into the untreated accessory canal (**B**). Microscopic photograph at 16x magnification displaying the untreated accessory canal (arrow) in the apical portion of the bone defect (**C**). Repositioning of the flap and microsutures (**D**). Excised lesion (**E**). 15 days postoperatively showing excellent tissue repair (**F**).

Figure 4. Histologic section showing a cystic cavity lined by nonkeratinized stratified squamous epithelium and a fibrous connective tissue capsule with chronic inflammatory infiltrate. Hematoxylin and eosin staining; 5x objective.

Under coaxial illumination and 2.5-16x magnification, careful inspection of the root surface revealed a small opening in the middle third of the root, within the apical portion of the bone defect. Its exploration with a #8 K-file supported its identification as an untreated accessory canal (Figure 3B–C). After complete removal of the lesion, the surgical site was cleaned, and the flap was repositioned with micro sutures (Figure 3D). The patient received prescriptions of antibiotics, steroidal anti-inflammatory medication, and an antimicrobial mouth rinse. The tissue showed excellent healing 15 days after surgery (Figure 3F). The clinical findings suggested a persistent endodontic infection. The histopathological findings were compatible with a lateral radicular cyst (Figure 4). The patient was subsequently referred to endodontic microsurgery.

DISCUSSION

Although the final diagnosis was relatively straightforward, establishing it proved considerably more challenging. This case demonstrates that the complexity of a diagnostic pathway may exceed that of the final diagnosis itself. Multiple professionals, including endodontic specialists, employed conventional diagnostic methods such as clinical examination, radiographs, and CBCT imaging, yet the lesion's etiology remained elusive. Over a two-year period, the patient reported intense pain and intermittent purulent exudate drainage, findings that were suggestive, but not definitive, of an endodontic infection[10]. Although conventional methods successfully identified the consequence (i.e., the lesion), they failed to determine its cause (i.e., the untreated accessory root canal), even with the CBCT assessment. Consequently, the diagnostic process became prolonged and required consideration of a broad and atypical differential diagnosis, including vertical root fracture, cemental tear, accessory root canal involvement, which had not been confirmed in previous assessments, connective tissue neoplasm, and small salivary gland tumors.

Among the odontogenic hypothesis considered, vertical root fracture was included because of the radiolucent/hypodense area adjacent to the root, a finding often reported 2–5 years after root canal treatment[11]. Similarly, cemental tear was suspected due to the hyperdense structure detected on CBCT scan. Clinically, both conditions show non-specific signs and symptoms that resemble endodontic and periodontal disease[11,12]. In the present case, however, the absence of an associated periodontal pocket was an unusual feature, possibly related to the distance between the lesion and the gingival margin. Another relevant hypothesis was accessory root canal involvement, since these anatomical variations can serve as a pathway for microbial communication between the pulp and the periodontium. Accessory canals are most commonly located in the apical third of the root (73.5%)[13], making them difficult to identify and treat. As discussed by Nair[14] and Siqueira Jr.[15], persistent microorganisms in these structures can contribute to endodontic failure, even in well-treated teeth[14,15].

In addition to odontogenic conditions, non-odontogenic lesions also had to be considered in the differential diagnosis. Connective tissue neoplasms and small salivary gland tumors were included because certain non-endodontic conditions may mimic inflammatory endodontic disease both clinically and radiographically. Accordingly, clinicians should consider non-odontogenic etiologies unless they can be definitively excluded[16,17]. In the anterior maxilla, lesions reported as mimicking endodontic infection include non-Hodgkin's lymphoma[17], hematolymphoid neoplasm[18], oral rhabdomyosarcoma[19], polymorphous adenocarcinoma[20], mucinous adenocarcinoma[21], osteosarcoma[22], and oral squamous cell carcinoma[23].

Despite repeated investigations, a definitive conclusion remained elusive. Although CBCT is recommended for the assessment of complex root canal anatomy[24], it was insufficient in the present case to identify the underlying cause of the lesion. This limitation may be attributed to resolution constraints and contrast artifacts, which jeopardize a more detailed observation, particularly in the presence of high-density materials such as root canal obturations, even when the metal artifact reduction tool is applied. Although a high-resolution protocol was adopted, CBCT detection of fine anatomical structures depends on their thickness relative to voxel size; in the present case, structures smaller than approximately 170 µm may not have been reliably depicted[25]. Ultrasonography, which has gained relevance in the evaluation of oral and maxillofacial lesions[26], contributed to lesion characterization by demonstrating a cystic-like image with internal hyperechoic debris, possibly related to obturation material. However, it also failed to detect the accessory root canal. This limitation may be explained by its remarkable sensitivity and specificity for soft tissues assessment, while being less effective in evaluating hard tissues[27].

The persistence of diagnostic uncertainty despite clinical and imaging assessment justified a more direct investigative approach. Exploratory surgery was therefore recommended as a final diagnostic step, with the aim of obtaining tissue for histopathological analysis while allowing direct inspection of the lesion site. In this context, magnification was incorporated to improve visualization of the root surface and lesion structure, thereby facilitating identification of its origin. Among the magnification devices described in the literature, colposcopes have been used in Oral Medicine, particularly for the evaluation of oral mucosal alterations and biopsy site selection[7–9]. However, their limited accessibility and maneuverability restrict their usefulness during intraoral surgical procedures[3,8]. By contrast, the dental operating microscope offers enhanced illumination and magnification, precise visual control, and ergonomic advantages, making it particularly suitable for microsurgical diagnostic exploration in anatomically delicate areas[28]. Similar advantages have also been reinforced

in recent literature, as demonstrated by Medeiros et al. (2025)[29], who reported its applicability in the diagnosis of localized juvenile spongiotic gingival hyperplasia[29].

Although magnification has been widely recognized in endodontics, particularly in microsurgical procedures[30], its diagnostic value in Oral Medicine remains poorly explored. In the present case, the DOM served as a valuable adjunct during surgical exploration and diagnostic clarification. By enabling meticulous tissue handling, preservation of lesion integrity, and detailed inspection of the exposed root surface, it allowed identification of the untreated accessory root canal that had not been detected by previous conventional assessments. The definitive diagnosis, however, resulted from the integration of the microsurgical and histopathological findings.

CONCLUSION

This report highlights the potential of enhanced visualization of normal and/or affected oral mucosa structures for improving the diagnostic process of oral lesions. In the present case, naked-eye clinical examination combined with imaging studies was insufficient to establish a definitive diagnosis. The incorporation of a dental operating microscope during surgical exploration and biopsy enhanced visualization of the root surface and facilitated identification of the lesion's underlying cause and subsequent treatment referral. Accordingly, further studies are warranted to clarify the role of magnification tools in the diagnosis and management of oral mucosal lesions.

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AUTHORS' CONTRIBUTIONS

PFF: Conceptualization, Methodology, Investigation, Visualization, Writing – original draft. HGA: Investigation, Visualization, Writing – review & editing. ACFM: Conceptualization, Investigation, Supervision, Visualization, Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

CONFLICT OF INTEREST STATEMENT

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Ethics approval: This case report received approval from the institutional Ethics Committees (CAAE: 85129724.6.0000.5419).

DATA AVAILABILITY STATEMENT

The data supporting this study's findings are available from the corresponding author upon reasonable request.

REFERENCES

1. Pradeep S, Vinoddhine R. The role of magnification in endodontics. Annals and Essences of Dentistry. 2014;6(2):38-43. https://doi.org/10.5958/0976-156X.2014.00023.9
2. Gogiya RJ, Chandak MG, Modi RR, Bhutda P, Kela S, Chandak RM. Magnification in dentistry: A review. Int J Appl Dent Sci. 2018;4(2):89-93.
3. Carr GB, Murgel CAF. The use of the operating microscope in endodontics. Dent Clin North Am. 2010;54(2):191-214. https://doi.org/10.1016/j.cden.2010.01.002
4. Shanelec DA, Tibbetts LS. A perspective on the future of periodontal microsurgery. Periodontol 2000. 1996;11:58-64. doi: 10.1111/j.1600-0757.1996.tb00183.x.
5. Tilaveridis I, Lazaridou M, Lazaridis N. The use of magnification and microsurgical instruments for the excision of lower lip mucoceles. J Oral Maxillofac Surg. 2011;69(5):1408-10. https://doi.org/10.1016/j.joms.2010.06.202
6. Zhang Y, Yuan P, Jiang H, Qiu X, Wang J, Luo X, et al. Application of medical magnifying loupes in diagnosis of oral mucosal diseases. Zhejiang Da Xue Xue Bao Yi Xue Ban. 2021;50(2):205-11. https://doi.org/10.3724/zdxbyxb-2021-0132
7. Gynther GW, Rozell B, Heimdahl A. Direct oral microscopy and its value in diagnosing mucosal lesions: a pilot study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000;90(2):164-70. https://doi.org/10.1067/moe.2000.105334
8. Ohri N, Kapoor C, Mohemmed RP, Vaidya S. An update on intraoral application of colposcopy. J Oral Maxillofac Pathol. 2014;18(3):403-10. https://doi.org/10.4103/0973-029x.151328
9. Mahmoud SAM, Latif MKA, Dahmoush HM, Hussein EA. Diagnostic accuracy of colposcopic examination in patients with oral dysplastic lesions. Oral Surg Oral Med Oral Pathol Oral Radiol. 2020;130(6):692-9. https://doi.org/10.1016/j.oooo.2020.08.019
10. Sanders JL, Houck RC. Dental Abscess. In: StatPearls [Internet]. Treasure Island: StatPearls Publishing; 2024 [cited on 2026 Feb 03]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK493149/

11. PradeepKumar AR, Shemesh H, Jothilatha S, Vijayabharathi R, Jayalakshmi S, Kishen A. Diagnosis of vertical root fractures in restored endodontically treated teeth: A time-dependent retrospective cohort study. J Endod. 2016;42(8):1175-80. https://doi.org/10.1016/j.joen.2016.04.012
12. Ong TK, Harun N, Lim TW. Cemental tear on maxillary anterior incisors: A description of clinical, radiographic, and histopathological features of two clinical cases. Eur Endod J. 2019;4(2):90-5. https://doi.org/10.14744/eej.2019.13007
13. Vertucci FJ. Root canal anatomy of the human permanent teeth. Oral Surg Oral Med Oral Pathol. 1984;58(5):589-99. https://doi.org/10.1016/0030-4220(84)90085-9
14. Nair PN. On the causes of persistent apical periodontitis: a review. Int Endod J. 2006;39(4):249-81. https://doi.org/10.1111/j.1365-2591.2006.01099.x
15. Siqueira JF Jr. Aetiology of root canal treatment failure: why well-treated teeth can fail. Int Endod J. 2001;34(1):1-10. https://doi.org/10.1046/j.1365-2591.2001.00396.x
16. Pimenta Carvalho S, Estrela C, Franco EV. Clinical Differential Diagnosis between Nonodontogenic and Endodontic Radiolucent Lesions in Periapical Location: A Critical Review. Iran Endod J. 2021;16(3):150-7. https://doi.org/10.22037/iej.v16i3.32572
17. Shilkofski JA, Khan OA, Salib NK. Non-Hodgkin's lymphoma of the anterior maxilla mimicking a chronic apical abscess. J Endod. 2020;46(9):1330-6. https://doi.org/10.1016/j.joen.2020.06.010
18. Wongpattaraworakul W, Krongbaramee T, Lanzel EA, Hellstein JW, Teixeira FB. Hematolymphoid neoplasm mimicking endodontic lesions: case series and review of the literature. Oral Surg Oral Med Oral Pathol Oral Radiol. 2024:139:e1-12. https://doi.org/10.1016/j.oooo.2024.07.011
19. Zheng FY, Qiu J-Y, Liao K-H, Lin N-C. Oral rhabdomyosarcoma, a rare malignant tumor mimicking an endodontic-periodontal lesion in an adult patient: a case report. BMC Oral Health. 2024;24(1):92. https://doi.org/10.1186/s12903-024-03875-w
20. Srirangarajan S, Shashidara R, Ramya R, Harika S, Pritham SN, Ravi RJ, et al. Mistaken identity of polymorphous low-grade adenocarcinoma treated as periapical lesion in anterior maxilla: A case report. Aust Endod J. 2023;49(Suppl 1):470-5. https://doi.org/10.1111/aej.12723
21. Dube K, Dube A, Jain P, Ghosh S, Paul B, Bhatnagar N. Maxillary mucinous adenocarcinoma mimicking a lesion of endodontic origin: A rare case report. Eur Endod J. 2023;8(1):101-4. https://doi.org/10.14744/eej.2022.29200
22. Pires MD, Martins JNR, Dias GS, Doutel D, Ordinola-Zapata R. Osteosarcoma of the anterior maxilla mimicking a periapical pathology: A case report. Aust Endod J. 2021;47(3):656-63. https://doi.org/10.1111/aej.12491
23. Stevenson MD, Dunlap CA, Shin M, Oza S, Lai GS. Invasive oral squamous cell carcinoma mimicking a dentoalveolar abscess: Report of a case in a 14-year-old patient. J Endod. 2024;50(11):1642-8. https://doi.org/10.1016/j.joen.2024.05.011
24. Patel S, Durack C, Abella F, Shemesh H, Roig M, Lemberg K. Cone beam computed tomography in Endodontics - a review. Int Endod J. 2015;48(1):3-15. https://doi.org/10.1111/iej.12270
25. Brüllmann D, Schulze RK. Spatial resolution in CBCT machines for dental/maxillofacial applications-what do we know today? Dentomaxillofac Radiol. 2015;44(1):20140204. https://doi.org/10.1259/dmfr.20140204
26. Joshi PS, Pol J, Sudesh AS. Ultrasonography - A diagnostic modality for oral and maxillofacial diseases. Contemp Clin Dent. 2014;5(3):345-51. https://doi.org/10.4103/0976-237X.137942
27. Scotti FM, Stuepp RT, Dutra-Horstmann KL, Modolo F, Cavalcanti MGP. Accuracy of MRI, CT, and Ultrasound imaging on thickness and depth of oral primary carcinomas invasion: a systematic review. Dentomaxillofac Radiol. 2022;51(5):20210291. https://doi.org/10.1259/dmfr.20210291
28. Perrin P, Eichenberger M, Neuhaus KW, Lussi A. Visual acuity and magnification devices in dentistry. Swiss Dent J. 2016;126(3):222-35. https://doi.org/10.61872/sdj-2016-03-142
29. Medeiros YL, César Neto JB, Alves FA. Operating Microscope in the Analysis of Localized Juvenile Spongiotic Gingival Hyperplasia. Oral Dis. 2025;31(12):3417-9. https://doi.org/10.1111/odi.70031
30. Setzer FC, Kohli MR, Shah SB, Karabucak B, Kim S. Outcome of endodontic surgery: a meta-analysis of the literature – Part 2: Comparison of endodontic microsurgical techniques with and without the use of higher magnification. J Endod. 2012;38(1):1-10. https://doi.org/10.1016/j.joen.2011.09.021