

# Use of Ultrasound Investigation in the Treatment Plan of Apical Surgery Relapse

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## ABSTRACT

Consecutive to endodontic treatment, the periapical infection, either acute or chronic, is a frequent disease in oral pathology. The two clinical features of periapical infection are granulomatous and cystic, characterized by bone loss, root resorption and impairment of tooth implantation. In current practice, the diagnosis of bone resorption is established using bidimensional and tridimensional radiological examinations. The present case report presents the fibrous exophytic wound healing as a rare complication of apicoectomy and shows the advantages of using ultrasonography in determining the size and nature of maxillary mucosa exophytic structures.

**Keywords:** Endodontic Treatment; Periapical Periodontitis; Ultrasonography; Fibrous Healing; Histopathology

**Abbreviations:** Lipopolysaccharides (LPS); Lipoteichoic Acid (LTA); Magnetic Resonance Imaging (MRI); Computer Tomography (CT); Cone-Beam Computer Tomography (CBCT)

## Introduction

Among the determining factors of chronic periodontitis is listed bacterial microbiota, especially Gram-negative bacteria that induce bone resorption due to lipopolysaccharides (LPS) and Gram-positive bacteria that damage the dental pulp and the periapical tissues through the lipoteichoic acid (LTA) [1]. The treatment of apical periodontitis is performed by mechanical instrumentation and thorough irrigation with antimicrobial substances, followed by the sealing of the root canals. Although the endodontic field seems to emerge with more effective substances used for disinfection and mechanical instrumentation to improve the clinical outcome, the residual endotoxins in the root canals lead to relapse or to complications [2]. The complications such as periapical periodontitis is treated by root-end surgery consisting in the removal of the tooth's apex, followed by retrograde obturation. The association of an oral antibiotic such as ciprofloxacin, ofloxacin or azithromycin is more efficient in the eradication of the microbial infection compared to large-spectrum antibiotics such as penicillin [3]. Cystic periapical infections are less likely to heal after

endodontic treatment due to the fact they are self-sustaining even in the absence of the microbial infection [4].

Complications after endodontic treatment mainly appear as a consequence of forwarding beyond the apex the gutta-percha, root-filling material, or other foreign bodies, such as paper points, amalgam, endomethasone, calcium salts [4]. After establishing the diagnosis of the periapical pathology based on clinical and radiological examination (bidimensional radiographies, tridimensional Computer Tomography- CT, Magnetic Resonance Imaging-MRI or Ultrasonography), the histological examination of the biopsy specimens is useful to exclude a malignancy. Rud & Moller presented a radiographical classification of the periapical tissue after surgery, recommending a minimum of one-year follow-up, ranging from Group 1- complete healing, to Group 4- unsatisfactory healing- failed intervention [5].

## Case Report

A 42-year-old male referred two years ago to Oral Rehabilitation, Oral Health and Dental Office Management Department, accusing

pain at the upper left canine tooth (2.3). Radiographical examination showed an inappropriate endodontic treatment, enlargement of the periapical periodontal space, resorption of periapical cortical bone corresponding to the tooth 2.3. The diagnosis of chronic periodontitis was set and apicoectomy followed by retrograde filling was performed. At one-year follow-up, the patient noticed an excrescence in the maxillary vestibule at the periapical level of tooth 2.3. Clinical examination revealed a 3/4 mm nodular-shaped fibrous structure in the periapical bone cavity post-apicoectomy, extended submucosal in vestibule, 3-5 mm mesial and distal to tooth 2.3. Retroalveolar radiography at 1-year follow-up showed osteoid healing and no evidence of periapical recidiva (Figure 1). After clinical and paraclinical investigation, the diagnosis of vestibular fibroma was set. In locoregional anesthesia (Articain 1/100000) the excision of the specimen was performed followed by apicoectomy and apical curettage.



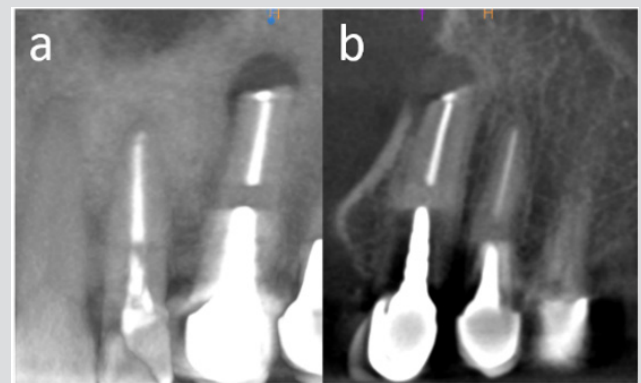
**Figure 1:** The periapical radiography of upper left canine; 1 year follow-up reveals the osteoid healing (red circle) of the post apicoectomy situs.



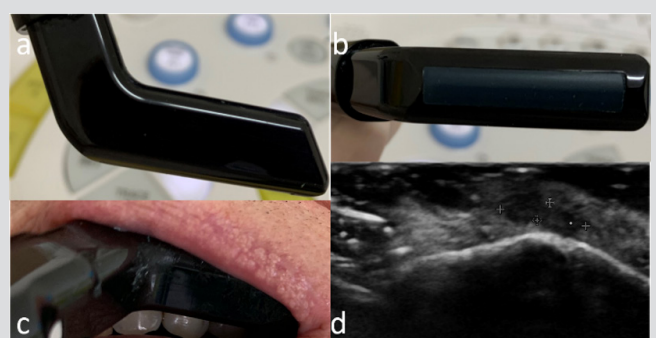
**Figure 2:** Clinical examination shows a round-shaped fibrous pseudotumoral mass, with slightly peripheral swelling at the upper left canine.

The tissue specimen was sent for histopathological examination and the result showed hyalinized connective tissue, lymphoplasmocitary and macrophagic inflammatory permeation, and microhemorrhage. One year after the second intervention, the patient reported swelling and tumescence at the postsurgical situs, accompanied by inflammation of the surrounding tissues. Clinical examination (Figure 2) showed, on the vestibular fixed-mobile mucosa corresponding to tooth 2.3, a reddish pseudotumor mass

adherent to the surrounding tissues, extended anteriorly, superiorly and mesially, with no inflammatory associated symptoms.



**Figure 3:** CBCT examination. Coronal (a) and sagittal (b) sections evidence buccal cortical resorption at periapical level of upper left canine and the extension of the resorptive process along the mesial side of the tooth.

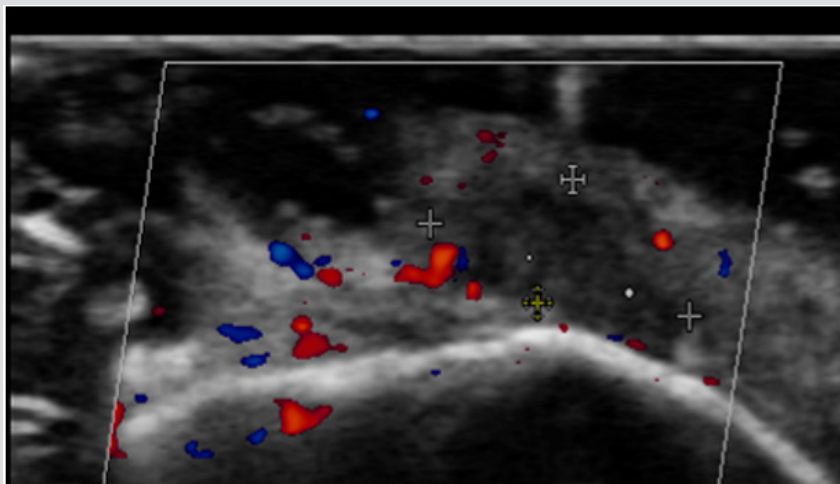


**Figure 4:** Intraorally ultrasonographic image recorded with a EUP-O54J linear hockey stick transducer (Hitachi) (a - lateral view and b - inferior view, c - intraorally recording approach) showed a 6/1.5 mm diameter hypoechoic structure (d) at the 2.3 apex level, with extension of hypoechoic structure to the medial and superior maxillary vestibule.

Cone-Beam Computer Tomography (CBCT) showed a round periapical radiolucency at the apex of tooth 2.3 and the resorption of the afferent buccal bone (Figure 3). Ultrasound investigation was performed using a EUP-O54J hockey stick linear transducer with a 25 mm width scan (frequency 7-13 MHz, Hitachi Noblus, Arrieta). Ultrasound imaging (Figure 4) showed a 6/1.5 mm diameter hypoechoic structure at the apex of tooth 2.3, with a more intense hypoechoic extension to the medial and superior maxillary vestibule. Intraoral EcoDoppler ultrasonography (Figure 5) revealed the avascular characteristics of the apical fibrous mass and the blood flow present only on the peripheral area of the fibromatous appearance. Giving the clinical features and ultrasonography investigation, the diagnosis of vestibular fibroma was set. In local anesthesia (Articain 1/100000), the detachment and excision of the fibrous structure from the vestibular mucosa were performed (Figure 6). Due to the structure's adherences, the periosteum was also removed (Figure 7). Curettage of the previous

surgery situs and flap suture were carried out (Figure 8). The harvested specimen was sent for histopathological examination and revealed the presence of connective tissue with extensive areas

of hyalinization and minimal lymphocytic inflammatory infiltrate (scarring changes).



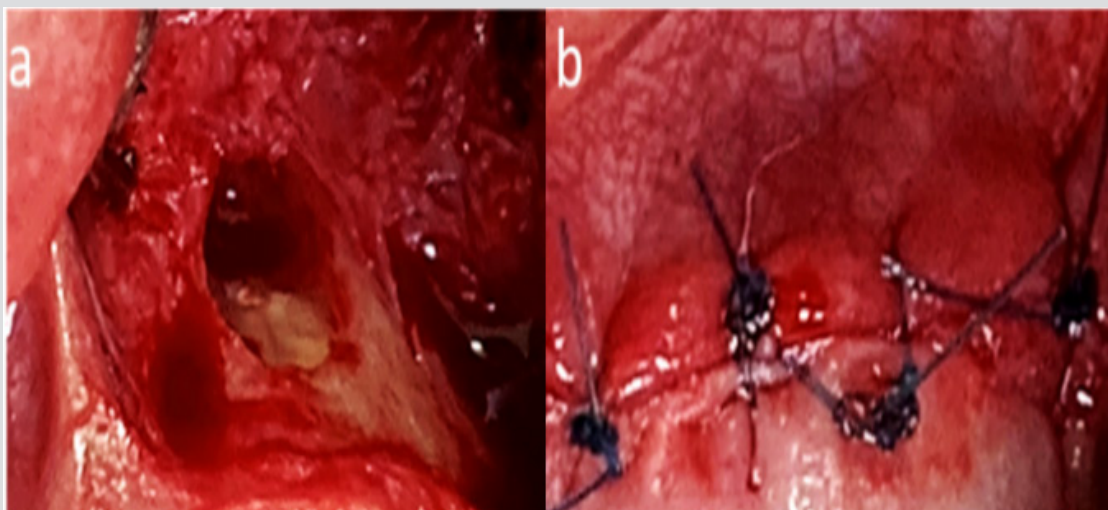
**Figure 5:** Intraoral EcoDoppler ultrasonography recorded with a EUP-O54J hockey stick linear transducer (Hitachi) demonstrated the avascular characteristic of the apical fibrous structure and its mesial extension.



**Figure 6:** Intraoperative image showing apicoectomy situs after the excision of the fibrous structure and curettage.



**Figure 7:** The excised specimen prepared for histopathological investigation.



**Figure 8:** The radicular surface of tooth 2.3 showing apex sealing and removal of all pathological tissues (a) and flap suture (b).

## Discussion

Literature states that regarding apical periodontitis, the specimens sent to histopathological examination are mostly granulomatous inflammation (due to foreign bodies), benign central giant-cell granulomas, fibro-osseous dysplasia, odontogenic keratocyst and periapical pathologies caused by infections (actinomycosis, histoplasmosis) [6]. Over the time, more accurate radiological methods such as MRI, CT and CBCT were used to investigate the periapical pathologies, especially cysts and granulomas, [7-9]. These methods are very useful in revealing bone resorption and soft tissue changes. In our case, after the first and second surgical interventions, a fibrous healing of both of the periapical bone and vestibular mucosa of the surgical situs were observed. The ultrasound color Doppler investigation showed no vascularization of the exophytic structure. This might be due to a fibroblastic hyperplasia induced by the healing process itself and the proinflammatory mechanisms involved. In dentistry, ultrasonography has been used to diagnose periapical cysts and granulomas, either as primary pathology or consecutive to endodontic treatment, and the postoperative healing. Ultrasonography has the advantage of providing in a nonionizing manner, the size and nature of the analyzed structures [10-12]. In the presented case, the excised specimen had a larger size in mesio-distal direction compared with the ultrasound measurements, but with a similar shape in frontal section. The mesial extension showed a higher hypoechogenicity compared with the exophytic fibrous structure adjacent to tooth 2.3, which might be due to the dense fibrous hyperplastic and hyalinized structure of the tissue.

## Conclusion

Ultrasonography is a non-invasive, nonionizing, painless, repetitive and real-time imaging method that can be used for examinations both the soft and the hard tissues. It could be taken into consideration as a more suitable investigation compared with the current radiological assays, due to the measurement and Doppler

functions, which allows the assessment of the vascularization pattern of oral cavity lesions and periapical pathological tissues. This represents an advantage in setting a treatment protocol, foreseeing possible complications and their management. The assessment of ultrasonography is an attractive and useful approach and should be considered to be implemented as an area of expertise in dentistry and oral surgery practice.

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