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Endodontic Microsurgery: Case Report

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ABSTRACT:

The development of endodontic surgery was encouraged by the failures and impossibilities of orthograde endodontics, which also aims to guarantee the apical sealing by the retrograde approach. A few decades have been necessary to improve this technique through the introduction of optical instruments offering a more precise diagnosis of apical lesions and their causes, then to find a type of cavity that is easy to perform with a minimally invasive approach of dental and bone tissues. This progress has been possible using ultrasound, as well as the instruments miniaturization and magnification.[1] A 35-year-old patient with a disgraceful anterior smile was diagnosed with chronic periapical periodontitis. The patient had a non-retentive composite restoration with palpable sensitivity, tenderness, and slight swelling. The treatment plan included root canal treatment, filling, and enucleation of the apical cyst. The patient's follow-up showed signs of cicatrization, apical healing, and remineralization of peri-apical bone loss. The patient's condition improved over time, demonstrating the importance of oral hygiene and proper treatment. Endodontic microsurgery, with guided microsurgery, offers a predictable, minimally invasive, and affordable alternative due to three-dimensional radiography and surgical guidelines, making it easier for practitioners to navigate.

Keyword: Endodontic surgery, Endodontic retreatment, Apicoectomy, Cone-beam computed tomography,

Introduction:

The development of endodontic surgery was encouraged by the failures and impossibilities of orthograde endodontics, which also aims to guarantee the apical sealing by the retrograde approach.

A few decades have been necessary to improve this technique through the introduction of optical instruments offering a more precise diagnosis of apical lesions and their causes, then to find a type of cavity that is easy to perform with a minimally invasive approach of dental and bone tissues. This progress has been possible using ultrasound, as well as the instruments miniaturization and magnification.[1]

Case Report:

A 35-year-old patient attended to our department with an aesthetic problem related to disgraceful anterior smile. During the clinical examination, the 22 presents a non-retentive composite restoration with palpable sensitivity. Additionally, we have noticed a palpation tenderness and a slight swelling. No response to the cold test and no pain on percussion were reported. The probing depth remained within normal ranges.

Figure 1: intra-oral aspect of the anterior teeth showing a disgraceful smile with absence of upper right second incisor

Retro-alveolar radiographic examination and CBCT revealed a well-defined radiograph image appended to the apex of upper left second incisor.

The tooth was diagnosed with chronic periapical periodontitis.

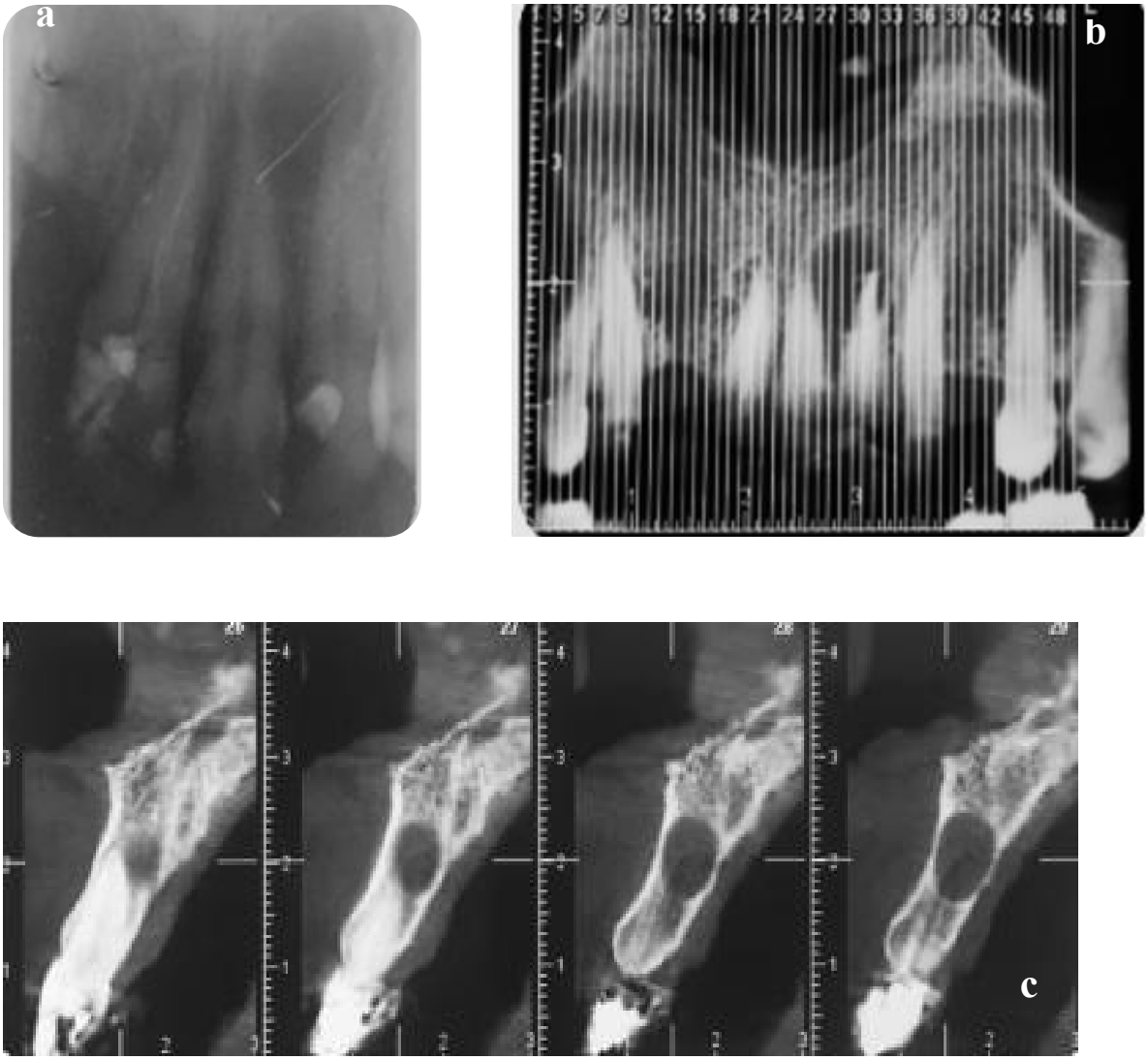

Figure 2 : (a) Preoperative radiograph with peri-radicular lesion present around #22 and incomplete root canal treatment of #11 (b); panoramic image of CBCT of anterior area (c) oblique CBCT slices showing the peri-radicular radiolucency related to #22 with no interruption of the cortical bone.

The Proposed treatment plan was first a good motivation for oral hygiene, followed by root canal treatment of upper left second incisor (#22) and upper right first incisor (#11) using Protaper® universal files and copious irrigation with 5% NaOCl with ultrasonic activation, followed by root canal filling using a resin-based root canal sealer (AHplus®) and standardized gutta cones.

The surgical treatment was performed using operative microscope (x25), we've proceed to the enucleation of the apical cyst and performed an apical resection with endodontic retrograde preparation using ultrasonic inserts (Acteon®) then we've proceed to the root-end filling with silicate-based filling material. **(Fig: 3, 4, 5 & 6)**

Follow up was made at one week showing signs of cicatrization then at one month, two months **(Fig 9c)** and then at one year **(Fig 9d)**, showing a satisfying apical healing with remineralization of the peri-apical bone loss.

Figure 3: clinical view after flap and root exposure, the diameter of the osteotomy is only 3 to 4 mm

Figure 4: enucleation of granulation tissues

Figure 5: retrograde preparation using ultrasonic inserts (Acteon®/ AS3D)

Figure 7: retrograde preparation using ultrasonic inserts (Acteon®/ AS6D)

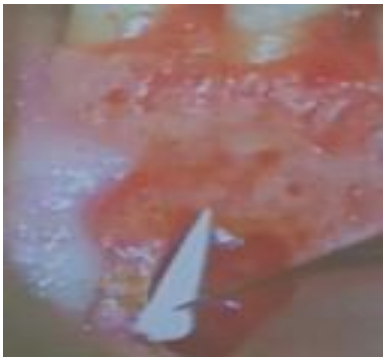

Figure 6: Placement of silicate-based material for root-end filling

Figure 8: Post-operative x-ray

Figure 9: one year follow-up after endodontic microsurgery. (a) Preoperative radiograph before the apical microsurgery, (b) postoperative radiograph after the apical microsurgery, (c) 2-months follow-up, (d) 1-year follow-up

Discussion:

The primary causes of post-treatment periapical periodontitis are persistent intra-radicular infection, extra-radicular infection, foreign body reactions of exogenous materials, true cysts, and fibrous scar tissues. [2.3.4] To save teeth with chronic periapical periodontitis that have been endodontically treated, an orthograde revision should be performed first to eradicate all the organic material in the root canal system and achieve full tridimensional filling. When nonsurgical endodontic treatment or retreatment is not possible, surgical options should be considered.[2.4]

A thorough medical and dental history as well as a clinical examination must be considered in the decision-making process. The prognosis and potential risks of each appropriate treatment option must be explained to the patient.

Endodontic surgery could be contraindicated or restricted if the proximity of sensitive anatomical structures may cause acute or permanent injuries during a surgical treatment. Systemic diseases, such as congenital coagulation problems, may also limit a surgical approach. A history of bisphosphonate treatment administered intravenously can increase the risk of osseous necrosis of the bone. [5] Specific cardiovascular diseases exclude the use of vasoconstrictors with local anesthesia, which severely restrict blood coagulation during surgery.[5]

Microsurgery has achieved a high success rate in the current literature, ranging from 69.3% to 93.3% in a meta-analysis of 10 clinical studies followed for 2 to 13 years.[6]

Kim et al. (2008) found out that when treated with microsurgical endodontics, teeth with Endodontic-periodontal lesions (77.5%) had significantly lower success rates than teeth with solely endodontic lesions (95.2%).[8]

Radiographic healing speed is directly related to the size of the osteotomy, with smaller ones resulting in faster recovery.[9] For example, a lesion smaller than 5 mm would take an average of 6.4 months, a 6-mm to 10-mm-size lesion takes 7.25 months, and a lesion greater than 10 mm requires 11 months to heal. [10] Consequently, the osteotomy should be as little as possible while yet being as large as required to achieve the intended therapeutic outcome.[10]

Endodontic microsurgery leads to excellent rates of long-term healing (78.3%) and survival (95.2%) over 5-9 years. The type of REF material and nonsurgical retreatment before endodontic microsurgery affect the long-term prognosis.[11]

Various materials have been used as root-end materials in recent years, including amalgam, zinc-eugenol cations, IRM® (Intermediate Restorative Material), and MTA (Mineral Trioxide Aggregate). Even though none of these materials meet all the requirements for an ideal repair material.[12.10.12] MTA has been the preferred material for root-end filling. Recently, a number of new bioactive materials based on silicate calcium, such as Biodentine®, have been introduced as potential root end-filling obturation materials due to their ability to release calcium hydroxyde in humid environment.[10]

Their physical properties include an exceptional dimensional stability, a high mechanical binding force, a simplicity to locate during therapy and to recognize on radiographs, its antimicrobial properties are partly attributed to its high alkaline pH.[13]

With the advent of the surgical operating microscope, ultrasonic root-end preparation, and calcium silicate materials, endodontic surgery has developed into endodontic microsurgery. Furthermore, the reach of CBCT has led to the development of endodontic microsurgery and spawned an entirely new branch of endodontics with the arrival of guided surgical procedures in endodontic microsurgery to facilitate guided osteotomy and root excision.[5]

The accurate planning of the osteotomy size and location, as well as the assistance with the three-dimensional printing of the surgical guides, are made possible by the juxtaposition of preoperative CBCT images with intraoral scans. The method can be modified to provide direct flapless access or standard flap access to the osteotomy site. With this alternative, surgeons can perform treatments with highly increased precision and safety precautions.[5]

Conclusion:

Endodontic microsurgery is a useful therapeutic approach for preserving infected teeth. While non-surgical retreatment is still the preferred for most cases involving endodontic failure, modern endodontic microsurgery with the guided microsurgery has emerged as a predictable, minimally invasive, and affordable alternative because of three-dimensional radiography, which makes it easier for practitioners to navigate, in part due to surgical guidelines.

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