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Case Series

Difficulties of Endodontics Access Treatment and its Challenges: A Case Series

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Abstract

Endodontics remains a difficult and demanding discipline, which cannot forgive approximation. A part of the failures seems to be linked to the non-respect of the recommendations of good practices, concerning the respect of the rules of asepsis and the taking of radiographs but also to an underestimation of the complexity and the difficulty of the case before treatment. The improvement of initial training, with the clinical teaching of simplified but scientifically based techniques, and the recent obligation of continuous training should allow a better penetration of these standards in the future and an improvement in the success rate of endodontic treatments. At the same time, the technological advances of the last two decades have made it possible to push back the technical limits of these procedures and to extend the indications for treatment to clinical situations that were unmanageable a few years ago.

The objective of these case studies is to present the different endodontic access difficulties encountered before and during treatment and the successful management of these complexities by starting with a good fundamental examination including the patient history, clinical results, and x-ray examinations before and after.

Keywords: *Endodontics; Radiographs; Pulp Stone; Root Anchors*

Introduction

Endodontic is a skill that requires the use of delicate instruments in confined spaces. Inevitably, difficulties will arise. Inadequate or difficult access can lead to untreated, poorly disinfected canals that are difficult to shape and seal and can ultimately lead to treatment failure. Endodontic remains a difficult and demanding discipline, which does not forgive approximation. A part of the failures seems to be linked to the non-respect of the recommendations of good practice, concerning the respect of the rules of asepsis and the taking of radiographs, but also to an underestimation of the complexity and the difficulty of the case before treatment. It's known that the difficulties of access occurring during the endodontic treatments are more and more frequently noted in our daily practice. Hence it is advisable before any act to evaluate the obstacles inherent to it. A patient's history, a clinical analysis and an initial radiographic assessment that requires several orthocentric, mesiocentric and distocentric incidences to define the morphology of the root canal system and to objectify root

canal curvatures, calcifications, inconstant canals as well as excising obstacles and difficulties of endodontic access. These parameters are fundamental in the evaluation of root canal treatment results and the data they provide should never be underestimated. After making the diagnosis, the practitioner will have to make his decision before conducting the therapeutic procedure. He must also be fully aware of the prognosis of this and other endodontic procedures. Endodontic treatment is a successful treatment modality in many cases. However, it can fail for reasons that cannot be predicted by the dentist. Many failures can be avoided by carefully assessing the level of difficulty of the case before starting treatment or by calling in a specialist [1].

Aim of the Study

The aim of these reports is to present a successful management of a series of clinical cases including pulp stone, presence of prosthetic devices as well as root anchors that make endodontic access difficult.

Case Reports

Clinical case 1

A 35-year-old female consulted following a right mandibular swelling.

Clinical examination

Palpable swelling located at the end of the vestibule going from 44 to 47 and opposite 34-35 Milling tests: Positive on suspected teeth, except the 46 with negative milling test (Figure 1 and 2).

Figure 1 and 2: *Palpable swelling is detected clinically in the right mandibular.*

Radiographic examination

Panoramic Radiograph examination revealed a peri-apical radiolucency opposite the 46, 47, 44, 45, 33, 34 with well-defined and monogenic cystic images (Figure 3).

Figure 3: *The panoramic radiograph confirmed the monogenic cystic images.*

A fortuitous discovery of the presence of calcification in the pulp chamber was seen in the radiograph of the 46 which was confirmed after realization of the access cavity (Figure 4).

Figure 4: *The precise volume of the pulpolith in the pulp chamber was assessed in the radiograph.*

Pathological examination

Non-odontogenic jaw cyst was confirmed by pathological examination.

The treatment

The main clinical implication of pulp stone is the discomfort it causes for access to the canal. The demarcation zone between the pulp stone and the pulp chamber walls is deepened and widened using ultrasonic tips (Figure 5).

Once the pulp stone is completely circumscribed within the access cavity, the objective is to mobilize it to come out as a single block (Figure 6).

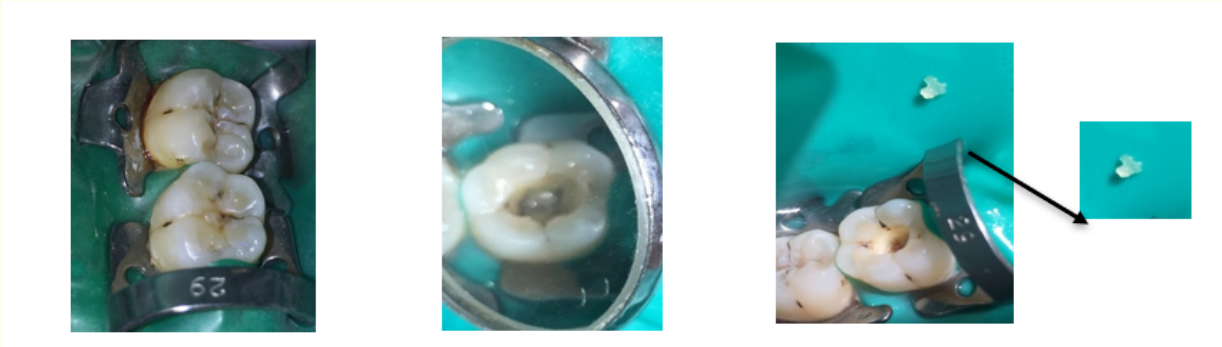

Figure 5 and 6: *The pulpolith is removed on the access cavity by gently using a specific ultrasonic insert.*

After removing the pulp stone, canal drainage was performed, and the canal filling was postponed after the cyst ablation surgery to ensure a more correct drying of the tooth and to benefit from a session of hydroxide of calcium (Figure 7).

Figure 7: *Obturation canals with gutta percha and hermetic coronary obturation performed.*

Clinical case 2

A 28-year-old female consulted following the appearance of a swelling next to teeth 21 and 22 at the palatal level (Figure 1).

Figure 1: *Presence of the swelling at palatal level.*

Clinical examination

21 and 22 axial percussions: positive (Figure 2).

Figure 2: *21 and 22 supporting a fixed prosthesis.*

Radiographic examination

The panoramic x-ray and retro alveolar radiograph show a cystic lesion next to the 22 and extending to the 21.

Incomplete endodontic treatment on the 21+ presence of a cast corono-radicular anchorage of the inlay-core type on 22 and a fiber post in 21 (Figure 3 and 4).

Figure 3: *Preoperative panoramic radiograph showing a cystic lesion next to the 22 and extending to the 21.*

Figure 4: *Preoperative retro alveolar radiograph showing a cast corono-radicular anchorage of an inlay-core on 22 and a fiber-post on 21.*

The treatment

Removal of the cyst followed by the removal of the prosthesis + inlay-core on the 22 and the fiber-post on the 21 as well as a correct endodontic treatment thereafter for the two teeth (Figure 5).

The difficulty lies in the separation of the coronal part and the elimination of the false stump which makes it difficult to access the canal, in our case the inlay-core and the fiber-post.

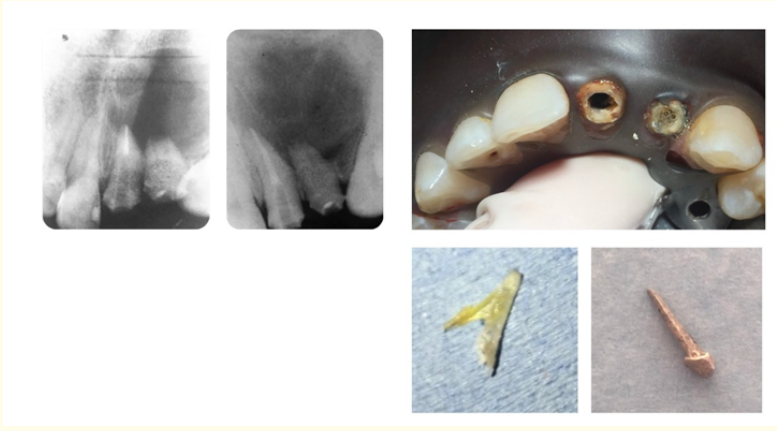

Figure 5: *The removal of the prosthesis + inlay-core on the 22 and the fiber-post on the 21.*

Clinical case 3

A 19-year-old female patient was referred to Department of restorative dentistry and endodontics of the Faculty of Dentistry, with aesthetic needs related to the right maxillary lateral incisor [12] and the central incisor [11]. Interrogation revealed the presence of recurrent caries following defective fillings on the maxillary anterior teeth 2 years ago (Figure 1).

Clinical examination

Dyschromia of the 12 and 11 with defective fillings made with the composite. 12 and 11 Thermal and percussion tests: negative.

Radiographic examination

Pre-operative panoramic and Retro alveolar radiograph show that:

- The crown of the 12: Presence of a radio-opaque image of metallic tone in screw-post.
- The crown of the 11 presents: radiopaque image distal indicating the defective obturation, radiolucent image distal.

The roots present:

- 11: Incomplete endodontic treatment on a right tooth (Figure 3).
- 12: Presents a proximal caries (Figure 2).

Figure 1 and 2: *Presence of recurrent caries on 12 and 11 already filled with composite, caries on 13.*

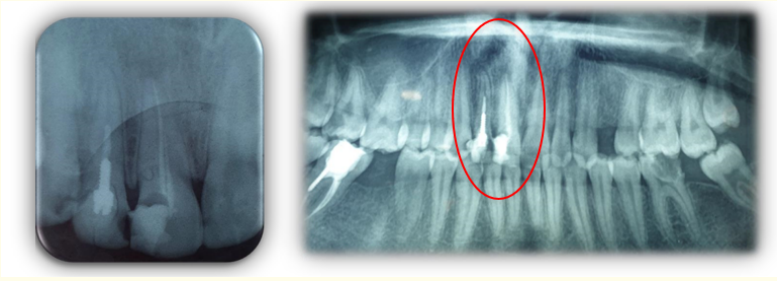

Figure 3: *Pre-operative panoramic and Retro alveolar radiograph show the presence of screw post in 12, incomplete endodontic treatment in 12 and 11.*

The treatment

12: Removal of the prefabricated post with a screw-post, making access to the canal difficult. The first step is to remove all the restorative material (restorative composite) using a round bur.

Once the screw-post head is cleared and isolated by milling. Our technique consisted of unscrewing the screw-post counterclockwise using a needle holder, then the resumption of endodontic treatment and the obturation of the canal system. In our case, the elimination of screw-post and gutta-percha on the canal walls during retreatment was carried out with more success and safety and a definitive filling with gutta percha is done in 12 and 11 (Figure 4 and 5).

Figure 4: *The elimination of screw-post on 12 and gutta-percha (12 and 11) on the canal walls during retreatment was carried out.*

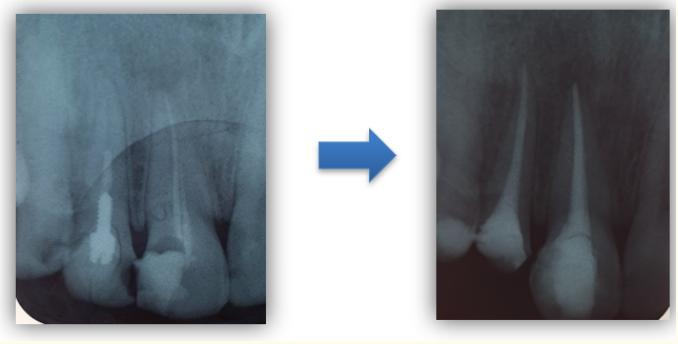

Figure 5: *Retreatment and definitive filling with gutta percha was done in 12 and 11.*

Finally, a composite stratification on the 11 was carried out as well as a prosthesis fixed on the 12 (Figure 6).

Figure 6: *A composite stratification on the 11 was carried out as well as a prosthesis fixed on the 12.*

Discussion

The main goal of access cavity preparation is to recognize the entrances of the root canal for subsequent preparation and obturation of the root canal system. Preparing the access cavity can be one of the most difficult and infuriating aspects of endodontic treatment, but it is the key to successful treatment. Inadequate preparation of the access cavity or thus the presence of obstacles at this level can lead to difficulties in locating or overcoming the root canals. This can lead to inadequate cleaning, shaping, and filling of the root canal system. It can also contribute to the fracture of instruments and aberrations in the shape of the canal. These factors can ultimately lead to treatment failure. A good design, elimination, or removal of any obstacle as well as a preparation of the good access cavity is imperative for a quality endodontic treatment, the prevention of iatrogenic problems and the prevention of endodontic failures [2].

From a physiological point of view

- **Age-related changes/difficulty of access**: Age-related dental changes are an inevitable physiological process with morphological and histological changes. The continued deposition of secondary dentin leads to a reduction in the size of the pulp space and narrowing of the root canals with age, which will lead to difficulties in endodontic access. Age was assessed based on the narrowing of the pulp cavity, the aging process has been shown to cause pulp formations, calcifications, increased fibrosis, and decreased innervation, this will lead to an Inadequate access which it will results to a poor endodontic treatment [3].
- **Limitation of mouth opening/difficulty of access**: The limitations of the mouth opening restrict the performance of endodontic treatment. Placement of the surgical drape and the supporting clamp becomes difficult. Instrumental procedures, especially the use of rotary instruments mounted on a contra-angle, may become impossible to implement. A distinction should be made between two families of mouth opening limitation: trismus and permanent constriction. Trismus is defined as a transient symptom characterized by limitation of mouth opening due to contracture of the masticatory muscles in relation to an evolving lesion. Permanent constriction is the chronic loss of the lowering movement of the mandible [3,4].

From a pathological point of view

- Calcifications within the pulp chamber interferes with the realization of the access cavity and requires their complete removal to obtain direct access to the canal. The consequences of restorative dentistry lower the pulp chamber volume due to the deposit of secondary dentine. The reduction in pulp chamber volume is also seen with localized deposition of tertiary dentin in specific

response to microleakage, caries and loss of tooth surface. The natural shape of the pulp chamber floor dome will become progressively flatter, resulting in the root canals becoming narrower and therefore more difficult to locate. Long cone burs or ultrasonic tips should be used with a light brush stroke to remove tertiary dentin. Pulp stones and calcifications are best extracted with ultrasonic endodontic tips or small, long-shafted excavators. Once the canal entrance has been revealed, it will be tacky when probed with a DG16 probe. An X-ray is recommended at this stage to confirm that the access cavity is prepared in the correct direction and to assess the amount of dentine that has been removed [5,6].

- Pulp canal calcification (PCC) also known as pulp canal obliteration or calcifying metamorphosis, is defined as the deposition of calcified tissue along the canal walls. Therefore, the canal space may be partially or completely obliterated. Cases of PCC are related to dislocation injuries after dental trauma. Additional causes of PCC are pulpal response to injuries such as invasive pulp therapy procedures, extended caries lesions, fractions, and restorations. The root canal treatment of teeth with PCC is only indicated in the presence of acute symptoms or apical periodontitis. In these cases, even the most experienced clinicians may have difficulty in achieving the goals of endodontic treatment. Root perforation and root canal deviations have been noted as common complications after treatment of PCC cases, which may ultimately lead to tooth loss. Up to 75% of teeth with pulp canal obliteration are asymptomatic and do not require treatment, but radiographic monitoring is necessary. The presence of pulp canal obliteration makes routine pulp sensitivity testing unreliable. Special diagnostic and treatment problems may arise in teeth with pulp canal obliteration requiring root canal therapy. Finally, as operating procedure, the removal of root canal calcification consists of identification of the canal with the DG16 probe, followed by the passage of a small file (size 06 or 08) with a lubricant (e.g., Glyde®) which should be used gently in a cadence to negotiate the canal entrance [6,7].

Prosthetic devices: Most of the teeth to be retreated have a coronal restoration making endodontic access difficult. Therefore, two therapeutic steps are essential: The coronal stage which allows access to the root canal openings, The root canal stage which allows to reach the apex. Both in the coronal and root canal stages, the techniques must be selected to be the most effective while being the least mutilating for the dental structures [8,9].

Coronary time: The objective of the coronary phase is to expose the pulp floor, to rectify the endodontic access cavity, and to objectify the canal entries in their entirety. Its principle is to eliminate all foreign reconstruction materials, these materials obstruct the canal entrances, preventing access to the apical areas. Access to the canal orifices is complicated by the prior crossing of the prosthetic caps, restorative materials, whether they are crushed (plastic materials secured or not by a root anchorage) or poured. The method applied will depend on the nature of the restoration in place [10]. Cast coronal-radicular anchorages: False stumps or even core inlays must be removed by always starting the operation by separating the coronal part, especially for false stumps. The difficulty of the operation lies in the fact that it is necessary to arrive at the cast corono-radicular anchorage / dental structure interface and to follow it carefully to carry out a complete separation, without however damaging the pulpal floor. The removal of the part secured to the pivot, at the level of which it is necessary to leave enough metal to emerge to guarantee correct gripping, is facilitated by using ultrasound during one or more sessions to disintegrate the sealing cement. This part is then eliminated using grasping forceps whose dimensions must be in line with the frequent narrowness of the access cavities without requiring very significant decay [11]. Screw or anchor pin: A distinction is made between sealed tenons, namely striated manufactured tenons also called “screw-post” as well as manufactured smooth tenons; and more recently, glued tenons: carbon fiber tenons. Manufactured smooth tenons: The removal will be done in first intention by vibration and in case of failure by controlled rotation or traction. The screw-posts: They are sealed using a sealing cement in the root canal. Most of the time, they can be easily removed after their heads have been carefully freed from the restorative material in which they are embedded. If the head of the screw-post has not been damaged, the use of ultrasound can preferably be performed by rotating the insert counter-clockwise around the head of the screw-post. The mandrels are also specially threaded counter-clockwise from the Gonon® pivot extractor (screw-post kit). Carbon fiber lugs: In practice the removal turns out to be much more difficult. Manual, mechanical or ultrasonic endodontic instruments must frequently be used to progressively remove the carbon fibers [8,11].

Root time: Its objective is to allow optimal access of instruments to the apical third of the root canals. This step is based on the recognition and elimination of intracanal materials which can be classified into three categories: root canal pastes and cements: can be based on zinc oxide-eugenol, or even based on phenolic resin. Semi-solid materials: gutta-percha. Solid and obstructing materials: silver cones, fractured endocanal instruments. Removing these barriers involves mastering selective mechanical, physical, and chemical processes. This elimination determines the possibility of catheterizing the canal and creates the conditions for therapeutic success [9,10]. Fractured instruments: Instrumental fracture in a root canal is the breakage of a hand file, nickel-titanium instrument, Gates drill, lentulo, finger spreader or any other instrument used during an endodontic treatment. This becomes an issue when the instrument cannot be removed. In this case, the entire portion of the canal apical to the fragment cannot be correctly instrumented, irrigated and obturated. Even if the instrument can be bypassed, the remaining fragment may interfere with canal preparation and filling, increasing the difficulty of endodontic access and the risk of treatment failure. There are multiple risk factors for fracture [12]. Severe or double curvature induces bending stresses due to root anatomy and torsional stresses due to the sheath effect. These stresses, particularly in bending, are responsible for the cyclic fatigue of the instrument. Many studies have been published to understand the difficulty of accessing the working length of the entire canal by passing the instrument fracture or removing it to free the entire canal. A fractured instrument is a potentially unsuccessful factor when it negatively influences the correct shaping and cleaning procedure. The protocols established by the manufacturers must be followed to reduce the risks: instrumental sequence, rotation speed, number of uses. Some simple gestures are also applicable such as insertion and removal while walking, controlled movements of small amplitude, without excessive effort, visual inspection, and cleaning of the instrument between each pass. Fractured instruments can be either bypassed or removed. The operator must weigh the benefits of these procedures. A fractured instrument remaining in a canal does not mean that the root canal treatment attempt will fail. It has been shown that, provided the remainder of the root canal is filled in the conventional manner, the success rate is not significantly affected [10,13-16]. Resumption of root canal treatment: the resumption of root canal treatment also constitutes a difficulty in accessing the root canals since they are already obstructed, but it can be continued due to the successful exposure of the pulp floor without collateral damage (root fractures, pulp floor perforation...). Once the operating field is in place, it will very often be necessary to rework the access cavity, eliminating the overhangs that may mask a "forgotten" canal, and accentuating the elimination of the cameral walls, to allow instrumental access to the root canals without coronal interference, thus allowing direct and centered contact of the instrument tip with the material to be removed. If it is difficult, unsuccessful, or impossible to expose the pulp floor and root canals, the retreatment is suspended. Depending on the clinical case, another treatment option must be chosen endodontic surgery, root amputation, etc. or even extraction [10,14].

to tooth type, radiographic appearance, and endodontic treatment history (Table A). There appear to be statistically significant differences between a variety of these parameters and endodontic outcomes [17].

Criteria for case difficulty	Good quality obturation	Improper quality obturation
Tooth type		
Anterior/premolar	89.7%	10.3%
1st molar	72.2%	27.8%
2nd molar	82.3%	17.7%
Radiographic appearance		
Visible canal	86.6%	13.4%
Reduced size of canal	76.4%	23.6%
Canal(s) not visible	54.5%	45.5%
Endodontic treatment history		
No previous treatment	87.9%	12.1%
Previous access without complication	78.1%	21.9%
Previous access with complication	76.9%	23.1%

Table A: *The quality of endodontic treatment results is also related.*

Conclusion

The use of specialized magnification, lighting and equipment greatly facilitates an operator's ability to identify root canal entrances and any difficulties that may arise at the time of treatment, but there is no substitution for the experience and knowledge acquired in practice, both in the clinical setting and on the extracted teeth.

The importance of achieving straight endodontic access cannot be overstated. Ultimately, poor access cavity preparation could result in inappropriate cleaning, shaping, and filling, thus affecting success.

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