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Surgical Removal of Fractured Endodontic Instrument in Periapex of the Mandibular First Molar: A Case Report

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Abstract: ***The purpose of this paper is to present combined endodontic and surgical treatment in complicated endodontic cases, related to fracture of endodontic instrument and existence of periapical lesion. Case report: Presentation of a case of a patient at the age of 23 years with periapical endodontic lesion of tooth 46 and fractured canal instrument in the lower 1/3 of the medial root. Retreatment of tooth 46 was done preoperatively, during which, the removal of the separated canal instrument could not be done due to the anatomic characteristics of the root of the tooth and the fracturing of the instrument at a distance of 2 mm outside the apex. The endodontic lesion was reached intraoperatively and the latter was extirpated, the apices of tooth 46 were resected, the fractured canal instrument was removed and retrograde obturation with MTA was done. Results: After follow-up observation of the process of recovery high level of success rate was found after the performed combined endodontic and surgical treatment. A complete bone regeneration of the defect is observed after follow-up of the treatment in 6 months and 1 year.Conclusions: The well performed endodontic and surgical treatment results in preservation of teeth with unfavorable prognosis. After sealing of the endodontic cavity coronally and apically, a complete bone regeneration is observed in the operative field. No enhancement of the mobility of the operated tooth is observed after apical surgery.***

Keywords: fractured endodontic instrument, periapical surgery, retreatment

1. Introduction

The success of the endodontic treatment is due to the removal of the infection in the root canals and regression of the periapical lesions. In some complicated cases, no success can be achieved only using therapeutic methods of treatment.

The fracture of an instrument in the root canal is an adverse complication during the endodontic treatment and may be due to anatomic characteristics and curved root canals, loss of tactile sensation, use of unsuitable size of instruments, unsuitable technique of filling in the root canals, possible existing production defects of the instruments [1,2,3]. When an instrument breaks during the cleaning and shaping of the root canal, the canal cannot be cleaned well after this zone, infected tissues remain and this deteriorates significantly the prognosis for the tooth [4,5]. The prognosis of teeth with fractured instruments depends on the stage of processing of the root canal before the breaking of the instrument, the degree of pulpitis and periapical inflammation, and the possibility to remove the fractured instrument or bypass it.

The best way for thorough cleaning and shaping of the root canal is to remove the fractured fragment, using various techniques and instruments to this effect [3,6].

The successful removal of the fractured fragment depends on the anatomy of the root canal, the location of the fractured instrument, the length of the fractured fragment and in which part of the curve the fracture is [6].

When an instrument breaks in the root canal several solutions are possible: to leave the instrument in the canal, to bypass it and obturate the canal at this level, or to remove the fractured fragment – conservatively or surgically [2,3,5,7]. Instruments fracture outside the apical foramen relatively rarely but when this happens, the fractured instrument is usually removed surgically [4].

To eliminate the infection and preserve the tooth in the mouth cavity, it is necessary to combine the surgical methods of treatment, in particular, apical surgery.

The purpose of this article is to present combined endodontic and surgical treatment in a complicated endodontic case related to fracture of endodontic instrument outside the apical foramen and existence of periapical lesion.

2. Case Report

The presented case is of a patient at the age of 23 years with periapical endodontic lesion of tooth 46 and fractured canal instrument in the lower 1/3 of the medial root.

The patient was admitted with complaints from pain in the region of the lower right first molar.

From the X-ray, the existence of periapical lesion, poorly filled root canals and a radicular post in the distal root were found.

In the medial root, fractured filler Lentulo was found outside the apical foramen (fig.1).

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Figure 1: Diagnostic X-ray of 46 – fractured instrument outside the apical foramen, existence of periapical lesion



Figure 2: Pre-operative orthopantomography

Endodontic retreatment of the tooth: The treatment plan includes the following stages:

1) Removal of the existing restoration.
2) Removal of radicular post from the distal root.
3) Removal of root canal filling material – only paste was found, without the existence of gutta percha. ProTaper Retreatment files (Dentsply Maillefer, Switzerland) was used, hand K-files and H-files. Attempt for removal of the fractured fragment but unsuccessful.
4) Cleaning and shaping of the root canals using ProTaper Universal (Dentsply Maillefer, Switzerland). 5.25% NaOCl was used during the shaping of the canals. The final irrigation was done with 5ml 5.25% NaOCl – 3 ml saline solution – 3ml 2% CHX – saline solution – 3 ml 17% EDTA for each canal.
5) The root canals were filled in using the method of cold lateral condensation technique and epoxy-based sealer (AH Plus).
6) A radicular post was adjusted and cemented into the distal root and a subsequent reconstruction with light curing resin composite was done.

During the retreatment, the elimination of the separated canal filler could not be done due to the anatomic characteristic of the tooth root and due to its fracturing outside the apex (fig.2-3). The patient was informed and a decision was made for its surgical removal.



Figure 3: After retreatment of 46

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Periapical surgery: The goal of surgical treatment is to eliminate the endodontic lesion, to cut the apices of 46, to remove the fractured canal instrument and to make a retrograde filling.



Figure 4: Preoperative view

The surgical procedure was performed under local anesthesia with Ubistesin 4%.

Planning of the flap: From an anatomic point of view, tooth 46 is surrounded by a massive quantity of compact bone tissue and spongiosis, under the apices of the tooth there is the lower-jay canal in which, the neurovascular bundle is situated, medially foramen mentale (fig.4). The planning of the flap should take into consideration besides the anatomic prerequisites, also the change for good visibility during the operation, and the chance to extend it intraoperatively. It is important that the surgical intervention does not result in loss of periodontal tissues. In view of the above, a triangular incision was chosen, passing on the border between attached and free gingiva, by a divergating incision running medially from tooth 44, aiming to avoid foramen mentale et nervus mentalis. The flap shaped in this manner is reflected into the full thickness of the gingival (fig.5).



Figure 5: Dissection of mucoperiostal flap using angle-shaped incision

The shaping of this type of flap gives a good visualization of the operative field, protection of n. alveolaris inferior et n. metalis from injury and an option for easy access intraoperatively.



Figure 6: Shaping of a bone window

A bone window was dissected in the buccal corticalis under constant cooling with physiological solution (fig.6). After visualization of the fractured instrument, it was removed and the medial root was resected approximately 3 mm. The granulation tissue was scrapped off. Then, the retrograde cavity was prepared using a round stainless steel bur and it was obturated with MTA (fig.7). The excess of material was removed with a wet sterile gauze.



Figure 7: Retrograde filling in with MTA

A resection of 3 mm was also done on distal root the retrograde cavity was dissected. The cavity was obturated with MTA. Absorbable sutures 4/0 were used for sutures of the operative wound (fig.8).



Figure 8: Sutures of the flap

The patient was prescribed Augmentin 1000 mg – 1 tabl. every 12 hours and non-steroid anti-inflammatory agent – Nimesil 100mg – as necessary.

Rinsing with solution Eludril three times daily for 7 days.

After 7 days, the sutures were removed.

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An X-ray was done immediately after the operation, after 2 months, 6 months and 1 year to follow-up the result of the treatment (fig.9-12). Besides the X-ray, the following parameters were monitored at each visit: clinical symptoms for existence of pain, existence or lack of fistula in the zone of the operative field, paresthesia, condition of the periodontal tissues, existence of mobility of the tooth.

During the control examinations, the lack of pain, mobility, preserved periodontal tissues was found. The X-ray diagnostic showed recovery of the bone structure.



Figure 9: X-ray immediately after the operation



Figure 10: X-ray after 2 months



Figure 11: X-ray after 6 months

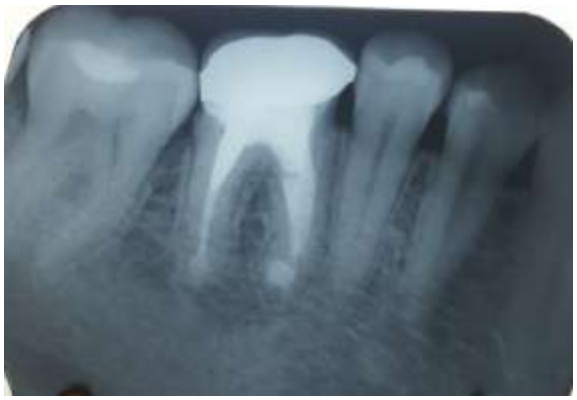


Figure 12: X-ray after 1 year

3. Discussion

The endodontic mistakes such as insufficient filling in, overfilling of the root canals, fracture of instruments, root perforations and thresholds increase the risk of periapical inflammation due to the impossibility to eliminate the microorganism in the main root canal and the lateral canals [4].

Instruments fracture outside the apical foramen relatively rarely but when this happens, the fractured instrument are usually removed surgically [2,4,5].

The periapical surgery of the lower molars is relatively hard to perform due to the proximity of the root apices to the mandibular canal, difficult access to the roots due to the distal location and the lingual inclination and the buccal bone thickness.

For a better pre-operative assessment of the anatomic structures, it is recommended to make CBCT in view of positioning the focus in reference to the mandibular canal [5].

In recent years, periapical endodontic surgery has been using for retrograde preparation after apical resection ultrasound tips, microscope [8,9].

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The retrograde obturation is of great importance for the prognosis for the tooth after periapical surgery [10,11]. Various materials are used for this purpose – MTA, Biodentine. In this clinical case, we used MTA which has proven in time features as a material for retrograde obturation. It has a good biological tolerability and good sealing properties. Its disadvantages are known, too, related to its long time of hardening (170 min) and the difficulties with its application. Some new calcium-silicate materials which are launched in recent years try to compensate the disadvantages of MTA. One of these materials is Biodentine (Septodont, France). It has a lower time of hardenting (12-15 min) and better manipulation properties. The main difference between Biodentine and MTA is the absence of calcium aluminate and calcium sulphate in the formation of Biodentin. Those compounds are known to result in a decrease of the mechanical endurance and entail the longer time of hardening typical for MTA [11,12,13].

A traditional technique for retrograde preparation of the root canal and filling with MTA was used in the presented clinical case.

4. Conclusion

The well done endodontic and surgical treatment results in the preservation of teeth with unfavourable prognosis and improvement of the conditions for fixed prosthesis.

After sealing of the endodontic cavity coronally and apically, a complete bone regeneration is observed in the operative field.

No enhancement of the mobility of the operated tooth is observed after apical surgery.

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