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Bypass Technique: A Conservative Approach for Management of Separated Instrument in Root Canal System

Dr.Pradnya V. Bansode[1], Dr. M. B. Wavdhane[2], Dr.Seema D. Pathak[3], Dr.Janhavi Swami[4]

[1](Head of Department, Professor, Department of Conservative Dentistry and Endodontics, GDC and Hospital, Aurangabad/MUHS, India)

[2](Associate Professor, Department of Conservative Dentistry and Endodontics, GDC and Hospital, Aurangabad/MUHS, India)

[3](Professor, Department of Conservative Dentistry and Endodontics, GDC and Hospital, Aurangabad/MUHS, India)

[4](MDS Student, Department of Conservative Dentistry and Endodontics, GDC and Hospital, Aurangabad/MUHS, India

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ABSTRACT: 'You are an endodontist', as an expression among them goes, 'when you accidentally break a file and try to retrieve or bypass it.' One of the most frequent endodontic errors is the separation of an endodontic instrument while performing a root canal treatment. Separation of endodontic files may obstruct access to the root's apical region and hinder the cleaning, shaping, and obturation procedure. There are numerous techniques used for either retrieval or bypassing of separated instruments in root canal systems. However, rather than retrieval, the bypass technique is nonsurgical and more conservative, causing less dentin removal, thus decreasing the chances of vertical root fracture in endodontically treated teeth. This paper is a representation of two such cases of instrument fracture in root canal systems and their successful endodontic management after using the bypass technique

KEYWORDS: separated instrument, bypass , retrieval , endodontic therapy.

I. INTRODUCTION

The rotary system has revolutionized the field of endodontics by providing fast pace and accurate root canal treatment[1,2] A problematic occurrence during endodontic therapy during preparation with a rotary system is the separation of instruments. It emerged in between 2% - 6% of the instances that were researched. [2] This issue may prevent the root canal system from being properly cleaned, shaped, [4,5] or definitively obturated, which may lead to endodontic failure in the future.[2] The most frequent causes of file separation are inaccurate use, physical property constraints, insufficient access, root canal anatomy, and perhaps manufacture flaws.[3] Instrument separation commonly occurs at the middle or apical third of the mesial canals of mandibular molars, and at the same position in the mesiobuccal roots of maxillary molars due to their root curvatures.[1]When an instrument fractures, the clinician must assess the separated portion clinically and radiographically. Then, determine the best course of action taking into account the pulp condition, root canal infection, anatomy of the root canals, location, size, and kind of the broken instrument, as well as the potential damage to the tooth's remaining structure. A major disadvantage of the retrieval of separated fragments has been the excessive removal of root dentin coronal to the separated fragment, which may lead to perforation or predispose the teeth to vertical root fracture.[6]Another treatment option is a non-surgical and conservative method such as attempting to bypass it before preparing and obturating the segment. this paper further elaborates on the bypass technique used for successful endodontic therapy in two cases.

II. CASE REPORT 1

A 32 male patient was referred by a general dentist to the Department of Conservative Dentistry and Endodontics, he complained of mild pain and discomfort in the lower right back region of the jaw on mastication. The patient reported a history of root canal treatment initiation three weeks ago. On intraoral examination, a temporary restoration was seen concerning tooth 46, which was tender on percussion. An Intraoral Periapical (IOPA) radiograph of the tooth revealed a separated instrument in the mesiobuccal root in the apical region, partially extruding out of the root canal

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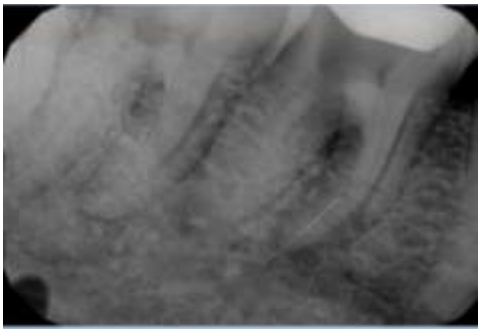
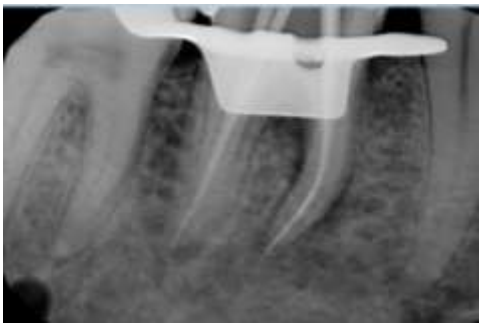
system. Based on the clinical and radiographic analysis, a diagnosis of Previously Initiated Root Canal Therapy was inferred. Retreatment was initiated under rubber dam isolation. The technique decided to be applied was the Nonsurgical Orthograde-Bypass technique as the separated instrument was in the apical third below the curvature where retrieval techniques would have caused an excess amount of dentin destruction or further ingress of the separated instrument in periapical tissues. Hence a conservative approach would have been apt for this case. If symptoms were happen to be not resolving then the surgical approach was kept on the agenda. Temporary restoration was removed and four canals were located namely mesiobuccal, mesiolingual, distolingual, and distobuccal. A straight-line access to all four canals was achieved by removing all dentinal overhangs using safe end diamond bur. The separated instrument was found dislodged in the mesiobuccal canal of the tooth. The remaining Canals were negotiated using 8k, and 10k files followed by 15k and 20k files. 5.25% NaOCl along with 17% EDTA was used to remove the debris from the canals. 8k file was inserted in mesiobuccal canal carefully and was tried to negotiate between the dentinal wall and the broken instrument thus avoiding placing the instrument directly on top of the broken file, a catch was felt, and the file was kept in the same position. A small in-and-out movement along with copious irrigation of the root canal was done. The full-length patency of the canal was achieved with #10K, #15K, and #20K in that position, and a working length measuring radiograph was taken. After the preparation of canals by a standardized rotary system, calcium hydroxide dressing was given for 14 days. On the next visit, the shaped and cleaned canals were obturated. A final radiograph was recorded. Post-obturation restoration was done after 7 days. The patient came for a follow-up after three months.IOPA X-ray revealed healing in periapical tissues and furcation area ,also patient was completely asymptomatic.



Preoperative IOPA Xray

Determination of working length after file bypass



IOPA Xray of master cone

Post-operative IOPA X-ray

3 Months follow up

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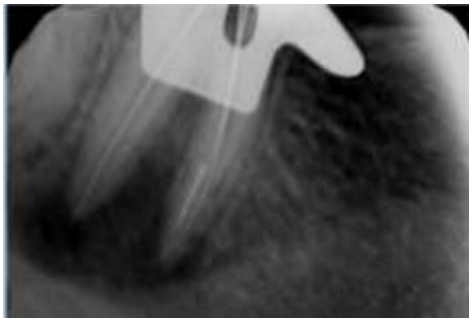
III. CASE REPORT 2

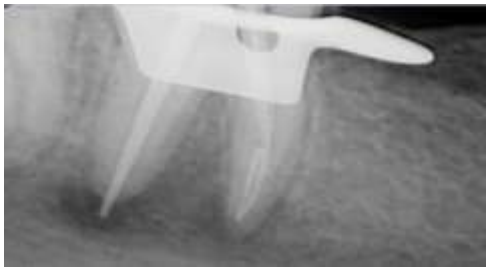
A 37-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of pain in the lower right back region of the jaw for the past 3 -4 days. On examination, the deep occlusal cavity was noted with 46. The patient gave a history of initiation of root canal treatment at a private clinic 2 weeks back. Radiographic examination showed a separated instrument in the mesiobuccal canal apical to the curvature concerning 46. Based on the clinical and radiographic analysis, a diagnosis of Previously Initiated Root canal Therapy was inferred. Retreatment was initiated under rubber dam isolation. The technique decided to be applied was the Nonsurgical Orthograde-Bypass technique as the separated instrument was in the apical third. A similar technique as described in the previous case was applied. Patency was obtained using 6k,8k 10k files then cleaning and shaping further proceeded with the rotary system using a standardized technique. Calcium hydroxide as intracanal medicament was given for 7 days. After the given period the canals were obturated. Post-obturation restoration was done after 7 days.

Preoperative IOPA X-ray



Determination of working length after file bypass

3D imaging of working length IOPA X-ray



Master cone IOPA X-ray

Post-operative IOPA X-ray

3Dimaging of post-operative IOPA X-ray

IV. DISCUSSION

The success of endodontic therapy depends on the clinician's ability to clean and shape the root canal system properly.[6] Nickel-titanium alloys are currently the most often used metal for manufacturing endodontic files due to their shape memory, biocompatibility, super elasticity, and corrosion resistance.[7] Despite these benefits, the incidence of file separation is higher with nickel-titanium files than with stainless steel files because their tensile and yield strength is lower than that of stainless steel.[8] Restricted access, improper angulation of the file during use, canal anatomy,

and over-utilization of files could have contributed to file separation in this case.[9] Separated instruments in root canals of teeth without periapical lesions did not affect endodontic treatment results. In a case-control study of 146 teeth conducted over a year, the overall success rate of cases and controls was 93.7%. In cases, 91.8% for instances. Controls had 94.5%.[10] Opting for retrieval techniques destroys dentin because of the use of relatively large, hard trephines and ultrasonic tips to create a staging platform. This will eventually result in perforation.[10]A conservative technique of bypassing the instrument can be applied. The "bypassing technique" relies on the fact that "no root canal is adequately round, and a minute gap exists between the root canal wall and the fractured fragment, which permit a smaller file to bypass the fractured instrument[10]. The canal is then negotiated to its entire working length, allowing for thorough cleaning and shaping till the apex. Also enables root canal obturation till the apex while the instrument remains in place no matter the position of separation.[12,14] Thus achieving our goal of cleaning and shaping of root canal till the apex and sealing of apex thus providing a hermetic seal. This method is simple and less intrusive.[10,14]

V.CONCLUSION

Technological development, advances in the armamentarium, and clinical expertise enable the successful management of fractured instruments. The recommended procedure in case of instrument separation treatment is first to endeavour to bypass the instrument as it's considered to be a conservative technique, with a low risk of clinical mishap, with the further advantage of having the potential to contribute to the final removal of the instrument

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