

Management of apical root perforations using precurved protapers- A case series

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ABSTRACT

Procedural errors are unwanted yet an integral part of an endodontic treatment. Management of these errors can be quite frustrating and difficult. Ledging leading to false canals or direct perforations are extremely difficult to manage and can even lead to loss of the affected tooth. This article describes the management of false canals and direct perforations in two cases using precurved protapers in balanced force technique.

Key words: ledge formation, root perforation, protapers,

INTRODUCTION

Procedural errors or endodontic mishaps are unfortunate occurrences that can occur during a routine endodontic treatment¹. Failure to understand the concepts in proper cleaning and shaping of curved canals can lead to errors like blockages or ledged canals or perforations. Consequently, there might be a casual relationship between ledge formation and unfavourable endodontic treatment outcomes. These have been attributed to inappropriate cleaning and shaping concepts².

Among the complications most commonly encountered ledging has been defined as a deviation from the original canal without forming a direct communication with the periodontal ligament³. The factors responsible for ledging are failure to achieve straight line access to the apical foramen or the first part of the curva-



Fig 1: Preoperative image

ture^{1,2,4} and using straight or too large an instrument in the curved portion of the canal. Occasionally, even skilled and careful clinicians develop canal ledges when treating teeth with unsuspected aberrations in canal anatomy.

The unfortunate sequence is as follows. A ledge is created and the proper working length is lost, the operator, eager to regain that length "bores" apically with each file, thus creating an artificial canal. Used persistently, the file eventually perforates the root surface⁵. Perforation may be caused by two errors of commission: (1) creating a ledge in the canal wall during initial instru-

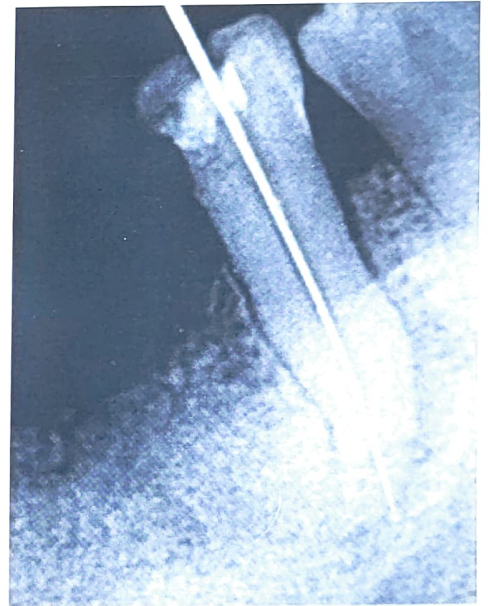


Fig 2: Number 15 File Perforating The Apical Third

mentation and perforating through the side of the root at the point of canal obstruction or root curvature and (2) using too large or too long an instrument and either perforating directly through the apical foramen or "wearing" a hole in the lateral surface of the root by over instrumentation (also called strip perforation). The prognosis of such teeth is questionable and often surgical repair is advocated unless the un-instrumented canal can be reclaimed and cleaned.

This paper highlights two case reports where iatrogenic perforations occurred at

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different levels and were managed using pre-curved protapers and continuous wave of obturation technique.

CASE REPORT 1

The patient was referred to the department by a fellow dentist who complained of loss of working length and pain during preparation which was not present in the previous visits. The tooth in question was 34. On examining the preoperative picture which the dentist had provided a gentle curvature at the junction of apical and middle third was noted (fig 1).

An estimated radiographic working length was taken and a number 15 K flex file (Dentsply Maillefer) was gently inserted and an RVG image was exposed. It showed that the file had missed the curvature and instead had perforated the apical third part of the canal (fig 2).

The patient was informed about all possible treatment options and was reappointed.

Rubber dam application was done, access opening was modified and coronal flaring was done using x gates drill. K3 body shapers were used in the straight part of the canal till the ledged point. Once the desired coronal to the middle preparation was done, a precurved 8 number file C+ was introduced, the rubber stopper was adjusted in the direction of the curvature and the file was pecked patiently till the "sticky stop" was felt. The file advanced apically and to our joy the lost canal was renegotiated. The file was used in short push and pull strokes making sure the head of the file was below the ledged point. Slowly the files were advanced from 8 C+ (Dentsply Maillefer) till 17 Senseus Profinders (Dentsply Maillefer). An image was taken and the new working length was taken. This was also confirmed using the Sybron Endo mini apex locator (Sybron Endo). Recapitulations were carried out repeatedly with a precurved number 10 Senseus profiler so as to maintain the apical patency at all times.

To provide uniform shape and taper to the canal it was decided to use the manual protaper using the balanced forced technique. The tip of S1 was overbent radically using an endobender plier. The rubber stop was marked in the direction of the cur-



Fig 3: Precurved protaper smoothing the ledge and at working length

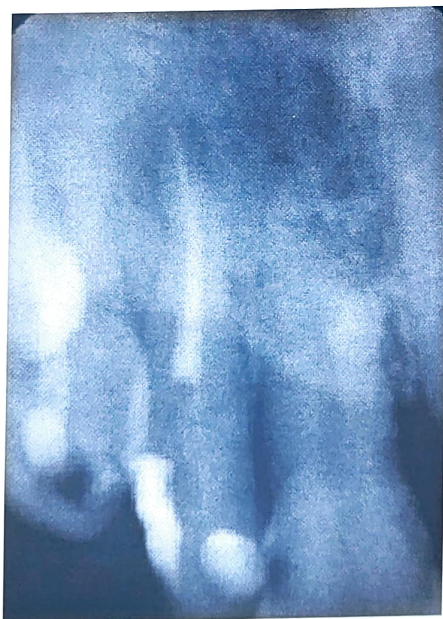


Fig 5: Final obturation image

vature. The canals were filled with sodium hypochlorite 3% and the S1 was introduced keeping the marking in the desired direction and a clockwise balanced force technique was used. The bent tip was able just able to negotiate the ledge into the original canal. Repeated voluminous irrigation was carried out using max 1 probe needles (Dentsply Maillefer). Patency was maintained at all steps using a precurved num-



Fig 4: Preoperative radiograph

ber 10 k Flexofile. The canal was prepared using precurved protapers in the balanced force technique. The canals were prepared till F2. (fig 3).

Gutta percha was placed and radiographic verification was done. After verification the tip was cut by 0.5mm and it was placed in 5.25% sodium hypochlorite for one minute. Smear layer management was carried out using Endoactivator (Dentsply Maillefer) with a 20/04 tip. Apexit (Ivoclar Vivadent) was used and the gutta-percha was downpacked using the Beefill system (VDW). The final radiograph was taken to verify the degree of fill.

CASE 2

This case was referred to our department by a fellow intern. She complained that the patient had pain every time the file was placed to the working length. She also stated that the root canal was opened in the camp setup by the institute in a village and she had debrided the tooth till a number 25 H file. She had not taken the preoperative picture of the tooth. On examination there was a large proximal carious lesion and access opening was made through it. The preoperative x ray showed a gentle curvature at the junction of the middle and apical third (fig 4).

A number 15 k Flexo file (Dentsply/

Mailifer) was taken and placed gently to an estimated working length and image was taken. The file had directly perforated the root at junction of the middle and apical third. Rubber dam application was done and access opening modification was carried out.

Pre coronal enlargement was carried out using gates drill. A working length X ray was taken till the straight part of the canal and it was prepared the k3 body shapers. A number 10 C+ file was taken and the tip was precurved in the desired direction, the rubber stopper was adjusted and the file, was slowly pecked in the desired direction in the canal to feel sticky spot. The original curvature was negotiated and apical patency was established. Subsequently files were pre curved and the apical third was prepared till a 20k file. The canal was prepared using precurved protapers in the balanced force technique. Smear layer management was carried using Endoactivator and alternating 3% NaOCl and 17% EDTA. The canal was downpacked. The final image showed that gutta percha had also filled up the false canal ensuring a complete fill (fig 5).

DISCUSSION

Occasionally even very skilled and careful clinicians might create a ledge within a root canal when treating teeth with unsuspected aberrations in the anatomy of the canal. This often results when the operator works the files short of the full canal length, and the canal becomes blocked at that "short point". This might create a ledge or it might begin to form a new pathway at a tangent to the true pathway of the root canal⁶. When a ledge is formed, the canal is usually "straightened" at that point; suddenly the file no longer negotiates the curve but catches on a "dead end". There might be a loss of normal tactile sensation of the tip of the instrument binding in the lumen of the canal. This feeling is supplanted by that of the instrument point hitting against a solid wall, that is, a loose feeling with no tactile sensation of tensional binding². Since negotiation of such canal is difficult misdirected pressure and force applied to a file may result in formation of an artificial canal and eventually in an apical or midroot perforation⁵.

Root canal curvature is the most impor-

tant variable which predisposed to a ledge formation^{4,6}. Proper access opening with straight line access to the apical foramen or the first part of the curvature is the most important step to prevent ledging and its consequence. Coronal enlargement and preflaring ensure smooth access to the curved portions of the canal. The above mentioned case reports had inadequate access to the first part of the curvature which was corrected initially only using K3 body shapers. These robust files come in a taper range from 8%-12% with a 0.25mm tip diameter. These were used in a crown down fashion just short of the ledged point ensuring a smooth passage for the subsequent files. Use of ultrasonics BUC-1 and CPR -8 tips is also recommended. The CPR-8 tip is made of titanium and can be prebent also⁷. Application of C+ file (Dentsply/Maillefer) that have been introduced for its initial instrumentation of the root canal is very helpful in attempting to bypass the ledge. Use of C + files (Dentsply/Maillefer) is crucial in locating the sticky spot which helps renegotiate the original canal as the precurved tip of a C+ doesn't get quickly deformed during the pecking movement. They are reported to be better for negotiating calcifications and to provide better tactile feel^{8,9}. Once the tip of the file can be placed apical to the ledge, it should be moved in and out of the canal with filing motion and occasionally with short push and pull strokes, with emphasis on staying apical to the defect².

Root canal enlargement after ledge management may be accomplished by using nickel titanium hand files. In the normal filing sequence there is a quantum jump of 50% in the tip diameters from a number 10 file to 15. It is this crucial step which is many goes unnoticed and ends up ledging the canal. Hence complying with the correct usage of file sequence is crucial. The use of these intermediate series (Senseus Profinders, Dentsply /Maillefer) ensures that the diametrical percentage increase is never too great ensuring that the canal anatomy and its nuances are maintained at all given time. In above mentioned case reports hand protapers were used to blend the ledge with the canal. The tip of these files was overbent using an Endo Bender plier (Sybron Endo/Orange CA). Radically

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overbending the file by 180-360°, the material was able to hold a bend of 35-45°. Once the bend was accomplished, the bent tip was directed around the impediment using a careful watch-winding motion. These files act like passive pilot guides. The major advantage of these files is that these files have a taper which is about 3-4 times larger than the conventional 02 tapered files, and thus their ability to shape the canal more efficiently. Since the flutes of these files are in a forward direction the file was used in clockwise motion. The sequence of motion used was

1) Clockwise insertion, this ends up feeding the file in the canal.

2) When resistance was met firm apical pressure was applied and it was rotated 360 in counter clockwise direction. The firm apical pressure doesn't let the file back out of the canal.

3) The file was again rotated clockwise and cutting was done in a counterclockwise direction

4) The file was then removed in a clockwise direction with the flutes loaded with debris.

After 3-4 cycles the ledged point was merged with the main canal ensuring a straight forward cone fit. Smear layer management was done using Endoactivator (Tulsa /Dental). Its design allowed for the safe activation of various intracanal reagents and produced vigorous intracanal fluid agitation 10. The perforation should be treated like an additional canal and sealed during routine endodontic procedure. The pressure on the obturating material pushes into the main canal as well the perforation. Ultimately the operator should decide based on his experience whether to abort the treatment or think of other treatment options One must keep in mind that not all ledges can, or should be removed, and they must assess the risk versus the benefits while also making every possible effort to preserve as much as dentin as possible. This should also be explained to the patient before commencing the treatment. If a ledge cannot be bypassed, then the treatment options become limited to the use of periapical surgery with retrograde treatment. If periapical surgery is needed but impractical

because of the tooth position or other local factors, an extraction should be considered. Other surgical options include root amputation, hemisection and apicoectomy. In such a case, the affected root is removed, and the remaining roots are retained and restored to prevent the need for a fixed or removable prosthesis to replace an entire tooth.

CONCLUSION

Unfavorable outcomes of endodontic treatment associated with such cases depend on the amount of debris and bacteria left in the untreated apical portion of the canal. The amount will depend on when the perforation was made during the instrumentation process, that is, if it formed early in the process, then the apical portion of the canal might not have been cleaned and disinfected to any extent, whereas if the ledge had formed late in the process, then the apical portion might have already been disinfected sufficiently to allow periapical healing to occur. The patient must be informed about the prognosis, the importance of the recall examination, and what signs or symptoms indicate an unfavorable outcome.

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A Dental Check Up & Treatment Camp was conducted by the ICD Section-6 in association with the A. B. Shetty Memorial Institute of Dental Sciences on the 26th of May under the guidance of the President Prof. (Dr.) U.S. KrishnaNayak at Paravanadukkam in Kasargod, Kerala in commemoration of the 150th Birth Anniversary of Swami Vivekananda. Over 200 patients were attended to and delivered various treatments such as Extractions, Restorations, Oral Prophylaxis etc...

