Endodontic treatment for mandibular molars using ProTaper

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INTRODUCTION

Although the patterns of dental disease is gradually changing, caries and periodontal disease still account for the most important reason for extractions in most countries. The highest proportion of tooth loss due to caries occurred between 21 and 30 years of age. For caries, the greatest proportion of tooth loss involved the posterior teeth, most frequently, the molars.¹ It has been observed that the percentage of tooth loss due to caries is much higher than due to periodontal disease.² Recent studies provide evidence that root canal treatment results in excellent clinical outcome for the patients, which is in favour of the preservation of teeth. Therefore, endodontic treatment remains a highly predictable method to retain teeth with irreversible pulpal disease.³ Success rates of more than 90% have been shown in root canal treated teeth. At present there are many alternative treatments available to preserve or replace diseased teeth and considerable progress has been made in this field.³ The pooled proportion of teeth surviving over 2–10 years following root canal treatment ranged between 86% and 90%.⁴ Two approaches to debriding and shaping the canal have finally emerged: either starting at the apex with fine instruments and working one's way back up (or down) the canal with progressively larger instruments—the “step-back” or serial technique; or the opposite, starting at the cervical orifice with larger instruments and gradually progressing toward the apex with smaller and smaller instruments—the “step-down” technique, also called “crown-down” filing. The unique feature of the ProTaper system is the progressively variable tapers of each instrument, which prepares the canal in both vertical and horizontal directions. It consists of three shaping files and three finishing files. Shaping files prepare the coronal and middle third of the canal, in addition to the critical coronal region of the apical third. Finishing files are designed to prepare the apical third.⁵

In this report, four cases of mandibular molars with irreversible pulpitis were treated with the available instruments and materials.

CASE REPORTS

Case 1

A serving soldier reported to the dental centre with pain in mandibular right first molar for the past one day. The patient had similar episode of pain about 10 days ago. Pain was throbbing in nature and was relieved by analgesics. Clinical examination revealed a large restoration involving the mesial marginal ridge and the tooth was tender on percussion. Patient reported that the filling was done two years back and he never had any pain in that tooth in the last two years. Thermal tests were done to check the vitality and it was positive. A clinical diagnosis of chronic irreversible pulpitis was made. Radiograph was taken and it did not reveal any periapical change except for widened periodontal ligament (PDL). After achieving adequate anaesthesia access preparation was made and three canals were located (Figure 1). After thorough examination of the subpulpal floor no additional canal was found. A radiograph with files in the root canals was obtained. The working length was established and recorded.

Case 2

A serving soldier reported with a complaint of sensitivity to hot and cold in mandibular right second molar and occasional pain on chewing in the same tooth. The patient reported an incidence of severe throbbing pain about six months ago which was relieved by local application of clove oil by the patient himself. On clinical examination a large carious lesion was found on distal aspect of the affected tooth and necrotic pulp was visible. The tooth was tender and on thermal testing a delayed response

Figure 1 Figure showing access opening.

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was found. Clinical diagnosis of non-vital pulp was made and a radiograph was taken which showed caries extending to the pulp and widening of PDL.

Case 3

The son of a serving soldier reported with ongoing root canal treatment in mandibular left first molar. On clinical examination a temporary restoration was found on the affected tooth. On removing the restoration it was found that the access opening was inadequate and was modified. Additional exploration revealed two distal canals.

Case 4

The daughter of a civilian employed in military hospital came with severe throbbing pain in mandibular left first molar since one day. She had a similar incidence of pain, six months ago which was then relieved on taking antibiotics and analgesics. On clinical examination a large carious lesion was found on the tooth, and the tooth was tender on percussion. A small swelling was also present in the buccal vestibule in relation to the tooth. Thermal tests were positive and a diagnosis of chronic irreversible pulpitis with chronic periapical abscess was made. Radiographic examination showed that the caries also involved the furcation area. Access opening was made and all caries including that

present on subpulpal floor was removed. The perforated furcation was sealed with light cure glass ionomer cement.

In all the above mentioned cases access opening was made and the canals were located. After determining working length biomechanical preparation was done using hand ProTaper and calcium hydroxide intracanal medicament was placed in the canals with the help of K-files. Calcium hydroxide is an effective antimicrobial agent and antibacterial activity lasts longer than other intracanal medicaments. Moreover, it has been shown to have some efficacy in dissolution of pulp and also increases the effectiveness of sodium hypochlorite. In the next appointment after one week, all patients were asymptomatic and the canals were obturated using ProTaper gutta percha cones (Figures 2–5). After the biomechanical preparation, healing was uneventful in all the cases and there was not much discomfort on second day after BMP. All the patients were asymptomatic three months, six months, and one year post-treatment showing good healing of the periapical tissues.

DISCUSSION

The goals of endodontic therapy are to shape and clean the root canal system in order to receive a three-dimensional and

Figure 2 Final obturation (Case 1).

Figure 4 Post-obturation (Case 3).

Figure 3 Post-obturation (Case 2).

Figure 5 Post-obturation (Case 4).

hermetic filling of the entire endodontic space. The need to provide instruments of a suitable size to reach the apex of curved root canals drove the development of preparation techniques with a greater focus on the apical part. The crown-down technique involves the widening of the canal orifices with Gates–Glidden drills followed by the incremental removal of organic canal contents proceeding from the canal orifice to the apical portion using manual files. Files are used from larger to smaller with no apical pressure. Nevertheless, the term “crown-down” neither defines the technique in the strictest sense, nor does it provide a specific sequence for the use of instruments, but rather defines a way to use the instruments. A crown-down approach provides certain advantages including early organic debris removal, the creation of a large reservoir for irrigating solutions, a straighter access to the apical region of curved canals, and greater precision with regard to the exact working length and apical size.⁶

The traditional cleaning and shaping strategy (the step-back technique) focused on the initial preparation of the apical third of the root canal system, followed by various flaring techniques to facilitate obturation. In an attempt to reach the canal terminus, the clinician first selected a small file, placed an appropriate curve on the instrument, and then tried to work the file to full length. If the terminus could not be reached, the file was removed and, after irrigation, either the same file or a smaller one was inserted. However, more often than not full length could not be reached because of blockage or coronal binding.⁷

A primary purpose of crown-down technique is to minimise or eliminate the amount of necrotic debris that could be extruded through the apical foramen during instrumentation. This would help prevent post-treatment discomfort, incomplete cleansing, and difficulty in achieving a biocompatible seal at the apical constriction. One of the major advantages of step-down preparation is the freedom from constraint of the apical enlarging instruments. By first flaring the coronal two thirds of the canal, the final apical instruments are unencumbered through most of their length. This increased access allows greater control and less chance of zipping near the apical constriction. In addition, it provides a coronal escape way that reduces the “piston in a cylinder effect” responsible for debris extrusion from the apex.

The ProTaper system of canal shaping is unique in the sense that it uses a crown-down approach with the shaping files and

a step-back approach with finishing files.⁸ The three shaping files by virtue of their variable taper prepare the coronal two third in a crown-down manner and finishing files due to their increasing taper in apical region prepare and finish the apical third. The unique design factor is the varying tapers along the instruments’ long axes. The three shaping files have tapers that increase coronally, and the reverse pattern is seen in the three finishing files.⁹

CONFLICTS OF INTEREST

None identified.

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