

## Five canals on mandibular first molar successfully managed by undergraduate dental student: An Educational Case Report.

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**Abstract:** Undergraduate dental student's eligibility and ability to treat difficult endodontic cases is a new area open for debate. A fifth year undergraduate dental student managed to perform a successful root canal treatment (RCT) on a 42 year old male patient diagnosed as a rare case of mandibular first molar with five root canals. As an educational case report, in a country like Sudan, close supervision and clinical training of undergraduate students in treating difficult endodontic cases is recommended.

**Keywords:** *Endodontics; mandibular first molar; root canal therapy; dental student.*

### INTRODUCTION.

Good knowledge of the root canal morphology and its variations is crucial for successful endodontic treatment, hence the inability to locate, negotiate and fill all canals result in root canal treatment (RCT) failure. Molar teeth have a wide range of variations in root canal morphology. In the case of mandibular first molars, one-canal<sup>1</sup> two canals,<sup>2</sup> three canals,<sup>3</sup> four canals,<sup>4</sup> five canals,<sup>5</sup> six canals,<sup>6</sup> seven canals<sup>7</sup> and even eight canals<sup>8</sup> have been reported. The prevalence of such a small percentage of extra canals puts a burden upon the undergraduate students. Students treating molars as part of their training requirements should be aware of the variable root canals anatomy. The detection of this extra canal could be enhanced by the use of an endodontic microscope or loupes<sup>9</sup> and could be further confirmed by cone-beam computed tomography.<sup>10</sup>

In the Faculty of Dentistry, University of Medical Sciences and Technology (UMST), in Khartoum, Sudan, the endodontic curriculum is taught over the final four semesters, during the fourth and fifth years of training. The undergraduate students begin their preclinical training in semester 7, during the fourth year, treating seven extracted teeth (upper central or lateral incisor, lower central or lateral incisor, upper or lower canine, upper first or second premolar, lower first or second premolar, upper first or second molar and lower first or second molar). The techniques used include manual instrumentation by means of the step-back technique and crown-down technique using rotary files. Then from semester 8 (the second semester of the fourth year) they proceed to treat patients after having been deemed competent. The requirements are as follows,

two teeth (anterior or premolar teeth) for semester 8, then 12 teeth (four anterior, four premolars and four molars) for both semester 9 and 10. During the endodontics course it is mandatory for students to perform a case of retreatment during the final year (semesters 9 and 10). To ensure competent supervision and sufficient time to acquire skills, students are informed that their requirements are to be finished within 16 weeks, during an average of three visits per root canal treatment per single tooth.

### CASE.

Our curriculum at UMST, follows the recommendations of the European Society of Endodontology, which is that undergraduate dental students are required to perform root canal treatments is a total of twenty teeth, including the extracted ones.<sup>11</sup>

To ensure consistent, sound and effective teaching, the members of the endodontics teaching unit are in full attendance whenever undergraduate students are performing clinical endodontic treatment. The ratio of teachers to students is 1:3.

Due to varied morphology and aberrant canal configuration, endodontic treatment in molar teeth is a challenging task for the undergraduate dentistry students. The purpose of this educational case report is to describe the successful treatment of a mandibular first molar tooth with five root canals performed by an undergraduate clinical dental student and to point out the importance of training the students in the treatment of difficult endodontic cases.

### Patient information

A 42-year-old male with no significant past medical history presented to the fifth year endodontic clinic at the Academy Dental Teaching Hospital with a chief complaint of pain in lower posterior teeth region. The pain had started three days previously, and interfered with sleeping.

He reported using an over-the-counter analgesic that morning and in the night before without lessening his symptoms.

### Clinical Findings

The patient was referred from the outpatient clinic to the fifth year endodontic clinic. The patient was seen

and examined by one of the students during his clinic time required to fulfill his endodontic requirements for semester 10 final Bachelor of Dental Surgery (BDS) degree (2014-2015). Intra oral clinical examination revealed deep pit-and-fissure occlusal caries in the lower right first molar (class I cavity), the tooth presented six cusps and responded positively to the cold sensibility test with continued pain after the removal of the stimulus. It was slightly tender to vertical percussion.

### Diagnostic Assessment

A pre-operative intraoral periapical radiograph (IOPAR) showed radiolucency extending to the pulp indicating pulp exposure of that tooth, with normal lamina dura and periapical bone trabeculae.

The radiograph also revealed abnormal tortuous canals in the two roots. (Figure 1) The case was presented to a clinical supervisor, with confirmation of the diagnosis as acute irreversible pulpitis.

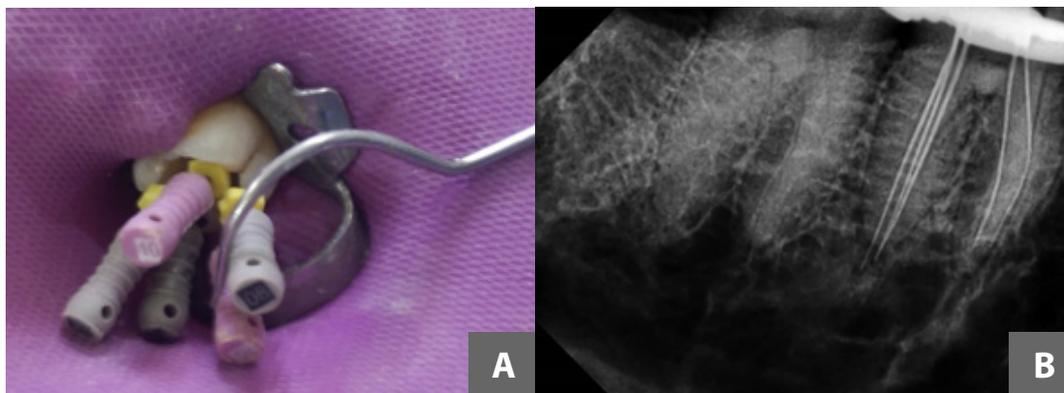
**Figure 1.** Preoperative Intraoral Periapical Radiograph of tooth No. 46.



**Figure 2.** Trapezoidal shaped access cavity prepared on tooth No. 46 shows orifices of two mesial and three distal root canals



**Figure 3.** A. clinically five hand files inside the five root canals of tooth No. 46. B. Intra oral periapical radiograph shows extension of files for working length determination.



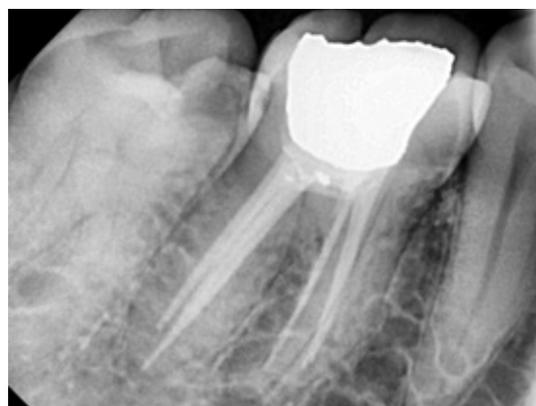
**Figure 4.** Intra oral Periapical Radiograph of tooth No. 46 shows master Gutta-Perch cones before obturation.



**Figure 5.** Intra oral periapical Radiograph shows obturated root canals of tooth No. 46.



**Figure 6.** Intra oral Periapical Radiograph of tooth No. 46 three years postoperatively showing normal lamina dura and bone trabeculae.



### Therapeutic Intervention

The student anesthetized the patient, applied rubber dam and prepared a trapezoidal shaped access cavity. The pulp chamber was unroofed, pulp tissues removed and canals orifices were located. (Figure 2) Mesio Buccal and mesiolingual canals were easily identified, but while locating the distal canals the student pondered the presence of more than two canal orifices. The student and one of the supervisors checked the presence of a middle distal canal through a magnifying loupe by inserting three size 8 and 10 (ISO) hand files into three different paths. IOPAR for working length determination revealed three canals in the distal root. (Figure 3A and Figure 3B)

The patient was informed of the rare extra canal and given the choice of being referred to a specialized endodontist outside the hospital or to continue the treatment by the same student. The patient consented to continue the treatment by the undergraduate student and gave signed informed written consent. The student accepted the challenge and was encouraged to continue the treatment with direct supervision from staff members.

The distal canals were prepared up to size F1, while the mesial ones were prepared up to size F2, using rotary ProTaper® Universal files (Dentsply Maillefer, Ballaigues, Switzerland) under copious irrigation with a 2.5% NaOCl, 17% EDTA solution. The canals were dried, calcium hydroxide intra canal dressing was placed, and Cavex temporary cement was placed in-between visits. After two weeks, the tooth was asymptomatic. Gutta-Percha master cones were checked for tug-back and to ensure accurate fitting to the full working lengths before obturation. (Figure 4) The canals were obturated with F1

& F2 ProTaper gutta-percha points and Zical™ sealant (Prevest Denpro limited, Jammu, India). (Figure 5)

The student managed to perform the treatment alone and the whole procedure was completed in three visits

#### Follow-up and outcomes

The patient was seen 6-months later, and then after one, two and three years, with no symptoms, no tenderness on percussion and with fully functional tooth. Radiographically, no abnormality was detected as shown in the latest IOPAR. (Figure 6)

## DISCUSSION.

Undergraduate dental students treating difficult cases is an area of intense debate. Although the incidence of difficult cases is low, it may appear high since there is a possibility to be seen by undergraduate students who may encounter such cases during their endodontic training requirements or even after graduation. A high incidence of less than ideal root fillings have been reported when assessing the quality of root canal treatment performed by accredited dentists.<sup>12</sup> The reason is related to the endodontic instruction during their training.<sup>13</sup> It appears that practitioners continue to use the techniques learned during undergraduate training.<sup>14</sup>

Our undergraduate curriculum designates both formal and additional separate subject curricula. Preclinical training takes place using extracted human teeth that simulates a real situation and increases student confidence when treating real patients. Shetty *et al.*,<sup>15</sup> showed that the majority of their students prefer preclinical training on extracted teeth and they believed that intense preclinical training would help them manage patients confidently. The clinical training in our endodontic clinics is supervised by six instructors (four teaching assistants, who are well trained in endodontics and potentially selected based on their final graduation grades in the endodontics degree component; and two consultant endodontists with a teacher to students ratio of 1:3). In recent years, there has been significant changes made to undergraduate endodontic teaching, that are influenced by changes in knowledge, techniques and materials, as well as educational approaches.<sup>16</sup> This case and those in the literature, emphasize that undergraduate dental students must be familiar with the diagnosis and

treatment of pulpal and periradicular disease and should perform a complete examination of the pulpal floor of the tooth, even after the expected number of root canals are identified.

Sudan is one of the largest countries in Africa, with a high percentage of population living in rural areas and large towns. The ability to provide endodontic treatment is expected of all dentists regardless of where they may practice. Hence, the education and training of undergraduate dental students in endodontics should be of a high standard.<sup>17</sup> This will enable a newly graduated dentist to deal with the most commonly encountered clinical problems. Profile and competences for the graduating European dentist include performing satisfactory root canal treatment on uncomplicated single and multirooted teeth.<sup>18</sup> This could not be the case in Sudan, as there is only one body for postgraduate studies in endodontics with restricted admission and an average of five postgraduate students per year. In addition, Sudan like other developing countries suffers from an exodus of qualified professionals including dentists and specially endodontists. Therefore, absence of postgraduate studies in almost all Sudan universities, except one, and lack of specialists, warrant the implementation of a no referral policy, and qualified specialized endodontists should actively participate in the training of undergraduate dental students. Tanalp *et al.*,<sup>19</sup> reported that students felt the lowest confidence in the treatment of maxillary molars followed by mandibular molars; they concluded that this may be related to the attitude of dental schools of referring these cases to post-graduate students which will increase the students' tendency of referring challenging cases to a specialist in the future.

The services provided by supervised students, if upgraded, can help in reducing the economic burden of endodontic treatment for those who cannot afford the expenses of both public and private clinics, as student provided treatment is usually done for negligible fees.<sup>20</sup> As an educational case report, we do not conclusively recommend a no referral policy of difficult cases, but rather in some countries like ours, the only alternative will be tooth extraction. The successful root canal treatment of this difficult case by an undergraduate student highlights the importance of teaching and training undergraduate

dental students, in countries like Sudan, to perform treatment for such cases.

## CONCLUSION.

The patient, three years after the successful RCT of his tooth assured good quality of life due to very satisfactory masticatory function and absence of any pain or discomfort. He acknowledged the strategy set by this university that undergraduate student can treat difficult cases. The student who

treated the case, three years later said “from my own experience before and after graduation; I believe that the teaching of endodontics should start early-on, from the second or third year, and the final year (5<sup>th</sup> year) students should be merely focusing on the management of multirrooted and retreatment cases. The number of RCTs required to be performed by each student should be increased in order to raise manual dexterity and the skill of the undergraduate dental students.” The patient gave informed consent to publish this case report.

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