A new model for pre-clinical teaching of endodontic procedure

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مثال جديد لتدريس أسلوب علاج الجذور لمرحلة ما قبل العيادة

الغرض من هذا التمرين هو عرض تصنيع مثال مخبري يحتوي على أسنان طبيعية لتدريس مبادئ إجراءات علاج الجذور المحافظ لطلاب طب الأسنان في مرحلة ما قبل السريري.

تم تصنيع أمثلة للفك العلوي والسفلي (باستعمال قوالب مصنوعة من مادة السيليكون الناسخة ولها ميزاب لساني وحنكي على شكل الـ U) مستعملين مادة الاكريل الممزوجة بن شارة الخشب. بعض الأسنان المنتقاة تم تغطيتها بالشمع ووضعت في الأسناخ الموافقة لقالب المطاط قبل صب الأكريل . وباستعمال هذا النموذج لمدة سنتين أثبت أنه مفيد لأنه قبل من الطلاب والأساتذة موضحا فوائده للطلبة قبل التخرج في تدريسهم على علاج الجذور ما قبل السريري.

The purpose of this laboratory exercise was to describe the fabrication of an in vitro model, containing natural teeth, for teaching the principles of conventional endodontic procedures to preclinical dental students. Maxillary and mandibular models were made (from moulds using silicone duplicating material with U-shaped lingual/palatal groove) from acrylic mixed with saw dust. Apices of the selected teeth were covered with beading wax and placed in the corresponding sockets of the rubber mould before pouring the acrylic. Using this model for a period of two-years has proved to be beneficial for undergraduate pre-clinical endodontic course work since its advantages were accepted by both the students and faculty staff.

Introduction

Pre-clinical laboratory exercises for dental students are very important for helping them to master specific dental technique. Several practice models had been designed to assist the development of endodontic skills. Simulated root canals in an epoxy resin block[1,2] or in an artificial dentin material[3] had been described. Extracted human teeth mounted in a variety of materials[4-6] have also been used. Furthermore, Khan[4] described a commercially available Dentec model that accommodates a limited number of extracted teeth and which can be attached to the Dentoform Manikin. However, the students need to practice on a large number of teeth. The purpose of this investigation was to describe an endodontic teaching model that was designed to simulate more closely the clinical situation and which can accommodate a large number of extracted teeth.

Materials and Methods

Radiographs of extracted human teeth were taken from both buccal and proximal sides, to ensure selecting teeth without any developmental anomalies, obstructions in the canal, or severe curvature. Maxillary and mandibular alginate impressions of a Dentoform model* (Columbia Dentoform Corp., New York) with a complete arch set were obtained. Stone models were poured and U-shaped grooves were made in the palatal surface of the upper, and the lingual surface of the lower arches respectively (Fig. 1). Moulds of these structures were made using silicone duplicating material** (Dentaurum, Fed. Rep. Germany) (Fig. 2).

Fig. 1. Occlusal view of the maxillary and mandibular stone models showing U-shaped groove that will accommodate x-ray films.

Fig. 2. Silicone moulds of the maxillary and mandibular stone models.

The apices of the selected teeth were covered with small balls of beading wax and each tooth was placed into its individual socket in the rubber mould (Fig. 3). Approximately 71 gram of a fast bonding repair polymer material (True Repair, fast

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Fig. 3. A small ball of beading wax on apices of selected teeth, which are placed in the corresponding socket of the silicone mould.

bonding repair material, Harry J. Bosworth Company) was mixed with 17 gram of saw dust until homogenous mixture was obtained, after which about 35 ml monomer (liquid) was added and mixed until the mass became smooth creamy obtained. The mixture was poured slowly into the rubber mould until the apices of the root were covered completely with the mixture. During the initial setting of the acrylic, a threaded plastic lock component of a screw attachment was embedded in the middle of the acrylic base (Fig. 4). The key component of the attachment in the manikin phantom head can be screwed into this lock component. This permitted stable mounting of the model in the manikin phantom head (Fig. 5). During the demonstration, student learned to place a rubber dam, cope with its inconveniences, and worked indirectly during access cavity preparation in the maxillary teeth (Fig. 6). Incorporating saw dust into the acrylic enabled the radiographic density of bone to be closely simulated (Fig. 7). Students were able to practice

Fig. 4. A threaded plastic lock component of a screw attachment was embedded in the middle of the acrylic base.

endodontic radiographic techniques by placing Eastman Kodak's x-ray films #1 or #2 in the U-shaped groove which was located at the proper angle behind each mounted tooth (Fig. 8). If a radiograph needed to be taken for the canines, the x-ray film had to be stabilized in the groove with wax.

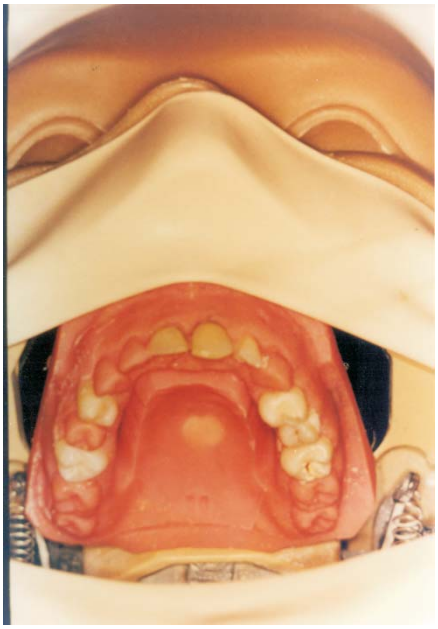

Fig. 5. The model mounted in a manikin phantom head.

Fig. 6. Rubber dam in place duplicating clinical situation.

Fig. 7. Radiograph of mounted teeth with closely simulated bone density.

Fig. 8. Eastman Kodak's x-ray films #1 placed in the U-shaped groove.

Discussion

It is a common practice in most pre-clinical endodontic technique courses to let the student to carry out the exercises on extracted teeth that are mounted separately and individually. Such a technique does not mimic the clinical situation. Transparent resin blocks incorporating simulated root canals have also been used for many years in endodontic teaching and research. This type of model allows the operator to visualize a canal in three dimensions, facilitating the assessment of preparation, irrigation and obturation. On the other hand, the resin block is softer and more compressible than natural root dentin.[7] Also, such blocks exclude important aspects of technique such as access to the canal system, the relevance and use of radiographs, coronal seal[8] and restoration of the crown.

Requirements for any pre-clinical dental model include simplicity of construction durability and facilitation of radiography of good diagnostic quality at various stages during root canal therapy. Our described model fulfills all these requirements and its construction does not take more than 30 minutes for both arches. Moreover, this new model can accommodate a large number of extracted teeth and if an additional tooth needs to be mounted, an artificial socket can be created. Alternatively a piece of wax could be placed on the socket mould before pouring and once solidified, the wax is removed, and the required tooth can be cemented using a relining acrylic. The small ball of beading wax placed around each apex mimics the periapical pathosis and resiliency of the periodontal tissue so that there is no barrier to prevent endodontic files from entering the periapical tissues, if the student does not take adequate care during the placement of files in the canals. This model can also be used to learn the basic steps in apicectomy and retrograde filling techniques.

Conclusion

The new model described has placed the student immediately in a simulated clinical environment. It has been used for a period of two-years by undergraduate students during their pre-clinical endodontic course and was well accepted by them and the faculty. The results demonstrated the advantageous use of this new model for teaching purposes during pre-clinical endodontic stage.

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