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CASE REPORT

Restoflex—A Revolutionary Change in Preclinical Practice for Restorative Dentistry and Endodontics

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ABSTRACT

Preclinical exercises are very important for the dental students in order to master various dental techniques. The objective of this article is to introduce a new preclinical working model named Restoflex. It is especially designed for the students to carry out various restorative and endodontic procedures in an environment that closely simulate clinical situations. This will help them to provide a smooth transition from preclinical environment to the clinical one. It would also mean an increased confidence level and the efficiency with which the students would deal with their cases.

Keywords: Restoflex, Preclinical working model, Working length determination.

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BACKGROUND

All dental schools have preclinical simulation laboratories. This creates a learning environment that promotes critical thinking, decision making and transfer of knowledge from the didactic to the clinical settings. The dental laboratories are necessary in order to enhance the knowledge, skills and performance of the students. Hence, these facilities, though complex and expensive, form a major part of the first and second year of both dentistry and oral health programs.

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Besides acquiring academic knowledge and a full range of highly precise manual and technical skills, including excellent hand/eye coordination; dental students should be able to visualize and understand how to undertake complex tasks, such as placing restorations and undertaking endodontic procedures. Furthermore, unlike medical education, the nature of dental education is such that its students are in a position of treating the patients very early in their training. This brings with it a range of challenges in the contemporary dental education. One among these challenges is to achieve a smooth transition from preclinical learning environment to the clinical one. This is best achieved through preclinical exercises that help students master in various dental techniques with a greater degree of efficiency and confidence.

In the past, several preclinical practice models have been designed to improve the learning of restorative and endodontic skills. Conventional plastic typodonts (Frasco Co.) that can be mounted in the phantom head have helped students to carry out various restorative procedures. Simulated root canals in epoxy resin blocks[1,2] or in an artificial dental materials[3] have also been described for a similar purpose. Unfortunately, these materials do not have the texture, anatomy and other characteristics of the natural teeth. This limitation has been overcome by using extracted human teeth mounted in a variety of materials,[4-6] e.g. POP, acrylic, etc. 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. Analysis of these approaches identified that it was not optimal because it did not permit any scaled learning and was time and cost-intensive. These techniques do not mimic clinical situations, and the laboratory time needed to do this can be put to better use.

This new preclinical working model named 'Restoflex' will provide a unique learning environment that will enable the students to perform all clinical procedures in restorative dentistry and endodontics in a way that closely simulates clinical situation.

TECHNIQUE

'Restoflex' is a durable model that consists of flexible maxillary and mandibular jaws made up of silicone rubber material (Fig. 1). It can house all maxillary and mandibular extracted teeth into it all at once (Fig. 2). The use of silicon rubber

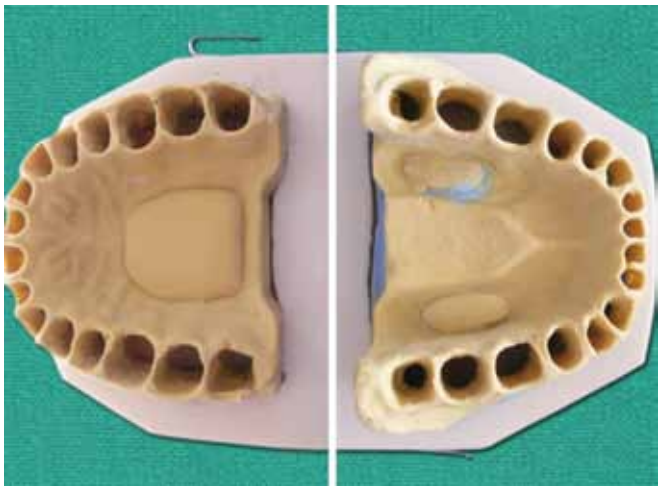

Fig. 1: Flexible maxillary and mandibular jaws of silicone rubber material

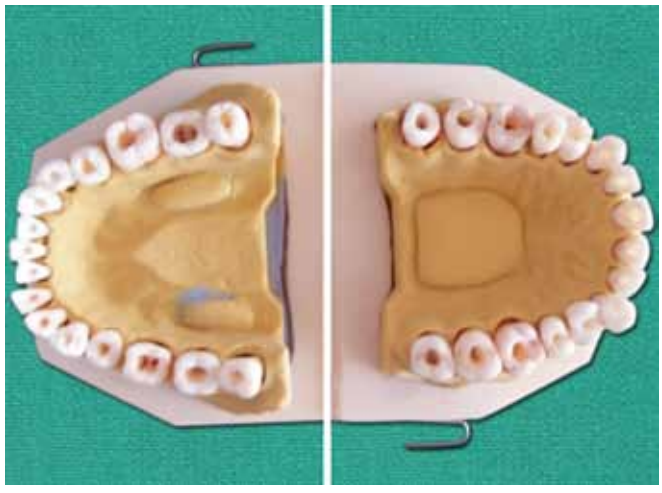

Fig. 2: Maxillary and mandibular jaws with extracted teeth

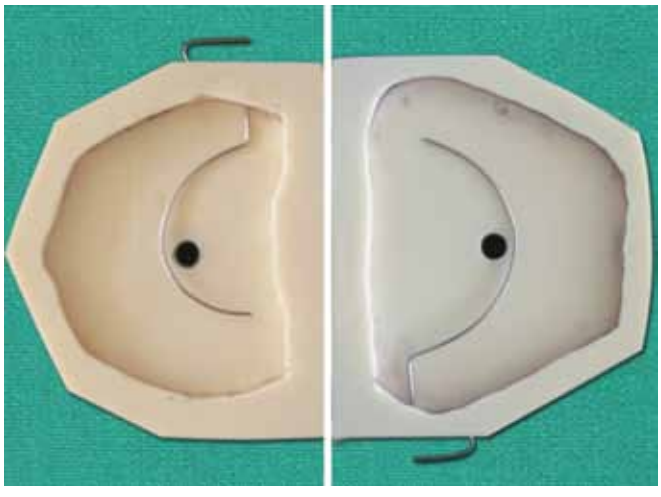

Fig. 3: Acrylic base plates that provide room for the conducting material for determination of working length by electronic apex locators

Fig. 4: Maxillary and mandibular jaws attached in the phantom head

material has greatly improved the ability to seat individual teeth into the simulated sockets irrespective of size, shape due to their variation in race and age. This is because of elasticity of the material which will hold the teeth tightly into the sockets. These maxillary and mandibular jaw contain acrylic base plates (Fig. 3) that provide room for the conducting material that will help in determination of working length by electronic apex locators. Eighteen gauge stainless steel wire loop is attached to the side of acrylic plates which holds lip clip of electronic apex locators and helps in completion of the circuit. These arches can be then attached in the phantom head (Fig. 4). The key component of the attachment in phantom head can be screwed into the lock component present at the bottom of acrylic base plates (*see* Fig. 3). This allows for stable mounting of the model in the phantom head.

DISCUSSION

Clinical competence relies on development of practice, confidence and psychomotor skills. Preclinical model that simulates the oral cavity would serve as a valuable teaching aid in offering direct visual information on the effects of instrumentation during various restorative and endodontic procedures. The visual and tactile experiences offered by the preclinical models will provide mental images which can be transferred to the clinical situations on the patients.

Restoflex will significantly contribute to improve the performance of the preclinical exercises by the dental students in restorative dentistry and endodontics. It can be attached in the phantom head thus helping the students to learn various operator's and patient's positions while working on different quadrants.

This model will help students to learn different techniques of placement of rubber dam for endodontic procedures and prepare access cavity under direct or indirect vision for mandibular and maxillary teeth respectively, keeping in mind the proper angulation and accessibility of the individual teeth. Consideration of these angulations is important as failure to

do so may result in unnecessary gouging of the dentinal walls that weakens the remaining tooth structure and in extreme cases leads to external perforation. In contrast, students lack exposure to these angulations and indirect vision when they carry out exercises on extracted teeth that are mounted separately and individually.

Once the access is prepared and the straight line access is obtained, students can learn to determine working length with help of electronic apex locator. This is carried out by placement of a conducting medium,[7] placed into the acrylic base plates. The file clip is then attached to the file which is introduced into the canal, and lip clip is attached to the wire loop. This will complete the circuit to determine the working length. This will provide a period of familiarization with the working of electronic apex locator which is necessary in order to learn and understand the proper use of these devices. The lack of preclinical practice with these devices might be one of the major causes for their inefficiency to use. This will provide greater standardization during working length determination unlike earlier *in vitro* models where individual tooth is placed in polystyrene tube containing electrolyte, which is then held in hand during determination of working length,[8] which was cumbersome.

This model can also be used to learn different techniques of biomechanical preparation under both direct and indirect vision. Besides hand instrumentation, it is especially useful in learning cleaning and shaping of root canals using rotary instrumentation as it will familiarize the operators with the various speeds, torque, angulations with which these rotary instruments should be used. This in turn will decrease the chances of mishaps related to file breakage during clinical situation. Unlike the resin blocks which are softer and more compressible than natural dentin, it familiarizes the students with the cutting of the natural dentin as in patients.[9] Furthermore, various obturation techniques can also be practiced on the models followed by permanent coronal seal placement.

Owing to inattention to these details or unpredictably, sometimes endodontic mishaps or procedural accidents can occur during the treatment. Recognition of these mishaps, various procedures for their correction and methods of their prevention can be learned by the students with the help of this model.

Apart from endodontic procedures, various restorative procedures starting from the basic tooth preparation for amalgam restorations, composite restorations, full partial crowns and veneering procedures can be carried out using this model. As these procedures can be carried out on natural teeth with their position that simulates their position in oral cavity, it will help the students to get familiarized with the speed and pressure that is needed for tooth preparation, with the proper angulation of the instruments, and learn various rest positions while carrying out tooth preparation.

Apart from this, it will also help to learn placement of various matrix systems and wedges for restorative procedures. It will also help them to learn tooth preparation and restorations for subgingival carious lesion.

Another major advantage with Restoflex is that, teeth can be mounted with abnormal anatomical rotations, with more buccal or palatal placement or with mesiobuccal, mesiopalatal rotations and thus helping the students to learn to build up the physiologic anatomical contacts of these malaligned teeth. This model will also help the students to get familiarized with working under microscopes during various operative procedures. As it will help the students to get accustomed to work under higher magnification, it saves time while working on the patients.

Further modifications can be done so as to help the students to take intraoperative radiographs, by placing the X-ray films into the slots, that can be made in the lingual sulcus of the mandibular base and palatal region of the maxillary base. Also, further modification will help the students to practice flap designs and incisions for surgery.

However, the only limitation of this model, as so far, is concerned with the availability of the natural teeth. However, this limitation can be overlooked keeping in mind the other advantages provided by this model during learning period of the students.

CONCLUSION

Restoflex may prove to be an indispensable tool for the learners of restorative and endodontic procedures.

CLINICAL SIGNIFICANCE

Restoflex will place the dental students immediately in a simulated clinical environment, where they will be able to practice various restorative and endodontic procedures with greater efficiency and confidence. It will also be useful in research and development of in vitro studies with greater precision and standardization.

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