A New Method for Endodontic Treatment in Molars of Rats

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The authors present a method which allows endodontic treatment in the mesial root of the upper first molar of rats in a condition similar to that used in humans. This method can be used in endodontic biological research. It allows the standardization of samples and the maintenance of the aseptic chain during endodontic treatment.

Key Words: endodontic treatment, new methodology, biological research.

Introduction

Scientific evolution demands constant changes in substances and improvement of techniques used in clinical practice. Efficiency and use must be tested in laboratory animals before application in humans.

Small animals are frequently used in these experiments, such as rats which are easy to manipulate and have a tissue reaction similar to men and dogs (Maisto and Erausquin, 1965). Rats also permit fast histological sections and are easily housed, requiring little care, easy storage, and low-cost acquisition and maintenance. Thus, numerous researchers have used rat molars for their studies (Stahl et al., 1957; Maisto and Erausquin, 1965; Detto et al., 1966; Erausquin and Murazábal, 1969; Araújo et al., 1980; Castelo, 1983; Lobarinhas, 1986).

In this study a method was developed to endodontically treat the upper molar of rats.

Material and Methods

Working table

A stainless steel working table consisted of a rectangular box, with a base of 6 cm x 20 cm. The upper part of the box was open and three 6-cm high sides were perpendicular to the base; the front side had an inclination of 50° in relation to the base. Two retractors with circles of 1/2 inch and 3/4 inch were designed and placed in the upper and lower parts of the front of the box so that they would fit in the upper and lower incisors (when the screws were tightened the mouth of the animal remained open). To hold the rubber dam in order to
have complete sealing, small pins were welded in the front part of the box. A stainless steel holder was adapted on the base, with the height adjusted by screws to support the animal’s head (Figure 1.1).

**Rubber dam**

**Clamps.** Stainless steel clamps were developed, similar to those used in human teeth, to adapt perfectly to the upper 1st molar of rats. Despite the small size, due to the rat’s mouth anatomy, the clamps were designed to keep the rubber dam in a correct position during all the procedures of endodontic treatment. Sufficient torque was obtained to open the clamp and adapt it to the tooth, avoiding loosening after positioning. The bow of the clamp had compatible height and distal extension with the opening of the rat’s mouth, providing access without interference of the low speed hand-piece. The width of the clamp was limited by the cheek and zygomatic bone of the animal (Figure 1.2).

**Rubber sheet.** Rolls of 6-cm wide rubber sheet were used. The rubber sheet was put on the front part of the working table, holding the edges on the pins placed on the external part. The rubber was placed against the tooth to be treated and the adequate area was marked with a pen. Punching was done with an Ainsworth puncher using the smallest opening in diameter of the perforation table.

**Rubber dam and preparation of surgical field.** The clamp was positioned in the rubber dam, introducing the lateral projections in the perforation area. Using Palmer pliers with points adapted to the openings of the clamp projections, the sheet was adapted to the tooth (Figure 1.3). Prophylactic treatment and antisepsis were then performed. All further surgical procedures were performed with a surgical microscope, 16X magnification (Model MC-MS, Vasconcelos, Brasil).

**Endodontic treatment**

**Opening of the pulp chamber and pulpotomy.** Through a pilot plan, the convenience shape was developed, according to the plan below (Figure 2.1). Adequate opening of the coronary chamber and pulpotomy were performed with a 1/4 round bur and a probing tip, abundant irrigation with Milton solution and distilled water.

**Pulpectomy and chemo-surgical preparation of mesial canal.** K-type and Hedström-adapted (Figure 2.2) 21 mm files were used for pulpectomy and mesial canal preparation. Three files were used (sequential numbers 15 to 25) in order to effectively enlarge the canal.

**Irrigation/aspiration and preparation of the gutta-percha cone.** After chemo-surgical preparation of the mesial canal, abundant irrigation/aspiration was performed with distilled water. A number 25 gutta-percha cone was used, with the point cut at 2 mm and kept in Milton solution until use.

**Mesial canal obturation.** Drying of the canal was done with absorbent sterile number 25 paper cones. Cement and gutta-percha cones were used for root canal filling.
Figure 1 - 1.1. Working table for endodontic treatment of molars in rats. 1.2. Clamp similar to that used for human teeth perfectly adapted to the upper 1st molar of the rat. 1.3. Positioning of rubber dam. A, Rubber sheet; B, clamp; C, Palmer pliers.
Figure 2 - 2.1, Convenience shape for the opening of the pulp chamber of upper 1st molar of the rat. DB, Distal-buccal; MB, mesial-buccal; DP, distal-palatal; MP, mesial-palatal; M, mesial. 2.2, Chemo-surgical preparation with prepared files. File for pulpectomy and preparation of mesial canal of upper 1st molar of the rat. A, Curved tube 18 mm long; B, active portion of the file (3 mm).

N-Rickert cement was chosen due to its good tissue tolerance (Sampaio, 1972) and optimal physical properties (Sampaio and Sato, 1984; Sato, 1984).

Discussion and Conclusion

The success of endodontic therapy depends on a sequence of correct procedures. This method allows the development of research within standards of asepsis and antisepsis, necessary to avoid possible contamination that could alter results.

A rubber dam provides better access and view of the surgical field besides assuring asepsis during the procedure. A stainless steel clamp was developed similar to those used in humans with perfect adaptation to the tooth, having compatible dimensions with the anatomy of the rat’s mouth. Enough flexibility was obtained for positioning. Clamps allow rapid efficient adaptation to the neck of the tooth without harming periodontal tissue; they do not come out of place during the procedure and do not impair the aseptic chain.
The stainless steel working table may be adjusted to all sizes of rats and small animals, with the following characteristics: it permits adequate retraction of soft tissues without injury; it keeps the head of the animal stable; it adapts the rubber dam without interfering with surgical procedures; it is sterile and easy to handle; it allows easy access to molar teeth, comfort and clean work. This table was based on the work of Houston (1964).

Acknowledgment

We wish to acknowledge Prof. J.A. Bauer from the Histology Department of ICB/USP for guidance and cooperation.

References


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Accepted September 29, 1993