Review Article

Various Obturation methods used in deciduous teeth

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ABSTRACT

Pulpectomy is one of the treatment options used to maintain primary teeth with radicular pulpal tissue inflammation or that have become nonvital, until normal exfoliation. The primary goal of this procedure is to maintain arch length and function by preserving primary teeth that are essential to proper guidance of the permanent dentition. Other objectives of preserving primary teeth are to enhance esthetics and mastication, prevent aberrant tongue habits, aid in speech, and prevent the psychological effects associated with tooth loss. The treatment consists of removing the pulp tissue associated with micro-organisms and debris from the canal and obturating with resorbable filling material. Familiarity with the complexity of primary tooth canal systems, their formation and resorption pattern dictates the parameters that affect the probability of success of root canal therapy. Moreover, the obturating material as well as obturation technique used that is capable of densely filling the entire root canal system and providing a fluid tight seal from the apical segment of the canal to the cavo-surface margin in order to prevent reinfection also significantly influences the success rate of the endodontic therapy. Several methods have been used to deliver obturating materials into the root canals. The purpose of this article is to throw light on various obturation techniques used in deciduous teeth with their comparison, pros and cons.

Keyword: *Pulpectomy, primary teeth, obturation techniques, deciduous teeth, treatment*

Introduction

Dental caries is the most prolific disease of the primary dentition. Morphologic variations and improper oral hygiene practices make deciduous dentition more prone to the vagaries of dental caries leading to early involvement of pulp. [1] Maintaining the integrity of the primary dentition until normal exfoliation is a major goal of modern dentistry. [2] A thorough understanding of the pulp morphology and root formation and resorption in primary teeth as well as different materials and techniques used is imperative for a successful pulp therapy. [3] The success of endodontic therapy and the long-term viability of the tooth are compromised if any step in the endodontic and restorative procedure is inadequate. It has been reported that obturation that is of inadequate length or non-homogenous has been associated with a significantly increased presence of periapical disease assessed within one year post treatment. [4] The mixing technique of the obturating material as well as obturation technique also significantly influences the success rate. [5] The ultimate goal of endodontic obturation has remained the same for the past 50 years: to create a fluid-tight seal along the length of the root canal system, from the coronal opening to the apical termination. [3] For this purpose, several techniques have been used for the filling of

material into primary teeth root canals. An ideal filling technique should assure complete filling of the canal without overfill and with minimal or no voids. [6] It is important to select an obturation technique that offers consistency and is easy to use. [7]

Root Canal filing methods

Endodontic pressure syringe: Using the technique described by Greenberg (1963) and following the manufacturer's recommendation, the standardized mixture was injected into the simulated canals in an in vitro study conducted by S. Aylard and Ronald Johnson. This apparatus consists of a syringe barrel, threaded plugger, wrench and threaded needle. The needle was inserted into the simulated canal until wall resistance was encountered. Using a slow, withdrawing-type motion, the needle was withdrawn in 3-mm intervals with each quarter turn of the screw until the canal can be visibly filled at the orifice with zinc oxide eugenol paste. [8] The 13 to 30 gauge needle which corresponds to the largest endodontic file can be used to instrument the root canal. [3] It has been noted that the needles are very flexible and can easily be maneuvered in the tortuous canals of primary molars. [3] Overfill is a common clinical finding in the primary dentition, especially when apical resorption and/ or the paste is applied through a pressure syringe. Difficulties in placing the rubber stop correctly and removing the needle (because of the need to refill the hub of the syringe several times during the procedure) may lead the clinician to remove and reinsert the syringe repeatedly, which, in turn, may displace the paste, create voids, and thus decrease filling quality. In addition, the need to clean the syringe immediately after use makes this method more complex and time-consuming. [9] This technique has been described in detail by Spedding and by Krakow et al. [10]

Lentulo spiral - This obturation technique was advocated by Kopel in 1970. Aylard and Johnson and Dandashi et al evaluated root canal obturation methods in primary teeth in vitro and concluded that the lentulospiral mounted in a slow speed handpiece was superior in filling straight and curved root canals of primary teeth. [8, 2] The investigators demonstrated no significant differences between the lentulo and the pressure syringe techniques when filling straight canals. [8] Torres et al also concluded similar result stating that calcium hydroxide radiodensity in a curved canal was significantly greater using a Lentulo spiral-only technique. [11] Similar results were reported by Peters et al and Sigurdsson who reported that application with a lentulo spiral was more homogenous than injection of Ca(OH)2 paste. [12, 13] Also Deonízio et al reported that the 15,000 rpm speed was more effective in filling the apical third and 5,000 rpm speed was more effective in filling the cervical and middle thirds in their study utilizing lentulospirals at different speeds for filling the root canal with calcium hydroxide paste. [14]

However, Bawazir and Salama evaluated in vivo two different obturation techniques, lentulospiral mounted in a slow speed handpiece and hand-held in primary teeth. Authors concluded that there was no statistically significant difference between the two techniques of obturation, according to the quality of the root canal filling or success rate. [15] The Lentulo spiral is one of the most effective and straight forward techniques for applying sealers and calcium hydroxide into permanent tooth root canals or pastes into primary tooth canals. The design and flexibility of the Lentulo spiral

allow files to carry the paste uniformly throughout the narrow, curved canals in primary molars. Difficulties with fitting the rubber stop, instrument fracture, and a tendency for extrusion beyond the apex, however, are disadvantages of the Lentulo instruments. [9]

Mechanical Syringe - This method was proposed by Greenberg in 1971. The canal shape governed the selection of the filling technique and the mechanical syringe was a poor performer in both canal types i.e. curved and straight canals in a study conducted by Aylard and Johnson. The screw mechanism of the endodontic pressure syringe would be able to generate far greater pressures than could a plunger system as is seen with the mechanical syringe. [8]

The Incremental Filling Technique - This was first used by Gould in 1972. An endodontic plugger, corresponding to the size of the canal, with rubber stop was used to place a thick mix of zinc oxide-eugenol paste into the canal. Length of the endodontic plugger equaled the predetermined root canal length minus 2 mm. Additional increments of 2-mm blocks were added until the canal was filled to the cervical area. [2] Also O'Riordan and Coll described a method of placing the material in bulk and pushing it into the canals with endodontic pluggers. [3]

Placing the paste in a narrow, apically curved canal is more difficult than in a wider apical preparation. Because the flexibility of endodontic pluggers is limited, the paste cannot be placed in the full working length of narrow, curved canals. In addition, movements of the plugger during paste application may increase the risk of large voids. According to a study conducted by Memarpour et al, an optimal filling result was obtained more frequently with the Lentulo instrument than with the packing technique. [9]

Jiffy Tube - The material of choice for filling the root canals of pulpectomized primary teeth is pure ZOE, first mixed as slurry and carried into the canals using paper points, a syringe, a Jiffy tube, or a lentulo spiral root canal filler. [10] The standardized mixture of ZOE is back-loaded into the tube. The tube tip is placed into the simulated canal orifice and the material expressed into the canal with a downward squeezing motion until the orifice appears visibly filled. [8] This technique was popularized by Rifficin in 1980. [8]

Tuberculin syringe - This syringe was utilised by Aylord and Johnson in 1987. The standardized mixture of ZOE was back-loaded into the syringe with a standard 26-gauge, 3/8-inch needle. The material was expressed into the canal by slow finger pressure on the plunger until the canal was visibly filled at the orifice. [8] There appeared to be no difference in the straight canal filling capabilities of either the tuberculin or mechanical syringes. [8] The tuberculin syringe group had the worst results for the length of obturation among other techniques used in a study conducted by Memarpour et al. [9] The main drawback of the tuberculin syringe technique is the difficulty of separating the tip during injection, which results in the need to repeatedly replace the needle. This may compromise optimal filling and increase the presence of voids in the paste. [9]

Also, Hartman and Pruhs recommended the use of wet cotton pellet to push the filling materials into the canals of primary teeth. [3]

The Reamer Technique - A reamer coated with ZOE paste was inserted into the canal with clockwise rotation, accompanied by a vibratory motion to allow the material to reach the apex, and then withdrawn from the canal, while simultaneously continuing the clockwise rotary motion. A rubber stopper was used to keep the reamer to the predetermined working length, and the process was repeated 5 to 7 times for each canal until the canal orifice appeared filled with the paste. The results of the study by Priya Nagar et al showed that the obturation quality of both the reamer technique and insulin syringe technique was found to be very closely related. [1]

The Insulin Syringe Technique - As described by Priya Nagar et al, a homogeneous mixture of ZOE, according to manufacturer's instructions is loaded into the insulin syringe and a stopper is used after assessing the working length of the canal. The needle is inserted into the canal and kept about 2mm short of apex. The material is then pressed into the canal and while doing so the needle is retrieved from the canal outwards while continuing to press the material inside. This helps avoid incorporation of voids into the canal. Finally, over the orifice more material is pressed and compressed using wet cotton. It can be concluded from this study that with optimum operator skills and proper material mix optimal filling with less no. of voids and good radiopacity can be achieved with both hand reamer technique as well as the Insulin Syringe technique with comparable results. [1]

Disposable Injection Technique - ZOE can be loaded in a 2-ml syringe with 24-gauge needle along with stopper adjusted to measured length taking RCT instrument as guide and the material is gently pushed into the canal till the material is seen flowing out of the canal orifice. Now the needle is gradually withdrawn while pushing the material till the needle reaches the pulp chamber. The technique described is simple, economical, can be used with almost all filling materials used for the purpose, and is easy to master with minimal chances of failure as reported by Bhandari et al. [16]

NaviTip - Recently, a thin and flexible metal tip was introduced viz., NaviTip (Ultradent), in the market to deliver root canal sealer. This NaviTip comes in different lengths and a rubber stop may be adjusted to it. Guelmann et al assessed the quality of root canal filling by using three filling systems: syringe with plastic needle (Vitapex), syringe with metal needle (NaviTip), and lentulo spiral. Filling quality was determined radiographically. Tip thickness, limited flexibility, difficulty to adapt a stopper and operator experience with the Vitapex delivery system may explain the less than ideal results. Unfortunately, due to paste thickness, material could not be expressed via the NaviTip™ lumen. EndoSeal, a syringe delivered zinc oxide eugenol based canal sealer can be expressed by the NaviTip system. [6]

Mahtab Memarpour et al concluded in comparative study of anesthetic syringe, NaviTip syringe, pressure syringe, tuberculin syringe, lentulo spiral and packing with a plugger that lentulo produced the best results in terms of length of obturation, while NaviTip syringe produced the best results in controlling paste extrusion from the apical foramen and having the smallest void size and lowest number of voids. [9]

Bi-Directional Spiral - Dr. Barry Musikant [1998] developed a new obturation technique with bi-directional spiral. This technique ensures that a minimal amount of obturating material will past the apex. This controlled coverage is achieved because the spirals at the coronal end of the instrument spin the material down the shaft towards the apex, while the spirals at the apical end spin the material upward towards the coronal end. Where they meet (about 3-4 mm from the apical end of the shaft), the material is thrown out laterally. The study by Muskant et al. [1998] observed that the bi-directional spiral prevented the apical extrusion of the sealer from the root canals of permanent teeth. The highest number of voids was seen in canals filled with the lentulo spirals and bi-directional spiral as observed by Grover et al.[5] NS Ca(OH)2 injected into canal with NaviTip consistently produced better results than the spirally placed dressings in a conclusion drawn by the study reported by Gibson et al. [17]

Pastinject - Pastinject (Micromega) is a specially designed paste carrier with flattened blades, which improves material placement into the root canal. In a study conducted by Grover et al, it was concluded that among lentulospirals, bi-directional spiral, pastinject and pressure syringe, the pastinject technique has proved to be the most effective, yielding a higher number of optimally filled canals and minimal voids, combined with easier placement of the material into the canals. [5] Moreover, it was reported by Deveaux et al and Oztan Meltem et al that special design of the Pastinject seems to favor a better intracanal placement of calcium hydroxide paste in single rooted teeth. [18, 19]

A Specially Designed Paste Carrier technique is also found to be an effective technique in the intracanal placement of calcium hydroxide as reported by Joseph Meng et al. [20] Bi-directional spiral and Pastinject are used for the placement of calcium hydroxide and root canal sealers in the permanent teeth, but there are not enough studies to evaluate their use as obturation techniques in primary teeth. [5]

Conclusion

Several obturation techniques have been used with success as recent obturation techniques for primary teeth, however, pastinject seems to be more preferred than other methods as concluded from various studies. But further controlled studies and research are still necessary to find an ideal obturating technique for deciduous teeth which is fast, convenient yet efficient.

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