Obturation Techniques in Primary Teeth

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**ABSTRACT**

Dental caries is a global concern affecting children and adults. A pulpectomy is considered to be the treatment of choice to preserve the pulpally involved primary teeth. Among the various factors determining the clinical success of pulpectomy, proper obturation of the root canals plays an important role. Different obturation materials are being used for the obturation of the primary teeth root canal, which includes zinc oxide eugenol, calcium hydroxide, calcium hydroxide iodoform paste and combinations. These materials are available in different forms such as powder, powder and liquid, paste forms. Various techniques are available to introduce the obturation materials into the root canal systems. These techniques have been tried to create a three-dimensional fluid-tight seal of the root canals. This review article aims to highlight the different techniques that are being used for the obturation of primary teeth. Each technique has its advantages and disadvantages. Creation of voids within the obturation, underfilling or overfilling are the common problems that can be encountered during root canal obturation. These factors can compromise the clinical and radiographic success of pulpectomy treatment. With the current evidence, no definitive conclusions can be made to decide which is the best obturation technique in terms of clinical and radiographic success. The choice of technique selection depends on the clinician’s preference, cost-effectiveness, time consumption, ease of handling.

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**INTRODUCTION**

One of the primary concerns in the field of Pediatric dentistry is the early loss of primary teeth. Premature loss of primary teeth results in space loss which affects the integrity of oral tissues, swallowing, mastication and speech (Fuks, 2000). A pulpectomy is considered to be the ideal treatment to preserve the primary teeth with pulpal involvement (Rodd et al., 2006).

A pulpectomy is the process of complete removal of the pulp from the root canals of the primary teeth and filling them with an inert resorbable material for maintaining the tooth in the dental arch till the time of their exfoliation (Fuks, 2008).

The characteristic features of ideal pulpectomy (Lin et al., 2006) includes,

1. The simple and fast technique,
2. Reduced treatment time
3. Lesser number of appointments
4. Thorough cleaning and debriding of the infected root canals without damaging the underlying permanent tooth bud/tooth
5. Three-dimensional hermetic seal of the root canal system

6. Few procedural complications

7. The ability of the treated tooth to restore or maintain the function

The three-dimensional hermetic seal of the root canal system is an essential factor that determines the success of pulpectomy. It affects microleakage and cuts off the nutrient supply to any surviving microorganism and prevents the entry of bacterial products into the periapical tissues (Singh et al., 2017).

There are several techniques available in the literature that have been used for introducing obturating material into the root canal. The ultimate goal of any obturation technique is to obtain a complete filling of the root canals from the canal orifice until the root apex with minimal or no voids (Guelmann et al., 2004). Also, the obturation technique should be easy to use, less time consuming and should have a consistent result (Sevekar et al., 2011).

Different Obturation Techniques

Endodontic Pressure Syringe

The Endodontic pressure syringe apparatus consists of a syringe barrel, threaded plunger, wrench and threaded needle. The pressure syringe acts by a screw mechanism. The needle is inserted into the root canal until the resistance is obtained. A slow, withdrawing-type of motion with a quarter turn at 3 mm intervals was used until the canal is visibly filled at the orifice (Aylard and Johnson, 1987). As the needles are flexible, it can be used in the tortuous canals (Sevekar et al., 2011). Overfilled obturation is common with pressure syringe.

In the study by Hiremath and Srivastava, endodontic pressure syringe performed the best with a maximum number of optimal fillings compared to insulin syringe, jiffy tube, and local anaesthetic syringe (Hiremath and Srivastava, 2016). Aylard and Johnson reported significantly better results with endodontic pressure syringe when compared with the mechanical syringe for obturating the curved root canals (Aylard and Johnson, 1987). Practical difficulties in adjusting the rubber stopper and need to clean the syringe immediately after every use make this method complex and time-consuming (Memarpour et al., 2013).

Mechanical Syringe

This technique introduced by Greenberg in 1971, utilizes a plunger system. This technique showed poor performance in both curved and straight canals (Aylard and Johnson, 1987).

Tuberculin Syringe

In 1987, Aylard and Johnson used Tuberculin syringe for the obturation of the root canal. 26-gauge, the 3/8-inch needle was used, and a slow finger pressure was applied onto the plunger to express the material into the canal (Aylard and Johnson, 1987). The wet cotton pellet was recommended to gently push the filling materials into the root canals (Sevekar et al., 2011). Tuberculin syringe group produced poor results in primary molar teeth obturation (Memarpour et al., 2013).

Needle separation during injection of the material was the main drawback of this technique. This necessitated the need for replacing the needle repeatedly leading to the formation of voids (Memarpour et al., 2013).

Insulin Syringe Technique

This technique was first described by (Priya, 2011). The needle is inserted into the canal and is kept 2mm short of apex. The material is expressed into the canal, as the needle is gradually retrieved, thereby avoiding voids. Addition of more material was done by placing the material over the orifice and is compressed using wet cotton. Optimal filling with less number of voids can be achieved with optimum operator skills and proper material mix (Priya, 2011). (Akhil et al, 2019) stated that insulin syringe produced least voids when compared to endodontic plugger and lentulo spiral.

Disposable Injection Technique

This technique utilizes 2-ml syringe and 24-gauge needle—a stopper adjusted to measured working length. The material is expressed into the root canal similar to insulin syringe technique. This technique is considered to be cost-effective and straightforward (Bhandari et al., 2012).

NaviTip

NaviTips, introduced by Ultradent, is a thin and flexible metal tip used to deliver sealers into the root canals. (Guelmann et al., 2004) stated that NaviTips offered more desirable obturation than the obturation with a syringe with plastic needle (Vitatex), lentulo spirals. (Memarpour et al., 2013) concluded that NaviTip produced the best results. NaviTips showed poor results when compared to Endodontic Plugger and lentulo spirals when EndoFlas was used (Pandrangi et al., 2017). Khubchanani reported that NaviTip controlled voids production and produced the best apical seal (Khubchanani et al., 2017).
Endodontic Plunger

Gould first used the technique of using endodontic plunger for obturation of primary teeth in 1972, and the technique is called an incremental filling technique. An endodontic plunger, to the size of the previously used file, was used. The rubber stopper is adjusted 2mm short of the apex. Additional increments were added until the canal is filled until the cervical area (Dandashi et al., 1993). The disadvantage of Endodontic plunger is its limited flexibility, and it does not produce good obturation in narrow and curved canals. Also, repeated insertion of the instrument can lead to large voids. (Memarpour et al., 2013) also found that packing with plunger causes more voids.

Reamer

A reamer is inserted into the root canal using a vibratory motion with clockwise rotation. It is then withdrawn from the canal while continuing the clockwise motion. A rubber stopper was adjusted at the predetermined working length. The process was repeated until the canal orifice appeared filled with the paste. The results were similar to that produced with an insulin syringe (Priya, 2011).

Jiffy Tube

Rifficin in 1980 popularized the technique of using Jiffy tube. The tip is placed into the canal orifice, and a downward squeezing motion is used to express the material until the orifice appears to be filled (Aylard and Johnson, 1987).

PastInject

PastInject (MicroMega, France) has flattened blades, thereby facilitating easy and effective placement of material into the root canal. (Grover et al., 2013) found that PastInject was more comfortable to be used and produced good results of maximum optimally filled canals and with minimal voids.

Lentulospiral

Kopel in 1970 popularized the technique of obturation using Lentulospiral. (Aylard and Johnson, 1987; Dandashi et al., 1993) concluded that the engine-driven lentulo spiral produced best results and there was no significant difference between the lentulo spiral and the pressure syringe when used in straight canals. For filling of the apical canal, lentulo spiral at 15000 rpm and for filling of apical and the middle third, lentulo spiral at 5000 rpm was suggested (Deonizio et al., 2011). There was no statistically significant difference between the engine-driven lentulo spiral and hand-held lentulo spiral. Highest optimally filled canals were observed in a lentulo spiral when compared to endodontic plunger and insulin syringe (Akhil et al., 2019).

Hand-held lentulo spiral showed maximum post obturation volume followed by engine-driven lentulo spiral (Nagaveni et al., 2017). Effective in obturation of narrow and curved canals due to flexibility of the Lentulospiral. Instrument fracture, over obturation and difficulties in adjusting the rubber stops, are the major disadvantages of using this technique. (Memarpour et al., 2013)

Bi-Directional Spiral

Dr. Barry Musikant introduced the bidirectional spiral in 1998. Spirals at the coronal end push the material towards the apex and the spirals at the apical end towards the coronal end. At the junction, the material is thrown out laterally. This controls the extrusion of the material beyond the apex. Bidirectional spiral produces a considerable number of voids (Grover et al., 2013). Bi-directional spiral and lentulo spiral produced better results than incremental technique, and past injects and the bi-directional spiral was superior to lentulo spiral in the prevention of over obturation (Chandrasekhar et al., 2018).

CONCLUSIONS

There are different obturation techniques available, each with their pros and cons. Clinician’s preference can vary based on cost-effectiveness, time consumption, ease of handling. Therefore, no definitive conclusions can be made to decide which is the best obturation technique.

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Conflict of Interest

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