

Dr.Vishesh Gupta	Associate Professor, Department of Conservative Dentistry & Endodontics, Babu Banarasi Das College of Dental Sciences, BBD University, Lucknow, INDIA.

* Dr. Akanksha Phatt	Assistant Professor, Department of Conservative Dentistry &	
	Endodontics, Babu Banarasi Das College of Dental Sciences, BBD	
Dhatt	University, Lucknow, INDIA. * Corresponding Author	

Aim: To evaluate the immediate and delayed volumetric changes after obturation with ProPoint using CBCT. Summary: An orthodontic patient was selected ,slated for four first premolars extraction. Root canal treatment were performed in all the four premolars using hyflex rotary system and were obturated with ProPoint. The CBCT scans were performed to observe the volumetric changes immediately and after four hours of obturation and compared to the scanned images of unfilled prepared canals.

It was found that there was a considerable amount of expansion after four hours of obturation due to the swellable nature of the sealer and the ProPoint. Volumetric expansion of 13-27% approximately was observed.

It was concluded that considerable amount of expansion has taken place in the present case with ProPoint system.

KEYWORDS	 ProPoints used in the study is hydrophilic in nature • Hermetic seal can be achieved with ProPoints • Bioceramic sealer used along with ProPoints assists in the expansion of propoints CBCT used in the study with latest software was able to show the three dimensional changes in the dimensions of ProPoints after expansion • With the use of ProPoints there are less chances of treatment failures

INTRODUCTION

Obturation of root canal system should prevent endodontic re-infection and peri-radicular disease. This objective may be achieved by three dimensional filling of the prepared canal and the accessory canals. Recently an obturating system called ProPoint system was introduced to overcome these problems and improve the treatment outcome.

The Propoint system(Endo Technologies, LLC, Shrewsbury,MA,USA) consists of hydrophilic endodontic points and a Bioceramic sealer(Endosequence BC Sealer,Brasseler, USA). This endodontic point is designed to expand laterally, by absorbing residual water from the prepared canal space and naturally occuring intraradicular moisture without expanding axially(Anthony Didato *et al* 2013).

The inner core of propoint is made up of two proprietary nylon polymers: Trogamid T and Trogamid CX and the outer polymer coating is a cross linked using allyl methacrylate and a thermal initiator (Lumbini Pathivada *et al* 2013)

As per the claim of manufacturer the lateral expansion of Pro-

Point is non-uniform and when it contacts with the canal wall the rate or extent of polymer expansion is reduced. Its expansion depends on the extent to which it is pre-stressed. The sealing ability of the root canal filling can be improved by this non-isotropic lateral expansion, thereby possibility of re-infection is reduced, and there are less chances of root canal treatment failures(Anthony Didato *et al* 2013).ProPoint covers all tip sizes and it is available in 4% and 6% taper from ISO tip size 15-45.

Till date there has been no direct comparison of the volumetric expansion of ProPoint immediately and after four hours under in-vivo situations.

CASE REPORT

A 19-year-old patient reported to the Department of orthodontics, Babu Banarasi Das College Of Dental Sciences with a chief complaint of irregularly placed teeth. His first maxillary and first mandibular premolars were slated for orthodontic extraction. Medical history was noncontributory. With the patient's consent he was sent to Department of Conservative Dentistry and Endodontics for root canal treatment using ProPoint (EndoTechnologies, LLC , Shrewsbury, MA, USA) for premolars to be extracted.

A preoperative CBCT (i-CAT Vision Denta, Hatfield, U.K) scan were done to evaluate the internal root canal anatomy of all the teeth to be studied. Mandibular premolars i.e. 34 and 44 had single canal whereas 14 and 24 had two canals (buccal and palatal).

Access opening were done in all the first premolars using highspeed handpiece (NSK, PANA AIR, Japan) with Endoaccess bur (DENTSPLY MALLIFER, Switzerland) and working length was established with the help of 15 no. K- file (Dentsply Mallifer, Ballaigues, Switzerland) and using apex locator (X-SMART, Dentsply Mallifer, Switzerland) and verified with digital radiography system(Satelec, X-Mind, France)

Canals were cleaned and shaped using K-files (Dentsply, Mallifer, Switzerland) and Hyflex (Coltene Whaledent, Switzerland) rotary system upto 4% 25. Irrigation regimen was followed using 5% sodium hypochlorite, (Denpro, Mohali, India), 17% EDTA(Triveni, India) and 2% chlorhexidine gluconate (V-Consept, Vishal Dentocare, India). CBCT (i-CAT Vision Denta, Hatfield, U.K) scan of prepared canals was done to evaluate the canal volume. Then the canals were dried using paper points(Dentsply, Mallifer, Switzerland) and a ProPoint verifier of size 4% 25 was used to verify the determined working length and the desired tug back.

Radiograph was taken to confirm the corresponding ProPoint of size 4%25, which was kept 0.5mm short of the radio-graphic apex of the tooth.

Canals were again dried using paper points. Bioceramic sealer (Endosequence, Brasseler,USA) was placed in the canal with the help of lentulospiral (Dentsply, Switzerland). The propoint was introduced into the canal using tweezers with a slow firm pressure required to allow the ProPoint to evenly distribute the sealer down into the canal.

The ProPoint was trimmed to the level of the canal orifice using a highspeed handpiece and a diamond bur(SS White, Germany). Teeth were then restored immediately with Glass lonomer Cement(GC, Tokyo, Japan).

A CBCT (I-CAT Vision Denta , Hatfield, U.K) scan was done to evaluate the volume of the obturated canal immediately after the obturation (Fig 1,2)and after four hours of the obturation (Fig 3,4)to evaluate the volumetric expansion of the obturating material.

It was found in the present study that there is a considerable amount of expansion after four hours of obturation which may be due to the swellable nature of the sealer and the Pro-Point. All the values were calculated using Anatomage version 5.3 of CBCT.

RESULTS

It was found in the present study that there is a significant (p=0.006) amount of expansion after four hours of obturation in ProPoint (Table 1). All the values were calculated using Anatomage version 5.3 of CBCT. statistical analysis was done using Paired 't' test and Tukey test.

Table 1: Comparative evaluation of immediate and delayed volumetric changes after obturation.

S.no	Tooth Number	Volume immediately after obturation (mm ³)	Volume after four hours of obturation (mm ³)	Increased volume(%)
1	14	112	124	10.7
2	24	115	133	15.65
3	34	90	107	18.8
4	44	91	115	26.4
Mea	a±SD	102.00±13.34	119.75±11.24	

Mean difference \pm SD = 17.75 \pm 4.92

't'= 7.209 (Paired 't'-test); p=0.006 (Significant)

Disparity in root canal anatomy and its tortuos course creates difficulty in three dimensional obturation of the canal space, this may lead to endodontic failure. different cross-sectional shape of root canal, makes it difficult to achieve a proper three dimensional obturation (Monticelli F *et al* 2007) Microleakage studies of single cone obturation systems have shown to be inferior in their ability to achieve a fluid tight seal(Mc Kissok AJ *et al* 2011)

ProPoint being a single-cone obturation technique, is a unique obturating system. this product utilizes the principle of hygroscopic expansion of the in-situ to fill these anatomical gaps , and provide a better three dimensional seal.

Due to the hydrophilic nature of ProPoints the minute amount of water present in the root canal are absorbed by the points which in turn can form hydrogen bond to the polar sites present, enabling expansion within the polymer chains. The rate and extent of this expansion is controlled as a part of manufacturing process. The expansion occurs with a miniscule force that is claimed to be well below the reported tensile stress of dentin(Lumbini Pathivada *et al* 2013)

According to the manufacturers ProPoint shows maximum expansion after four hours under in vivo conditions, thus in the present study volumetric changes have been seen after four hours of obturation. The slight positive pressure against the canal wall that is created forms a seal that is believed to be virtually impermeable to bacterial microleakage.

An active polymer is there in bioceramic sealer which controls the degree of swelling. the sealer is dimensionally stabe and non-resorbable inside the canal due to the addition of bioceramics. Calcium hydroxide and hydroxyapatite are the by-products of the setting reaction of the sealer, rendering the material both anti-bacterial while setting and very biocompatible once set (Eid AA *et al* 2013)

A significant amount of volumetric expansion of ProPoints along with the sealer has been seen in the present study using CBCT. The results were approximately calculated by using Anatomage version 5.3 of CBCT, the latest software. Canal orifice level was taken as a standard point for calculating the volume immediately and after four hours of obturation.

CBCT was used as it provides a 3D information of craniofacial structures with accurate measurements and it also improves localisation of teeth. It reduces the radiation risks associated with full CT Scan and with an advanced software we were able to measure the volume expansion of sealer and obturating material in the present study.

CONCLUSION

From the present study it was concluded that ProPoint can provide a good hermetic seal as it shows a significant amount of volumetric expansionafter obturation due to its hydrophilic nature. It is an excellent biocompatible material which can lead to better prognosis of a root canal treated teeth.

Fig 1 : CBCT image Immediately after obturation (anatomage verison)



Figure 2 : Volume calculated immediately after obturation



Figure 3: CBCT image after four hours of obturation



Figure 4 : Volume calculated after 4 hours of obturation



REFERENCES

- 1. Anthony Didato, Ashraf A. Eid, Martin D. Levin, Sara Khan, Franklin R.Tay, Fredrick A.
- Rueggeberg (2013) Time-Based Lateral Hygroscopic Expansion of a Water-Expandable Endodontic Obturation Point. *Journal Of Dentistry*, 1-6.
- Beatty R, Vertucci F, Zakariasen K(1986) Apical sealing efficacy of endodontic obturation techniques. International Endodontic Journal 19, 237-41.
- Eid AA, Nikonov SY, Looney SW et al(2013) In-Vitro Biocompatibility evaluation of a root canal filling material that expands on water sorption. Journal of Endodontics 39, 883-888.
- Grossman L(1981) Endodontic Practice, Vol. 10. Pp.279. Philadelphia: Lea and Febiger.
- Hannigan A, Lynch Cd (2013) Statistical methodology in oral and dental research: pitfalls and recommendations. *Journal of Dentistry* 41, 385-92.
- Highgate Dj, Frankland Jd (1986) Deformable polymeric compositions. United States Patent Number 4, 565, 722.
- Lumbini Pathivade, Karthik Krishna Munagala, Aashima B Dange(2013) Smartseal New Age Obturation. Annals of Dental Speciality 01, 13-15.
- 9. Mc Kissok Aj, Menis P, Sweet Mb, Klyn Sl (2011) Ten month in-vitro leak-

age study of a single cone obturation system. Us Army Medical Department

- Michaud RA, Burgess J, Barfield RD, Cakir D, Mcneal SF, Eleazer PD (2008) Volumetric expansion of gutta percha in contact with eugenol. *Journal of Endodontics* 34, 1528-32.
- Monticelli F, Sadek FT, Schuster GS, Weller RN , Ferrari M, et al (2007) Efficacy of two contemporary single-cone obturation filling techniques in preventing bacterial leakage. Journal of Endodontics 33, 310-3.
- Monticelli F, Sword J, Martin RI, Schuster Gs, Weller Rn, Ferrari M (2007) Sealing properties of two contemporary single-cone obturation systems. *In*ternational Endodontic Journal 40, 374-85.
- Nagas E, Uyanik MO, Eymirli A, Cehreli ZC, Vallittu PK, Lassila LV et al (2012) Dentin moisture conditions affect the adhesion of root canal sealers. *Journal of Endodontics* 38, 240-4.
- Schilder H (2006) Filling root canals in three dimensions. Journal of Endodontics 32, 281-90.
- Tronstad L, Barnett F, Flax M (1988) Biocompatibility of calcium hydroxide -containing root canal sealers. Endodontics and Dental Traumatology 4 , 152-9.
- Vibha Hegde, Shashank Arora(2015) Fracture resistance of roots obturated with novel hydrophilic obturation systems. *Journal Of Conservative Dentistry* 18, 261-264.
- Vibha Hegde, Ashwin Jain, Rahul Ved, Shashank Arora(2015) Sealing ability of novel hydrophilic single -cone obturation systems in an oval canal: an in-vitro bacterial leakage study. *Endodontology* 27.42-46
- Vibha Hegde, Shashank Arora (2015) Effect of intracanal medicaments on push out bond strength of Smart Seal system. *Journal Of Conservative Dentistry* 18, 414-418.
- Vibha Hegde, Shashank Arora(2015) Effect of advanced irrigation protocols on self-expanding smart seal obturation system: A scanning electron microscopic push out bond strength study. *Contemporary Clinical Dentistry* 6,26-30.
- Vibha Hegde, Shashank Arora(2015) Comparative evaluation of a novel smart seal obturating system and its homogenity of using CBCT: In-vitro stimulated lateral canal study. *Journal Of Conservative Dentistry* 17, 364-368.
- Vijitha Badami, Bharat Ahuja (2014) Biosmart materials: Breaking new ground in dentistry. *Scientific World Journal*. doi: 10.1155/2014/986912.
- Wu MK, Fan B, Wesselink PR (2000) Diminished leakage along root canals filled with gutta- percha without sealer over time: A laboratory study . *International Endodontic Journal* 33, 121-5.
- Wu Mk, Wesselink PR (2001)A Primary observation on the preparation and obturation in oval canals. *International Endodontic Journal* 34, 137-41.