A Case Report on CBCT Analysis of Immediate and Delayed Volumetric Changes of Propoint System

Dr. B. Rajkumar  
Professor & Head, Department of Conservative Dentistry & Endodontics, Babu Banarasi Das College of Dental Sciences, BBD University, Lucknow, INDIA.

Dr. Aniket Kumar  
Post Graduate students, Department of Conservative Dentistry & Endodontics, Babu Banarasi Das College of Dental Sciences, BBD University, Lucknow, INDIA.

Dr. Shweta Tekriwal  
Post Graduate students, Department of Conservative Dentistry & Endodontics, Babu Banarasi Das College of Dental Sciences, BBD University, Lucknow, INDIA.

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

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

ABSTRACT

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.

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 occurring 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 ProPoint 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).

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 Pro-
A preoperative CBCT (i-CAT Vision Denta, Hatfield, U.K) scan was 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).

Canals were cleaned and shaped using K-files (Dentsply, Mallefer, Switzerland) and Hyflex (Coltene Whaledent, Switzerland) rotary system up to 4%25. Irrigation regimen was followed using 5% sodium hypochlorite,(Denpro, Mohali, India ), 17% EDTA(Triiveni, India) and 2% chlorhexidine gluconate (V-Consept, Vishaal 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, Malleifer, 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 radiographic apex of the tooth.

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 obturated 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 ProPoint being a single-cone obturation technique, is a unique obturating system. This product utilizes the principle of hydroscopic 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.

A CBCT scan was done to evaluate the immediate and delayed volumetric changes after obturation (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>
<thead>
<tr>
<th>S no</th>
<th>Tooth</th>
<th>Volume immediately after obturation (mm³)</th>
<th>Volume after four hours of obturation (mm³)</th>
<th>Increased volume (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>112</td>
<td>124</td>
<td>10.7</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>115</td>
<td>137</td>
<td>15.65</td>
</tr>
<tr>
<td>3</td>
<td>34</td>
<td>59</td>
<td>107</td>
<td>8.8</td>
</tr>
<tr>
<td>4</td>
<td>44</td>
<td>91</td>
<td>115</td>
<td>26.4</td>
</tr>
<tr>
<td>Mean±SD</td>
<td>102.60±13.34</td>
<td>119.75±11.24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean difference ±SD = 17.75±4.92

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

**DISCUSSION**

Disparity in root canal anatomy and its tortuous 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) Micro-leakage 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 hydroscopic expansion of the in-situ to fill these anatomical gaps, and provide a better three dimensional seal.

**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.**

**REFERENCE**

- Monticelli F et al 2007
- Lumbini Pathivada et al 2013
- Eid AA et al 2013
- Kissok AJ et al 2011
REFERENCES


9. Mr Kissak Aj, Menis R, Sweet Mb, Klyn Si (2011) Ten month in-vitro leak-


