Oval Fiber Posts Do Not Improve Adaptation to Oval-shaped Canal Walls

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Abstract

Introduction: Oval fiber posts attempt to provide better adaptation to root canals. The hypothesis of this study was that there are no differences in adaptation of oval and circular fiber posts to canal walls. **Methods:** Posts were inserted in 20 canals; 10 were oval, and 10 were circular. The posts were cemented with composite cement. Coronal, middle, and apical sections were observed through a microscope. The space occupied by the post and the maximum distance between it and the canal wall were calculated. The 2 groups were compared with analysis of variance. In all the analyses the level of significance was set at $P < .05$. **Results:** The proportion of space occupied by the post showed no significant differences ($P > .05$). The cement layer was thinner in the apical region in oval posts ($P < .05$). **Conclusions:** Oval posts do not adapt better than circular posts to the morphology of oval canals. *(J Endod 2011;37:1386–1389)*

Key Words

Endodontics, fiber post, oval post, oval root canals

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Endodontic treatment is usually preceded by a significant loss of coronal tooth structure. Posts might be necessary to specifically retain the core material (1). Many researchers have studied the influence of post length and diameter (2). There are, however, very few studies on post shape (3). There is a high prevalence of oval-shaped canals in human dentition, even in the apical region (4, 5). Canals are prepared to eliminate the infected organic and inorganic content, preserving morphology as far as possible and adapting it, when necessary, to receive a post.

Although in many cases the internal morphology of canals is oval, the posts used up to now are not oval. Drilling adapts canal morphology to the circular shape of the post (6) to adapt it as closely as possible to the canal walls and reduce the thickness of the cement layer between the post and canal walls (7). Various studies have established that a thick cement layer has a negative impact on post retention (8–10), whereas the type of endodontic sealer did not influence the bond resistance of fiber posts (11). The length of the post also affects its retention (12).

Recently, new posts with an ovoid cross section have been marketed for oval cross-section canals to improve post adaptation.

This present study aims to compare the adaptation of oval and circular cross-section posts to oval cross-section root canals in mandibular premolars. The null hypothesis is that there are no differences in the adaptation of oval and circular cross-section posts to canal walls.

Materials and Methods

Twenty human mandibular premolars with 1 root canal, extracted for periodontal reasons and without root anomalies, were chosen and sectioned at the buccolingual enamel junction with a low-speed diamond bur (Kornet, Lemgo, Germany). The length of the selected roots was 15 ± 1 mm. To ensure that canal morphology was ovoid, mesiodistal and buccolingual x-rays were taken of each tooth; teeth with a ratio of more than 2 between their long and short diameters at 5 mm from the apex were considered oval, and the teeth that did not meet this condition were excluded from the study (5). Roots were stored in 1% chloramine-T solution at 4°C for less than 1 month (7).

The 20 selected roots were endodontically treated by the same operator. Patency was made with #08 and #10 K-files (Dentsply Maillefer, Ballaigues, Switzerland), and the working length was obtained. The canals were prepared with the ProTaper System (Maillefer, Tulsa, OK) and an XSmart 16:1 engine (Maillefer). S1, S2, F1, and F2 instruments were used, irrigating with 5.25% NaOCl. Then the canals were dried with ProTaper F1 paper points (Dentsply Maillefer) and filled by using the continuous wave technique with an F2 main gutta-percha cone (Dentsply Maillefer) and TopSeal sealer (Dentsply Maillefer).

The specimens were divided into 2 groups. Group 1 comprised 10 canals prepared by using the Ellipson ultrasound tip (Satelec/Acteon, Merignac, France) at 70%–80% of the intensity provided by the P5 ultrasound equipment (Satelec/Acteon), inside the canal to eliminate the gutta-percha, to leave 4 mm of apical gutta-percha, while simultaneously shaping the internal oval anatomy of the canal. This ultrasound tip has the same cross section as the oval post used in this group (Ellipson posts; RTD, St Egrève, France). Group 2 comprised 10 canals prepared for Rebilda posts (Voco, Cuxhaven, Germany) with circular cross section by using

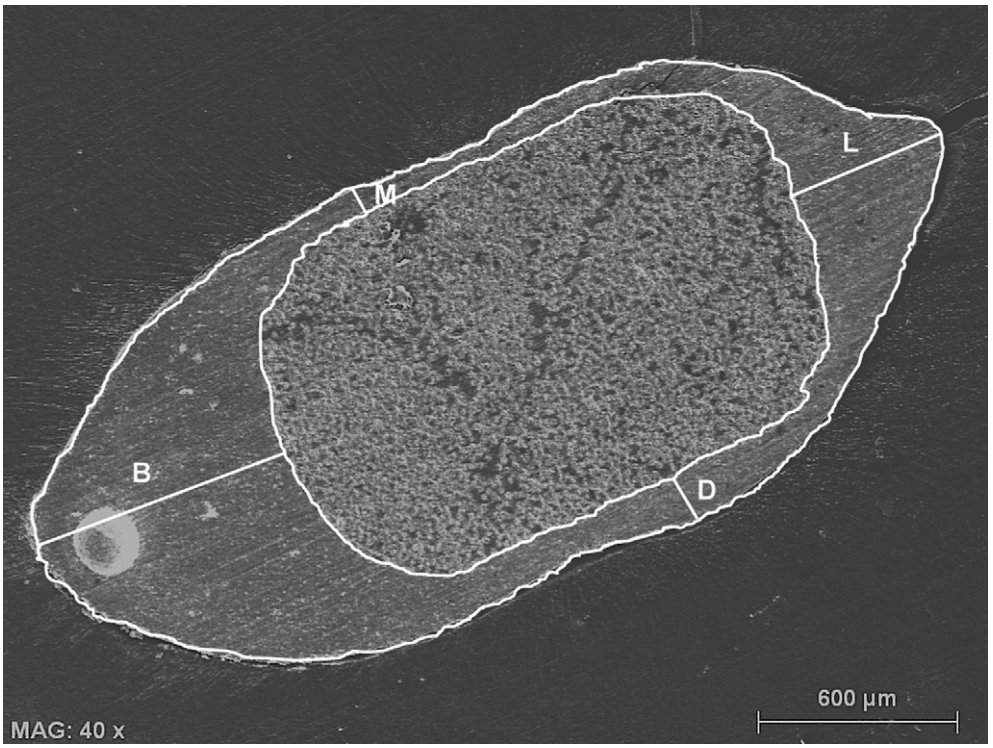

Figure 1. SEM image ×40. The post and the canal areas are marked. B, buccal; D, distal; L, lingual; M, mesial.

the corresponding green and black drills to a length that left 4 mm of apical gutta-percha.

Before cementing, it was ensured that the posts reached the correct length, and they were submerged in alcohol for 30 seconds, dried, silanized with Ceramic Bond (Voco) for 60 seconds, and air dried. All posts were fixed with a self-etching adhesive (Futurabond DC; Voco) inside the root canal and on the post, dispersing the solvent for 5 seconds with air. Then the composite cement Rebilda DC was applied inside the canal and on the post, the posts were inserted in the canal, and their position was verified radiologically. Finally, the cement was polymerized for 40 seconds.

After 24 hours the teeth were transversely sectioned with a hard tissue microtome (Accutom 2; Struers, Ballerup, Denmark) at 5, 8, and 12 mm from the apex to obtain 1-mm-thick slices (3 slices per root). The slices were palladium-coated with a Sputter Coater SC7640 device (Polaron; Quorum Technologies Ltd, Newhaven, UK), stored in a vacuum device to dehydrate them, and observed under a scanning electron microscope (SEM) (FEG-S4100; Hitachi, Krefeld, Germany). A 40× magnification SEM image was recorded of each slice on which the proportion of the space in the canal occupied by the post was calculated (post area/canal area × 100) and the maximum distances between the post perimeter and the canal wall from 4 standardized points at the mesial, distal, buccal, and lingual aspects, respectively, resulting in 12 measurements per tooth (Fig. 1).

Data were analyzed with statistical software SPSS 17.00 (SPSS Inc, Chicago, IL). A one-way analysis of variance followed by the Tukey test was applied to compare proportion of space occupied by the post, maximum distance between the post and the canal walls, and average of the distances found at each measurement point (mesial, distal, buccal, lingual) between groups (circular and oval posts) and differences between cross-section levels for each group. In all the analyses the level of significance was set at $P < .05$.

Results

After preparation, the sizes of the cross-section areas of the canals showed no differences between both groups at any of the studied section levels ($P > .05$).

The proportion of space occupied by the post showed no significant differences ($P > .05$) between the 2 types of posts. The cement layer along the post was thicker in circular posts, but there were no significant differences ($P > .05$) in relation to the oval posts (Table 1).

There were no significant differences in the adaptation of the 2 groups of posts between the post surface and canal wall at the mesial, distal, lingual, and buccal points ($P > .05$). Measurements were greater along the entire post at the buccal and lingual aspects for both types of posts (Table 1).

Circular posts occupied a significantly higher proportion of space in the apical and middle thirds than in the coronal third ($P < .05$) (Table 1).

Measurements of oval posts in the buccal and lingual aspects were significantly higher ($P < .05$) in the apical region. In contrast, in circular posts they were significantly higher in the coronal third ($P < .05$) in the same aspect (Table 1).

Discussion

Oval canals can be found in all types of teeth, with a prevalence of 63% in mandibular premolars (5), and that is why premolars were selected for this study. The oval shape is generally much more pronounced in the coronal portions of the canal and decreases toward the apex (13), which might justify the finding in our study that circular cross-section posts adapt better in the apical and middle thirds than in the coronal third.

Although root canal instruments for hand-held and rotary instrument techniques have been gradually developed and optimized, they provide rounded morphologies regardless of their type and shape