

THE ELLIPSON CONCEPT: AN ULTRASONIC CANAL PREPARATION COMBINED WITH AN OVAL FIBER POST

NICOLAS CHELEUX

Introduction

Since their first appearance in the 1990s,¹ fiber posts have represented a clinically viable alternative to their metal post predecessors. The first fiber posts (Composipost®, RTD, France)² were composed of carbon fibers bonded into a resinous matrix and were ultimately replaced by esthetic posts utilizing glass, quartz and other fibers. Several authors have, by mechanical tests and finite element analysis,³⁻⁵ confirmed that the most advantageous characteristic of these posts is a high flexural strength⁶⁻⁸ and high fatigue resistance⁹ with a modulus of elasticity close to that of dentin.² By considerably limiting the risk of root fracture,¹⁰⁻¹³ this results clinically in a more homogeneous reconstruction from a mechanical point of view. The favourable results of in-vitro studies were confirmed by long term clinical observations of this mode of reconstruction.¹⁴⁻¹⁷

During the clinical preparation of the prefabricated post space, the dentist usually uses a series of drills to create a space which corresponds to the post dimensions. While many anatomical (tapered) forms of fiber posts have been introduced in recent years, the principle of mechanical preparation remains unchanged. Nevertheless, while this mode of preparation proves to be satisfactory when the canal is basically round, it poses a problem when the section is flattened, oval or hourglass shaped. In fact, it is almost impossible to prepare an accurate oval post space using a drill.

Currently, prefabricated posts adapt very roughly to the canal space. They must be inserted into a tooth where the post is in contact on only two sides and the remainder of the canal space is filled with cement, or the oval canal must be over-prepared to accommodate a much larger post.

In collaboration with RTD, France, the author designed the standard shape of an oval post. This post, whose dimensions (Figure 1) have the same chemical composition as those in the DT Light-Post range, is made from quartz fibers (60%) embedded in an epoxy resin matrix.

Nicolas Cheleux
School of Odontology,
Paul Sabatier University,
Toulouse III, France

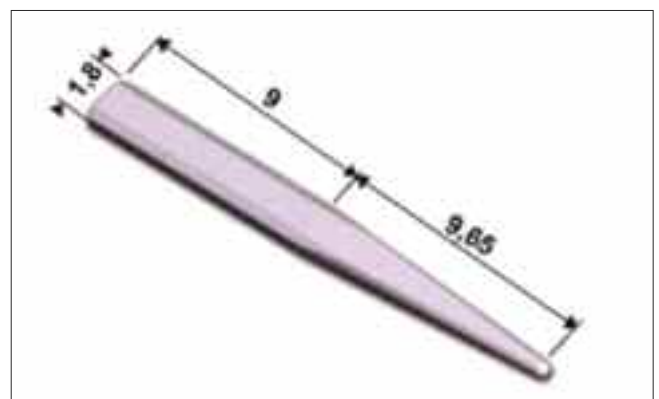


Figure 1: Ellipson post



Figure 2: Ellipson tip

Designing the shape of an oval post is a long process, but finding a means of creating an elliptical canal form is even more complicated. Besides being technically impossible to use conventional techniques of canal preparation, it was decided to test methods of ultrasonic preparation. The principal objective is to design a minimally-invasive preparation technique, in order to preserve the maximum of dental tissue as well as avoid any use of aggressive instrumentation which could create false canals. Only an ultrasonic oscillatory movement combining the effectiveness of the cut, while preserving a soft and progressive boring at the same time, met the required criteria.¹⁸

Once the post shape and dimensions were determined, a collaboration with the Satelec Acteon Group (Merignac, France) was undertaken to design a set of diamond tips for



Figure 3: Lower left second premolar

ultrasonic equipment, which take their shape from the post (Figure 2). The tips are manufactured from stainless steel, and covered with diamond particles with an average diameter of 76µ. A central canal was created making it possible to enable water irrigation of the instrument and is compatible with all the piezoelectric generators in the Satelec range. The result of the collaboration is the Ellipson Concept, a system that allows better adaptation and restoration of root canals that have oval sections.

Another requirement relates to the number of sizes of posts. In keeping with the minimally invasive concept, it seems unnecessary to create 3 or 4 different sizes of posts associated

with several drilling instruments such as those practised with current techniques. The other objective was to design a universal instrument for this type of canal preparation. This universal instrument would conform to one or two sizes of the Elliptical Post.

Clinical protocol

Figure 3 represents a lower left second premolar. In the pre-prosthetic stage, corono-peripheral preparation can be carried out beforehand. The placement of rubber dam makes it possible to isolate the tooth. Figure 4 emphasizes the oval aspects of the canal. In order to guarantee the success of the preparation using the set with diamond tips, several rules have to be followed.

The first fundamental rule is to work according to the level of power recommended by the manufacturer of the ultrasonic instrument while inserting the tip (between 10 and 15). A coloured ring on the tip (Figure 2) guides the dentist, indicating the level of power which must be used. For those who have a chairside ultrasonic generator, the range of power to be considered is between 50% minimum and 80% maximum,



Figure 4: Oval aspects of the canal



Figure 5: Tip is positioned vertically parallel with the long axis of the tooth or canal



Figure 6: Tip may be used without irrigation to improve the removal of the first quarter of gutta-percha



Figure 7: Preparation with the ultrasonic tip



Figure 8: Post is suspended"



Figure 9: Etching with 37% orthophosphoric acid is performed for 20s in the post space and the coronal portion simultaneously



Figure 10: Adhesive is placed in the post space and the coronal portion



Figure 11: Composite cement is injected into canal space and the post quickly positioned



Figure 12: The remainder of the restoration is performed.



Figure 13: Pre-prosthetic restoration

according to the equipment's specifications.

Once the power is regulated, the tip is positioned vertically, parallel with the long axis of the tooth or canal (Figure 5). In order to improve the removal of the first quarter of gutta-percha, the tip may be used without irrigation. Heat associated with vibration eliminates gutta-percha more easily at the surface (Figure 6). After that, irrigation must be regulated to the maximum until the insert reaches the desired depth. Two visual reference marks (placed by laser marking by the manufacturer) on the diamond insert tips are located at 8mm and 10mm. These reference marks are there simply to help the dentist measure the depth of its penetration; they do not

represent a minimum or maximum of preparation which is not to be exceeded. Factors such as the length of the root, the ratio of clinical crowns:root and the presence of a curve must be taken into account to determine the depth of the preparation. A portion of at least 3mm of gutta-percha must be left at the apical level to guarantee the apical seal.¹⁹

During preparation, the dentist should not exert vertical pressure too aggressively, but should rather insert the tip gradually. Compared to the use of a drill, where the head of the contra-angle limits visibility of the working area, the Ellipson™ offers better accessibility and visual enhancement. Preparation with the ultrasonic tip conforms to the mesio-distal diameter of



Figure 14: Operational radiographs; pre- and post-operative

the canal and engages the buccal and lingual zones (Figure 7). Cleaning and the removal of cement and sealer are facilitated with the ultrasonic vibration of the insert, coupled with irrigation.

The Ellipson Post is then tried in the prepared space. It should not be in direct contact with the canal walls, as the post should be suspended to allow space for the bonding and cement system (Figure 8). The bonded fiber post will thus allow a better dispersal of the occlusal stress.^{2,20,21} The length of the post is evaluated at the coronal level, and ideally will be covered by approximately 1mm of composite core material. It is advised to perform extra-oral cutting of the post with a diamond disc or diamond bur.²² (Never use forceps or pliers to shorten the post).

The luting procedure is identical to those described by many authors²³⁻²⁸ to bond fiber posts. Etching with 37% orthophosphoric acid is performed for 20s in the post space and the coronal portion simultaneously (Figure 9). Abundant rinsing for at least 15s is necessary, with excess moisture being removed using paper points and air blasting.

Adhesive is then placed in the post space (Figure 10) and the coronal portion. Excess adhesive is removed with a paper point. The adhesive is then air-dried and light-cured according to the manufacturer's instructions. The surface of the post is also coated with adhesive, air-dried and light-cured. Dual-cure composite cement is injected into the canal space and the post quickly positioned (Figure 11). The remainder of the restoration is then performed (Figure 12).

Figure 13 shows the pre-prosthetic restoration and Figure 14 the operational radiographs; pre and post operative.

Conclusion

Although promising, these results constitute only a preliminary study. They must be supplemented by studies on the performances of bonding, the post-cement-dentin interface, a possible reduction in the risk of brittleness of the root compared to rotary techniques and by a long-term clinical study. The minimally invasive preparation concept presents an alternative to traditional systems.

Dentistry in the 21st century is resolutely directed towards adhesive techniques and aesthetics, while preservation occupies a fundamental place. With the Ellipson Concept, a completely reliable system where the field of corono-radicular restorations (by fiber posts) is improved and augmented. The

major advantage of this technique allows precise preparation of oval canal anatomy. Composed of only one tip and one (tapered) post shape, the Ellipson Concept is a simple and effective system to restore pulpless teeth which have an oval section. It benefits from fiber post technology, which has been documented during nearly 20 years of clinical service.

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DENTASA UPDATE



DENTASA has become the platform for all dental technicians to remain informed on the current issues within the dental technology profession. It has created the opportunity for all technicians to stand and work together in a unique union to create and ensure a sound and ethical profession that will still be around for years to come.

2008 promises to be big, better and full of wonderful surprises.

DENTASA AGM & exhibition 2008

Sirona is the proud Platinum sponsor of this year's prestigious AGM to be hosted at The Castle, Kyalami in Midrand.

The registration fees are R400 for students, R500 for members and R900 for non-members. Your registration fee includes entrance to the exhibition, all lectures and hands-on courses, Friday evening cocktail, AGM, keynote lecture by Vanik Jinoian and to the Millners Farewell drinks Saturday afternoon.

This is just a small selection of the wide range of lectures that will be presented:

Vanik Jinoian: The development of CAD/ CAM systems and what criteria should I use in selecting a system for my Lab.

Sandro Cuchiaro: Hand milling vs. Computer milling. Demo, Q&A.

Alex de Gradde: Porcelain troubleshooting. Cause & Remedy.

Vanik Jinoian: The latest CAD/ CAM techniques and clinical case studies (hands-on session)

Dr. Andrew Ackermann: Interfacing full ceramic systems with implants & avoiding pitfalls.

Do not miss out on this unforgettable event, which offers more to see, more to learn and more to experience. Diarise the 30th and 31st of May 2008 and be a part of the highlight of the year for all dental technicians!

Registration is required before Friday 16 May. For up to date information visit the DENTASA website.

SADTC matters

News has been that the Minister of Health is reshuffling all Medical Councils and that the SADTC will, in future, be disbanded to fall under an Oral Health Council. This new council will represent and govern all oral health professions. The new development is only expected to start in 2010+.

The SADTC is still the statutory body for all dental technicians and technologists thus continued registration with the SADTC is necessary.

Council Registrar

A new registrar of council has not yet been appointed and the education inspector of council has formally resigned. Despite uncertainties, the SADTC continues to perform of its duties.

Direct Billing

According to the Dental Technician Act the laboratory contractor is contractually bound to the dentist and it makes no provision to enter into a contract with the patient. The Minister signed an Act which states that you MAY enter into a contract with the patient or to claim directly from the Medical Aid(MA).

A problem that may occur is that if the dentist is under the impression that he/she is no longer in the payment loop to the lab, that he/she may use the total benefit the MA provides and that there will be nothing left for the laboratory. Then the laboratory contractor has the problem of extracting payment directly from the patient of which there is no legal stance to do so. Things are very grey at this stage. The medical aids have no protocols in place at this stage (i.e. No ICD 10 codes, no NAPPIE codes and MA practice numbers etc.) in place. I hope this perspective gives a bit of deeper thought.

Denturism

Please visit the "The Society for Clinical Dental Technology" website at www.denturism.co.za and post your comments on the visitor comments area.

Membership Registration

Each DENTASA member represents a link in the chain of our profession. If you are not yet a member of DENTASA we kindly invite you to become part of our family. You might become the link of today that makes the strongest difference tomorrow!

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Reg No: 2005/035340/08**

P O Box 95340, Waterkloof, 0145, 105 Club Ave, Waterkloof Heights, Pretoria

Phone: 012-460 1155 • **Fax:** 012- 460 9481

Office Hours: Mon-Fri 08:00-13:00

URL: www.dentasa.org.za • **Email:** dentasa@absamail.co.za