New abutment for a screw-retained, implant-supported crown

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The 1-piece, implant-supported abutment and crown, colloquially described as the UCLA abutment, commonly is used to fabricate single, screw-retained crowns. This abutment was designed to allow attachment of the crown directly to the implant and requires a waxing and casting procedure by a laboratory technician. A new prefabricated abutment has been developed that uses a similar approach but does not require the waxing and casting process. The PDQ abutment is made from a metal-ceramic alloy that is custom contoured by grinding to support a porcelain veneer. Porcelain then is fired to the contoured abutment to develop the 1-piece artificial crown. This article describes the use of the PDQ abutment. (J Prosthet Dent 2001;85:30-3.)

The method of implant-supported prosthodontics introduced by the Brånemark group involved the restoration of totally edentulous mandibular arches.[1,2] Nevertheless, this treatment modality offered promise for the restoration of partially edentulous patients, and considerable research has been devoted to the use of osseointegrated implants to support artificial crowns in partially edentulous arches.[3,4]

The configuration of the transmucosal abutments developed by the Brånemark team limited the esthetic capabilities of the system, and modifications soon were initiated. One approach eliminated the transmucosal abutment to produce a 1-piece, screw-retained abutment-crown restoration that was attached directly to the implant. This abutment-crown combination, colloquially described as a UCLA abutment[5] and introduced by Lewis et al,[6] facilitated the fabrication of implant-supported crowns with a more natural appearance.

The original design for the UCLA abutment was a plastic burnout pattern. The dental laboratory technician modified the burnout pattern with wax to develop the contour for the metal substructure of the artificial crown. The combination plastic-wax pattern then was invested and cast. This plastic burnout pattern was relatively inexpensive, but casting inaccuracies were inevitable and produced problems. The flat-bearing surface of the abutment required "lapping" with a specially designed instrument to adapt the abutment to the prosthetic platform of the implant. In addition, the fit of the cast hex was inferior to the fit of a machined-hexed surface, and this inaccuracy was impossible to correct effectively. The contemporary UCLA abutment is an improvement over the original design and includes a premachined gold cylinder in both hexed and nonhexed configurations, but custom waxing by a dental technician is still necessary.

The UCLA abutment also can be used to support cement-retained, implant-supported crowns. The preformed UCLA abutment is modified with wax by a laboratory technician to resemble a traditional tooth preparation for a complete crown, and the pattern is invested and cast. A conventional artificial crown then can be made and cemented over this "customized" abutment.[7]

UCLA abutments have many applications, such as free-standing or splinted implant-supported, screw-retained artificial crowns; implant-supported fixed partial dentures (FPDs); custom abutments for cemented restorations; and bar attachments for overdentures.

Single implant-supported crowns are either cemented to an implant abutment or screw-retained. Ease of retrievability is the primary advantage of screw retention for implant-supported crowns. Also, when there is limited interarch clearance and conventional retentive form is difficult to achieve with custom abutments, screw retention is more predictable. However, the screw-access channel can compromise esthetics and interfere with the development of the occlusal structure of the crown. Cement retention can improve the esthetic result, especially for misaligned implants, and facilitate the development of occlusal function. Cement retention is also advantageous with multiple splinted crowns or implant-supported FPDs because it allows a more passive seat to the restoration.[8] Although cement-retained crowns can be seated with temporary cement and removed later if necessary,[9] this approach is less reliable than screw retention.

This article describes the use of a new 1-piece abutment-crown system. The PDQ abutment (Impac, Vident, Brea, Calif.) is bulb-shaped with a hexed-fitted surface; it is composed of a metal-ceramic alloy for direct porcelain application (Fig. 1). The dental labo-

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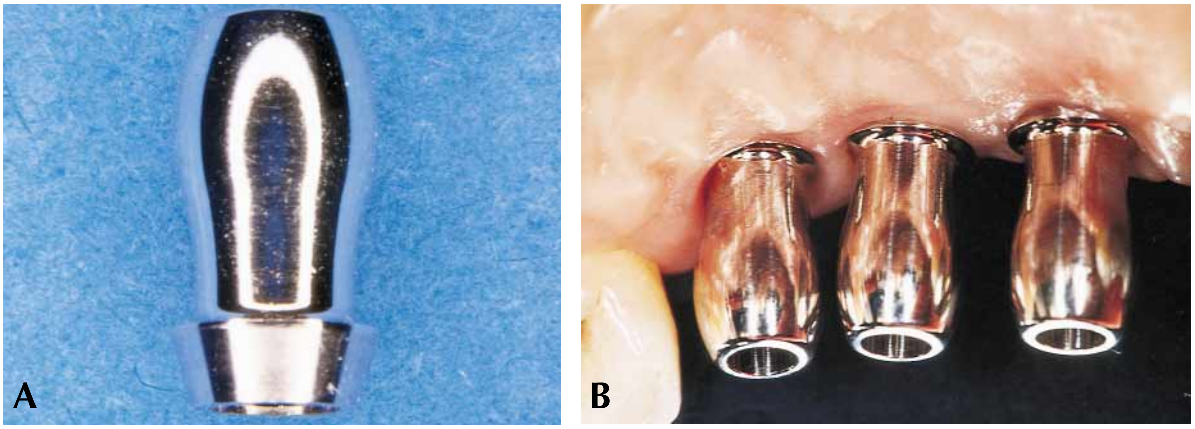

Fig. 1. PDQ abutment. **A,** Free standing; **B,** attached to implants in mouth.

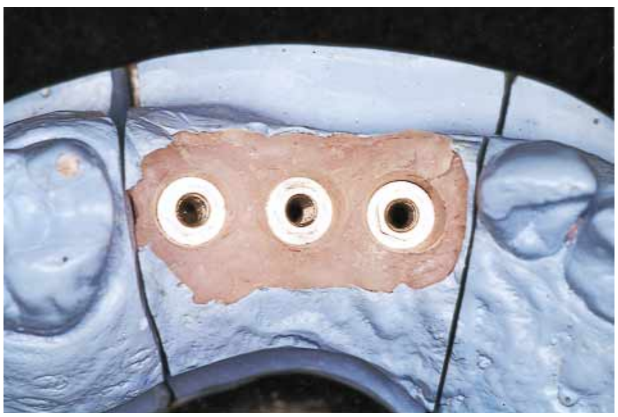

Fig. 2. Working cast with soft tissue replica.

Fig. 3. Clear plastic shell used to determine suitability of PDQ abutments.

Fig. 4. Abutments recontoured and ready for porcelain application.

ratory technician grinds this premade abutment to contour a substructure that will support the porcelain veneer. This approach avoids the waxing and casting process and offers considerable savings in laboratory time compared with the conventional technique for the 1-piece UCLA-type abutment and crown.

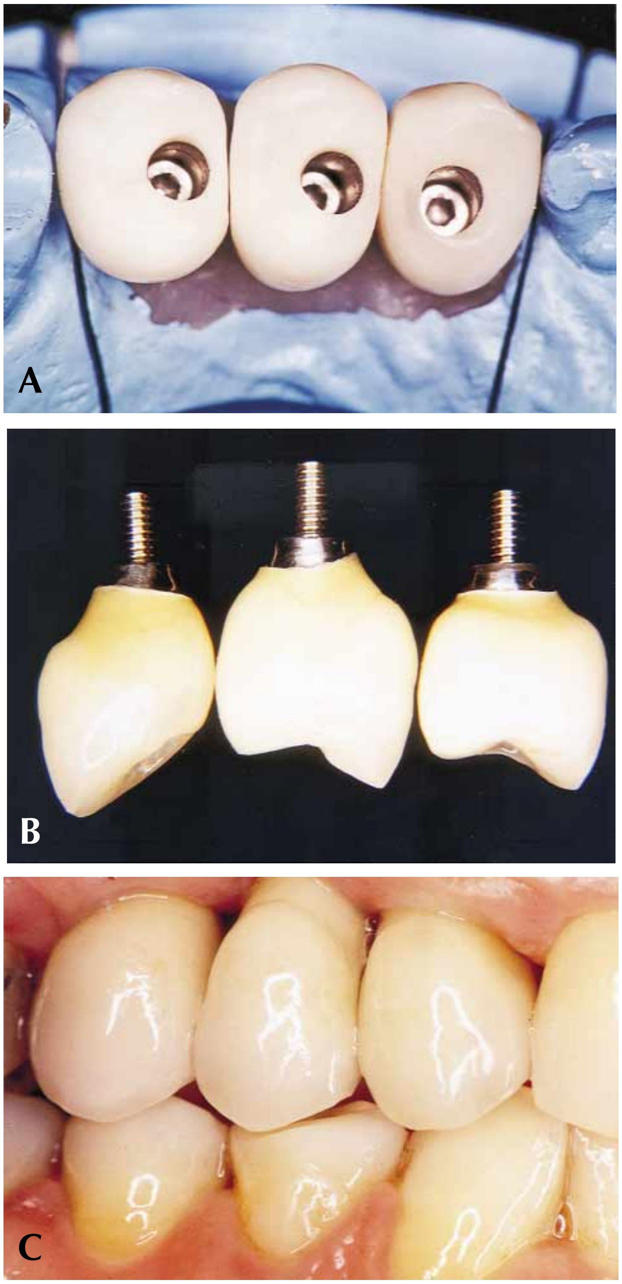

Fig. 5. Completed crowns. **A,** On master cast; **B,** ready for delivery; **C,** in mouth.

PROCEDURE

1. Eight weeks after uncovering of the implants, make a pick-up impression with Impac implant impression copings (Impac, Vident). (Each coping is hexed and retained in the impression to accurately relate the rotational position of the hex in the mouth to the hex on the implant analog.)
2. Attach Impac implant analogs (Impac, Vident) to the copings in the impression, and pour a working cast that includes a soft tissue replica made from an elastomeric material (Fig. 2).
3. Mount the casts, and set artificial teeth to represent the planned implant-supported crowns.
4. Make a clear plastic, vacuum-formed template of the trial setup (Fig. 3).
5. Attach the PDQ abutments to evaluate the interarch clearance and relationship of the abutment contours, including the screw-access openings, to the final contours of the planned crowns. (At this stage, it can be determined whether the PDQ abutment is suitable. With careful planning of the positioning of the implant, the PDQ abutment is usually applicable. If problems with porcelain support or the location of the screw-access opening are anticipated, another system, such as the UCLA-type custom abutment with cemented crown, should be considered.)
6. Reshape the PDQ abutments with appropriate noncontaminating aluminum oxide stones (Laboratory Mounted Points, Dedeco, Long Eddy, N.Y.) (Fig. 4).
7. Prepare the abutments for porcelain application by steam cleaning, followed by firing in a porcelain furnace in air to 980°C with a 5-minute hold to oxidize the metal.
8. Apply a compatible dental porcelain such as Vita Omega 900 porcelain (Vita Zahnfabrik, Postfach, Germany) by following the manufacturer's instructions with the use of conventional porcelain application techniques.
9. Complete the crowns. (The completed crowns on the cast, ready for delivery, and in the mouth are pictured in Figure 5, *A* through *C*.)

DISCUSSION

The PDQ abutment is compatible with several implant systems, either externally or internally hexed, including 3i Implant Innovations, Inc (West Palm Beach, Fla.), Nobel Biocare (Nobel Biocare USA, Inc, Westmont, Ill.), Calcitek (Sulzer, Carlsbad, Calif.), Paragon (Los Angeles, Calif.), Implamed (Sunrise, Fla.), Imtec (Ardmore, Okla.), Interpore (Irvine, Calif.), Lifecore (Chaska, Minn.), and Steri-Oss (Division of Nobel Biocare USA, Inc, Yorba Linda, Calif.).

Advantages of the PDQ abutment include the hexed, machine-fitted surface of the abutment. The bulbous contour of the abutment facilitates reshaping to develop support for the porcelain, and the manufacturer recommends a ceramic veneer not more than 2 mm thick. The abutment is manufactured from a high-noble metal-ceramic alloy that allows direct porcelain application. The abutment alloy is composed of 78% gold, 10% platinum, and 8% palladium, with the remaining 4% comprising trace elements (indium and iridium).[10,11] Its melting range is 1120°C to 1280°C.[10] The manufacturer has rated the linear coefficient of thermal expansion of the alloy as 13.8 µm/m°K, so this abutment can be used with any porcelain that possesses a compatible thermal coefficient. The manufacturer has successfully tested the PDQ abutment with Vita VMK 95 and Vita Omega 900 porcelains (Vita Zahnfabrik) (personal written communication with Mr Bart Halberstadt, implant and attachment product manger, Impac, Vident, July 2000).

The PDQ abutment can be used in most situations in which the UCLA-type, 1-piece, implant-supported single crown is indicated. The new method is less complicated than the UCLA system; therefore, it conserves laboratory time and is more cost-effective. An experienced dental laboratory technician has determined that using the PDQ abutment saves at least 30 minutes of direct labor time compared with the conventional cast UCLA method.[11] With the high cost of implant dentistry, implant-supported restorations currently are unattainable for many patients. Laboratory expenses for the fabrication of an implant-supported prosthesis are a considerable burden for the dentist; any cost savings to the dentist can be passed on to the patient. Reducing the fees for implant-supported prosthodontics can improve access to this area of dental practice.

Because the final restoration is screw-retained, the advantages and disadvantages of screw retention apply to this system. This method is not well suited for misaligned implants because unfavorable location of the screw-access opening and inadequate support for the porcelain veneer are likely consequences. An evaluation of the working cast with a clear plastic template is a critical step that will alert the dentist and technician to any problems related to porcelain support or implant angulation. With the conventional UCLA abutment, the technician applies wax to the plastic waxing sleeve to develop a complete anatomic contour, and then methodically cuts back the wax pattern to provide space for the ceramic veneer. With the PDQ abutment, the clear plastic shell represents the desired contours of the planned crowns and substitutes for the traditional full-contour waxing. The technician grinds the abutment to provide space for the ceramics, using the template as a guide. This abutment also may be unsuited for extremely small teeth, such as maxillary lateral incisors and mandibular incisors, because of the relatively large screw-access opening. The clear template will warn the dentist and technician of this problem, and another abutment can be chosen.

SUMMARY

A new abutment that substitutes for the conventional UCLA-type abutment-crown restoration has been described. The PDQ system is less time-consuming for the dental laboratory technician and is likely to reduce laboratory costs.

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