
Soft Liner–Retained, Implant-Supported Overdenture: A Technical Note

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This paper describes the design and fabrication of a soft liner–retained, implant-supported overdenture used in 10 patients over a period of 1 to 6 years. A final complete denture impression is made of the dental arch, including implant abutments extending 5 mm above the gingival tissue. The master cast is fabricated with actual abutments placed in the impression. After the final wax try-in, the denture is flaked in the usual manner with the metal abutments in place. Before packing with acrylic resin, plastic tubing 1 to 2 mm thick is placed around each abutment. The denture is trial packed and allowed to bench cure over night. The plastic tubing is then removed and a soft denture lining material is placed in these areas only. The flask is closed and cured according to the manufacturer's recommendation. The denture is delivered as a conventional overdenture.

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Key words: dental implant, overdenture, soft liner, treatment planning

Restoration of the totally edentulous arch with endosseous root-form dental implants often involves complex and time-consuming techniques. The restorative options may include fixed prostheses that are either screw-retained or cemented. Removable prostheses may be retained with a bar-and-clip attachment or an O-ring mechanism. The successful completion of these restorative techniques requires that the surgeon place a sufficient number of implants of adequate length, diameter, and distribution to support the prosthesis in function.

Using in vivo strain gauges and finite element analysis, Benzing demonstrated that a “spread out implant arrangement resulted in a more favorable distribution of stress to the bone than with a concen-

trated implant arrangement.”^{1p188} In the event the “spread out implant arrangement” cannot be accomplished because of implant loss,^{2–5} poor orientation, or questionable implant prognosis, modification of the original treatment plan may be indicated for either short- or long-term use. The prosthesis used in a modified treatment plan should be esthetic, easily altered in the event of implant loss, and minimize forces placed on the supporting implants. Jemt et al⁶ reported that forces from compression or tension were lower with an overdenture than with a framework connected to the dental implants.

The fabrication of a complete overdenture will produce a prosthesis that is supported primarily by natural tissues and not by implants. The implant-supported overdenture is an alternative to the original implant treatment plan, which might overload the implants. Patient satisfaction increases with an implant-retained overdenture when compared to a complete denture.^{7,8} The placement of a layer of soft material around the dental implant abutments will add retention and stability to an overdenture.

Materials and Methods

A transmucosal abutment and a gold cylinder are placed on top of the dental implants (Fig 1). Components are selected so that the top of the gold cylinder will extend 5 mm above the soft tissue. A

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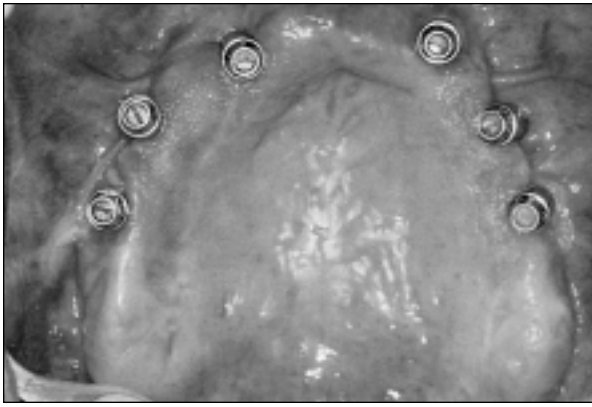


Fig 1 Bone-grafted edentulous maxilla with 6 implants and gold cylinders in place.

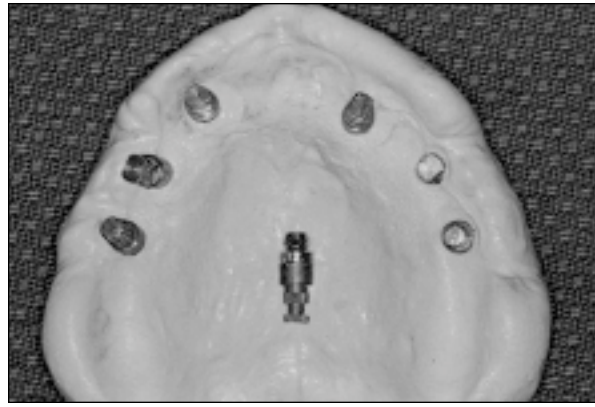


Fig 2 Final maxillary impression with gold cylinders and abutment analogs in place.

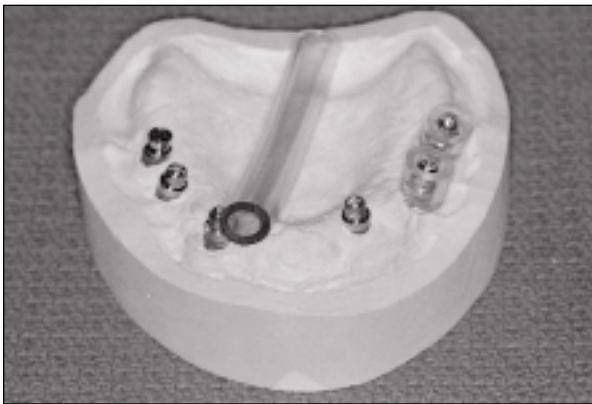


Fig 3 Plastic tubing 1 to 2 mm thick is placed over each gold cylinder and abutment.

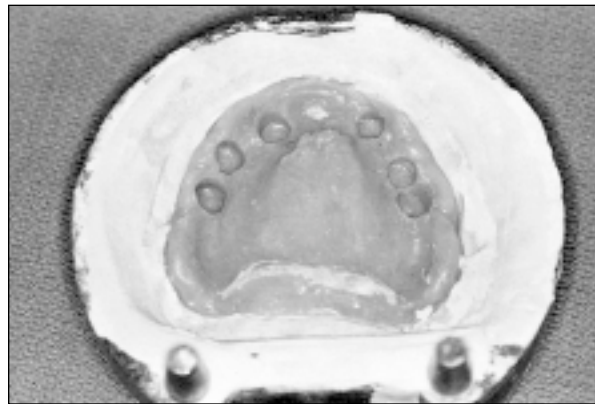


Fig 4 Boiled out flask with plastic tubing open end sealed with elastomeric material, ready to be packed with acrylic resin.

final impression of the edentulous arch and the implant components is made with a custom impression tray and the elastomeric impression material of choice. The gold cylinders are then removed from the patient's transmucosal abutments and secured to laboratory abutment analogs. The gold cylinder and abutment analogs are placed into the final impression, which is boxed and poured with an improved dental stone, such as Silky Rock (Whip Mix, Louisville, KY) (Fig 2).

The master cast is a replica of the patient's arch and includes the correct position of the transmucosal abutment and the gold cylinder. The contours and undercuts of the gold cylinder will provide retention for the final prosthesis.

Jaw relation records and a wax try-in of the denture are fabricated using the operator's preferred technique. The denture is flaked and prepared for

processing in the customary fashion. After the denture flask has been boiled out, prior to packing with acrylic resin, a piece of generic plastic tubing 1.0 to 2.0 mm thick^{9,10} of appropriate diameter is placed over each abutment to serve as a spacer (Fig 3). The plastic tubing should fit the gold cylinder and abutment tightly, should be in intimate contact with the stone cast, and should extend 1.0 mm beyond the top of the gold cylinder. The open end of the plastic tubing is sealed with a small amount of elastomeric impression material to prevent the ingress of acrylic resin during packing (Fig 4).

The denture is trial packed and allowed to set overnight. This "bench curing" allows the unpolymerized acrylic resin to develop a viscosity high enough to resist the packing pressure of the soft liner material without deformation. The flask is then opened, and the plastic tubing and elastomeric

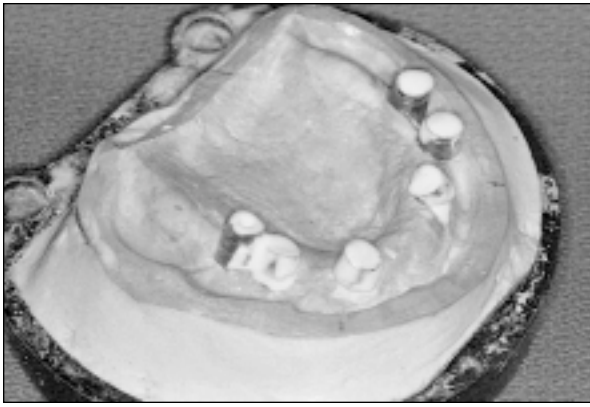


Fig 5 Bench-cured denture with plastic tubing removed, ready to receive soft lining material.



Fig 6 Processed complete maxillary denture with soft lining material around the dental implant abutments.

impression material are removed (Fig 5). Primer and bonding agent are applied to the uncured acrylic resin, and the soft denture lining material of choice is placed in the spaces created by the plastic tubing.¹¹ The denture flask is closed and curing of the soft liner is completed as recommended by the manufacturer. The processed denture is recovered, finished, and polished utilizing conventional techniques (Fig 6). The recovered gold cylinders are cleaned, sterilized, and placed back on the intraoral transmucosal abutments. Reproduction of the original intraoral orientation of the flat sides of the gold cylinders recorded in the impression is unnecessary. The flat sides of the gold cylinders are so minimal that their orientation within the soft liner does not impede the seating of the completed prosthesis. The completed denture is delivered, utilizing the techniques of a conventional overdenture.

An alternative technique would involve the use of modified healing abutments. Healing abutments that will extend 5 mm above the soft tissue are selected. A large-diameter separating disc is used to cut a circumferential groove 2 mm from the top of the healing abutment. Polishing stones and wheels are used to smooth the surface of the healing abutment. The modified healing abutment now resembles the shape of an hourglass and may be used in place of the transmucosal abutment and gold cylinder (Fig 7).

This prosthesis design has been used for 10 patients over a period of 1 to 6 years. The overdentures have been well accepted by the patients, although most would have preferred the originally planned prosthesis. No dental implants have been lost using this technique, even though some had a questionable prognosis because of bone quality or implant length. The only complication noted involved the use of an aggressive denture cleaning agent (5%

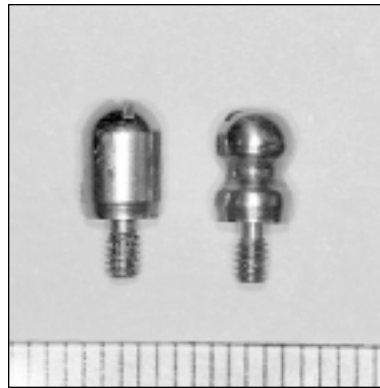


Fig 7 Modified healing abutment.

sodium hypochloride [bleach]) by 1 patient, resulting in the rapid degradation of the soft lining material, which then needed to be replaced.

The usable life span of a soft lining material can be patient dependent.⁹ The use of a soft liner in any dental prosthesis obligates the dentist to observe and replace the soft liner at periodic intervals.¹⁰

Discussion

The use of a soft liner-retained, implant-supported overdenture (SLRISO) offers the restorative dentist a treatment option when the number, location, or angulation of dental implants placed may differ from the original treatment plan. A SLRISO may be used for a short or long term. The short-term use of an SLRISO is indicated if the long-term prognosis of a dental implant might be in question, for example, when an implant is placed in grafted bone or bone of poor density. The use of an SLRISO with provisional

loading prior to the completion of a complex, final prosthesis could help determine an implant's likelihood of long-term survival.

The long-term use of a SLRISO might be indicated when the number, size, or orientation of dental implants is inadequate to complete the treatment originally planned for a patient. Another reason may be that during the extended time required for completion of dental implant treatment involving edentulous arches, a patient's financial needs could dictate modifying the treatment plan to a less complex, less expensive design than that originally selected. The SLRISO allows for these contingencies.

The soft lining material is placed around the gold cylinders to engage the undercuts, resulting in additional retention of the prosthesis. Furthermore, the presence of the soft lining material compensates for the volumetric contraction of the acrylic resin that occurs during processing.¹² This prevents the dental implant components from coming into direct contact with the acrylic resin, minimizing the possibility of overloading the implants.

Conclusion

The fabrication of a conventional implant-supported prosthesis may be contraindicated when bone quality and position or number or size of dental implants may be inadequate to support a prosthesis. The soft liner-retained, implant-supported overdenture has proven to be a valuable alternative in dental implant reconstruction of the edentulous arch. In 10 patients treated over a period of 1 to 6 years, this technique has proven to be well accepted by the patients, durable, and cost effective either as an intermediate or final prosthesis.

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