Treatment options for the edentulous arch

By Marc Montana

Introduction
Historically, when a patient’s dental condition reached a state of total tooth loss, treatment was limited to a complete denture with no hope of improving that status. The greatest challenge, particularly when working with a lower jaw providing a denture with reasonable stability and retention. Success was greatly dependent upon the skill of the practitioner but also on the neuromuscular ability of the patient, their supporting structures and a philosophical attitude toward their treatment. Treatment for patients suffering complete edentulism has been revolutionized by the ongoing success of dental implants such that the standard of care for the mandible is an implant overdenture.

The spectrum of prosthetic modali- ties developed since the acceptance of endosseous implants to the dental market ranges from the very simple to the astonishingly complex. As this field of study once directed by specialists, has evolved into a mastery of the general practice, favor of expeditious and reproducible methods has gained dominance over complex therapies. Implant overdentures and fixed hybrid prostheses are choices typically offered by the dentist based upon a patient’s financial ability. While both are generally successful, the overdenture and the hybrid prosthesis are not without pitfalls.

The implant-retained overdenture
The implant-retained overdenture is described as a prosthesis that covers and is supported by, the natural tissues retained by the dental implant; the prosthesis is retained and is assisted rather than supported. Placement of two to five implants is commonly found for the edentulous mandible with emphasis on creating a large antrostemor spread between the edentulous pillars. If more than two implants are clustered in a small AP range, the patient may not move freely about a single axis of rotation and the denture may dis- loe dysfunction.

By creating the fulcrum on the most posterior overdenture abutments, the denture will pivot in function resulting in disengagement from the attachment mechanism and cause premature wear of the retentive components. Therefore, an increase in the number of implants beyond two does not necessarily provide a linear increase in retention and sta- bility. In fact, the opposite may be true. Support provided may be supplied by the mandible itself, resorption of the supporting structure will result in increased tipping of the denture during function, resulting in dislodg- ment. Therefore, the dentist and pa- tient must be cognizant of the need for relining of the prosthesis periodic- ally to assure optimal performance.

Recommendation is, therefore, placement of two implants in the posterior mandible to allow one axis of rotation. These implants should also be positioned such that future implants may be considered should the patient wish for an implant-sup- ported alternative.

The hybrid prosthesis
The screw-retained hybrid prosthesis is a fully implant-supported struc- ture and, therefore, is not affected by incremental resorption of the resid- ual ridges. It has gained in popularity as the technically difficult and costly gold frameworks have been replaced by CAD/CAM titanium structures and by proven success of angled implant placement to increase the AP spread. Because the restoration has a substructure, it is possible to cantilever posterior to the terminal abutment, increasing the length of the functional arch.

However, the esthetic component of the restoration, namely the denture teeth and acrylic resin matrix, are inherently weak materials originally intended for use in complete and partial dentures where functional load is comparatively low. If insuffi- cient inter-arch space is available, the risk of fracture or displacement of denture teeth or resin base is high as the materials will be too thinned to withstand forces generated during function and especially parafunc-

Unfortunately, this is an increasingly common occurrence, especially in restoration of the maxilla with a fixed hybrid prosthesis. Inconve- nient screw-access holes may further weaken the prosthetic teeth. Repair of a fractured denture is a last resort requiring removal of the hybrid prosthesis and correction in the dental labora- tory. The denture must be prepared to remove the structure and later re- seat it once the repair is completed. The patient must accept they will be without “teeth” for the length of time required for the technician to fix the problem. Attempts to prevent frac- turing by increasing the thickness of the resin is limited by the space available to do so. If inadequate inter- arch space is encountered, correction cannot be achieved by adding more resin. Rather a change in design to a different and possibly more expen- sive restoration may be necessary. When hybrids are used in the max- illa, contract may arise in attempting to improve the esthetic and phonetic result by use of ridge lapping and the limitations such shapes impose on proper oral hygiene.

The benefits of the fixed hybrid prosth- eses are clearly improved function and minimal post- treatment complications as long as the patient is able to properly clean it and break- age is avoided. Because it is fixed, the patient cannot remove it to clean away entrapped debris and properly remove plaque. Repair or replace- ment of the resin teeth requires re- moval and re-seating by a dentist.

ATLANTIS Conus concept: the removable implant-support- ed bridge
As described above, the tissue-sup- ported overdenture performs best with only two implants placed in the anterior regions. When more than two implants are placed, the goal should be to provide a completely implant- supported result. The Atlantis Co- nus concept (DENTSPLY Implants, Waltham, MA) portfolio, it is avail- able for all major systems. In addition, because each abutment is custom made, correction of angled implant placement is possible up to 30 degrees. Two major require- ments are necessary, the implant must make an accurate, implant level impression and a scan must be made of either an approved denture set up or of a completed denture to be retro-fitted. The ATLANTIS Conus Abutments are then designed to be positioned optimally within the denture confines. The fixed yet re- moveable prosthesis offers the advant- ages of excellent chewing function, improved esthetics and fracture re- sistance (as no screw access holes are present) and optimally facial sup- porting contours, without compro- mising cleaning by the patient.

Case Report
A 73-year-old woman with a history of 11 years of complete edentulism of the maxilla and mandible, and five endosseous implants in the ante- nor mandible, presented with a chief complaint of a non-reten- tive and un- stable lower denture. The implants were standard diameter, externally hexed, Bransform fixtures. She had adequate bone loss and moderate resorption of both the maxillary and mandibular residual ridges (Fig. 1).

The patient had bone loss involving the implant bodies but comparing the radiographic evidence available, documenting her condition through the years, it appears the bone loss oc- curred soon after implant placement and no appreciable change was seen thereafter.

During those 11 years, her treatment history included initial restorations of the implants with a complete denture retained by the Locator at- tachment system (Zest Anchors), and the maxilla was restored with a complete denture. She advised that the result was unsatisfactory as the lower denture displaced during function.

Her history further reveals that the Locators were replaced with Prex-Oxix attachments (Icika At- tachments) with no demonstrable improvement. The patient was later retreated by the author, with new maxillary and mandibular complete dentures and new Locator attach-
ments used to retain the lower prosthesis. The attachment male components were secured intra-orally using autopolymerizing acrylic resins to enhance the possibility of laboratory error. The patient continued to experience problems with the lower denture coming loose during function and complained of frequent replacement of the nylon male inserts, replace- ment with Extended Range Inserts did not improve the performance. The metal abutments demonstrated considerable wear as well (Fig. 2). Relining the lower denture base was agreed upon to an adequate depth to completely cover the coping-analog interface. The impressions were boxed with wax and poured in vacuum-mixed die stone to prepare a reline. The impression coping screws were removed and the impressions were separated from the cast with the standard laboratory procedures followed in clean- ing and trimming the working casts.

At the subsequent appointment, the patient was presented with the mentioned adaptation. Due to the potential solution to her ongoing dilemma Treatment options were presented as well including a fixed hybrid prosthesis and a 2-in-1 bar overdenture. These were rejected as interarch space was less than opti- mal, requiring compromise to the strength of the design. The patient also expressed a desire for a remov- able design as she was concerned with having adequate facial support and wished to be able to remove the prosthesis for proper hygiene and maintenance. It was agreed that a new maxillary and mandibular complete denture would be fabricated and ATLANTIS Conus abutments would be made to secure the lower restoration.

Clinical and laboratory procedures

Because the existing dentures were made within the last five years and were acceptable with regard to tooth position and vertical dimension, it was decided that clear, acrylic resin duplicates of each denture would be made to serve as custom trays. Double-sided impressions of each denture were made and delivered to the dental laboratory for fabrication of the duplicates. Once processed, the copy denture borders were shorten- ed by 2 mm to allow border mold- ing. The duplicate of the mandibular denture with the partial denture of each Locator housing and there- fore the position of the denture im- plants. Holes of adequate diameter to allow the duplicate denture to be placed in the patient’s mouth over impression copings were prepared (Fig. 3). The intaglio surface of both the fixed lower duplicate denture and the copy denture were relieved to allow for a wax impression. The patient returned for final im- pressions and the Locator abut- ments were removed and kept in appropriate order to avoid confu- sion when re-seating them at the appointment completion. Open tray impression copings were connected to each Locator abutment and were re- stored and tightened. The impression post and gingival moulage were injected around the analogs to an adequate depth to completely cover the coping-analog interface. The impressions were boxed with wax and poured in vacuum-mixed die stone to prepare a reline. The impression coping screws were removed and the impressions were separated from the cast with the standard laboratory procedures followed in clean- ing and trimming the working casts.

The tray was seated, ensuring that the impression copings were completely accessible through the holes previously prepared. The patient was instructed in facial and tongue movement to achieve proper pe- ripherial border extension. Legal Rigid (DENTSPLY) bite registration material was injected around each impression coping to rigidly adhere to the impression tray. This step is critical as reliance on flex- ible impression materials may allow transl- ation transfer error when constructing the working casts. Once the impression materials were fully set, the screws retaining the im- pression copings were removed and the final impression and tray were withdrawn from the patient (Fig. 4). All locators and the case were re- seated and tightened. Final impres- sion of the maxilla was completed with border molding using mod- eling plastic and a wash impression with light body PVS. Upon completion, the patient was dismissed.

In the dental laboratory, implant analogs were secured to the impres- sion posts, gingival moulage was injected around the analogs to an adequate depth to completely cover the coping-analog interface. The impres- sions were boxed with wax and poured in vacuum-mixed die stone to prepare a reline. The impression coping screws were removed and the impressions were separated from the cast with the standard laboratory procedures followed in clean- ing and trimming the working casts.

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Once verification of the completed abutments was obtained (Figs. 15, 16), the clear, duplicate copy of the bridge can only occur follow- ing the long-axis of the abutments, the tip up or turning on itself, it is possible. In any event, the abutments were again removed and Teflon tape was placed in the implant excluded from the design. The abutments were seated onto the dental implant (Fig. 12), and the clinical orifice was planed centrally over the SynCone caps to verify the implant mucosal support. The SynCone caps were placed and secured to the abutments, ensuring an intimate frictional fit with the impression post. At this point, the structure is a bridge and not an overdenture. To facilitate seating of the abutments in the pa- tient, a clear matrix was made with the abutments on the original working cast, where they remain, and the SynCone caps were placed and secured to the abutments and the SynCone caps were placed and secured to the abutments and the SynCone caps were placed and secured to the abutments. The patient continued to experi- ence problems with the lower den- ture and complained of excessive cantilever over the implant excluded from the design. The abutments were seated onto the dental implant (Fig. 12), and the clinical orifice was planed centrally over the SynCone caps to verify the implant mucosal support. The SynCone caps were placed and secured to the abutments, ensuring an intimate frictional fit with the impression post. At this point, the structure is a bridge and not an overdenture. To facilitate seating of the abutments in the pa- tient, a clear matrix was made with the abutments on the original working cast, where they remain, and the SynCone caps were placed and secured to the abutments and the SynCone caps were placed and secured to the abutments.

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Intraoral welding and lingualized (lingual contact) occlusion: a case report

By Dr. Luca Dal Carlo, Dr. Franco Rossi, Dr. Marco E. Pasqualini, Dr. Mike Shulman, Dr. Michele Nardone, MD, Tomasz Grotowski, Dr. and Sheldon Winkler

Intraoral welding was developed by Pierluigi Mondani of Genoa, Italy, in the 1970s to permanently connect submerged implants and abutments to a titanium wire or bar by means of an electric current (Fig 1). The current is used to permanently fuse the titanium to the abutments in milliseconds, so the heat generated does not cause any pathology or patient discomfort.

If possible the implants are placed without flaps. The titanium wire or bar is bent and aligned passively to the contour of the labial and lingual surfaces of the implants before applying the electric current to permanently connect titanium implants.

The technique follows a strict surgical and prosthodontic protocol, which includes using a number of implants close together, the number of teeth to be replaced, achieving primary stability by engaging both cortical plates (excisional immediate splinting of the implants utilizing intraoral welding and immediate insertion of a fixed provisional prosthesis with satisfactory occlusion. The technique provides for immediate loading and does not jeopardize the integration process although intraoral welding has been used successfully in Europe, especially Italy, for many years, it has yet to achieve everyday use in the United States.

Members of the Italian affiliate of the American Academy of Implant Prosthodontics, NuovoGISI, have long and successful experiences with immediate loading of maxillary implants connected together by intraoral welding.

By inserting the prosthesis with adequate retention and stability the same day as the surgery, patient complaints and discomfort can be avoided or substantially reduced. The instantaneous stability that results from the splinting can reduce the risk of failure during the healing period. Intraoral welding can also eliminate errors and distortions caused by unsatisfactory impression making, as the procedure is performed directly in the mouth.

Intraoral welding can fulfill a great need for business and socially active people for immediate and temporary function in the context of definitive prostheses.

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Discussion

The number of implants placed for an edentulous patient should be based upon whether the design is to be implant-supported or supported. If the goal is a minimal-invasive solution, utilizing the soft tissue for support, two implants using locator attachments are appropriate to retain a mandibular denture and will provide a predictable outcome. However, when more than two implants are utilized, resilient overdenture retainers are employed, then there is a corresponding linear increase in retention of the dentures and the result may suffer. Therefore, when at least four implants are planned, the retention should be designed as implant-supported to maximize the value of the patient’s greatest investment.

This article discusses just such a situation where a patient had experienced an edentulous state and was motivated to ensure that the implant-supported restoration was based upon the use of the ATLANTIS Conus concept, a successful result was achieved without the greater expense of a fixed hybrid. The final result was functionally and esthetically similar to a fixed restoration while providing lip and cheek support of a removably prosthesis without complicating or obstructing oral hygiene.

The minimal-invasive design of the ATLANTIS Conus concept provides outstanding retention of the prosthesis during function. Because the patient chewed in a relatively flat elliptical pattern, the bridge can be only removed vertically. The abutments themselves are patient-specific and can be manufactured for all major implant systems, allowing rescue of many frustrating situations with overdentures.

As long as there is sufficient inter-arch space (at least 12 mm), existing finished overdentures can be retro-fit with ATLANTIS Conus abutments, reducing patient cost while providing a stable result. Cast chrome frame reinforcement is advised for new ATLANTIS Conus prostheses as the tremendous increase in strength of the bridge by the frame more than offsets the slight increase in cost and may actually reduce re-quired inter-arch space. The clinical procedure is relatively simple and comparable to implant overdentures; however, because the abutments are patient-specific, the tooth position must be established before the design of the abutments is begun.

Conclusion

A patient with an 11-year history of frustration with her dental implant investment was treated successfully with the ATLANTIS Conus concept using patient-specific abutments and SynCone caps, providing an implant-supported, removable bridge with all the benefits of a fixed design and none of the limitations.

Acknowledgements

The author would like to thank Fred Sedrani, RMT, Bergstresser and Sean Ferguson (DENTSPY Implants) for their professional and educational support. The author would also like to thank Tom Wundl and the talented team at Wisconsin School of Dentistry for their cooperation in the laboratory procedures and products described in this article.

References

2. Fish E W. Using the muscles to stabilize the full lower denture. JADA 1981; 104:695-6a.

Editorial note: The full list of references is available from the publisher.

Figure 13. Completed bridge with SynCone caps processed in position. Because they have been processed intra-arch there is no error in fit, these caps are extremely retentive allowing only vertical displacement of the prosthesis.

Figure 14. Completed restoration. Note the absence of screw access holes for a prosthesis that looks like a denture yet fits like a bridge.

Figure 15. ATLANTIS Conus abutments torqued to specified level, obturated with Teflon tape and composite resin.

Figure 16. Laboratory processed, clear duplicate prosthesis with silanized silver material to improve retention; to be used as a mock-up to protect the linguin of the selected teeth.

Figure 17. Panoramic radiograph of the abutments seated on the four selected implants. Because the restoration is denture supported, gradual diminution of the residual ridge will present no consequence to the patient.

Figure 18. Completed bridge in place showing flange length suitable to prevent food.