The advent of CAD/CAM technology and the more widespread utilisation of implants in modern dentistry has led to an explosion of treatment solutions designed to address any situations encountered by the general dentist.

As patients have become more aware of the benefits of implant therapy, they have begun to demand more immediate restoration of their teeth. The provision of a fixed prosthesis has also become the goal in dentistry; however, the cost of such treatment is pricing the vast majority of patients out of the implant market. Immediate loading, avoiding conventional grafting techniques by placing implants at various angulations (AN-0-4, Nobel Biocare; Columbus Bridge, BRONET 3), has resulted in a significant upsurge of treatment by edentulous patients and those with a failing dentition. This is mainly because fixed bridges are provided and treatment times are reduced from months to hours, avoiding a conventional denture.

Most edentulous patients can tolerate a complete maxillary denture with few problems. The vast majority of problems arise in the mandible, where the underlying supporting tissues are not designed to function under this type of occlusal loading. Even a properly constructed complete lower denture can move as much as 1 mm mandi blely. This continuous movement of the prosthesis results in loss of the supporting bone for many years, causing denture instability and, therefore, a failing dentition. This is mainly because a fixed bridge is provided and treatment times are reduced from months to hours, avoiding a conventional denture.

The advent of CAD/CAM technology has resulted in a significant change in patient expectations. Where double coverage was sole y acceptable, single coverage is now considered a minimum. Treatment protocols

A similar treatment protocol was devised to treat this problem. According to this protocol, two dental implants are placed in the interforaminal area of the mandible, to which either a bar or stud attachments are connected to retain the lower denture. This treatment greatly improves both masticatory efficiency and function in patients. Over the last two decades, attempts have been made to render the implant-retained overdenture the standard treatment for edentulous patients. Most recently by the McGill consensus.2

Prosthetic failure, usually loss of retention, and the technical difficulties encountered when retaining or changing attachments required to be major negative factors in den tists’ attitudes towards this treatment modality. Several attempts were made to redesign and improve the attachments; however, owing to previous negative experiences, most dentists became reluctant to adopt temporary attachments as a routine treatment option.

The implant-retained bar overdenture: The SFI-Bar

The push to place more implants in an attempt to improve the situation led to the bar- and clip-retained overdenture scenario. This technique was more successful but still encountered similar issues to the stud-attachment overdentures.3

Poor stress transmission from the prosthesis to the supporting implants results in bone loss around the implants (especially the most distal implants in the multiple bar scenario), in addition to prosthetic and surgical complications. This resulted in implant companies and clinicians moving away from the two-implant-retained overdenture treatment option in favour of fixed solutions, such as round-house bridges fixed on four or more implants. As a result, the vast majority of patients cannot access implant therapy owing to financial constraints. The McGill consensus brought about the implant-retained overdenture to the spotlight as a way of increasing access to implant dentistry and improving patients’ quality of life. Improved component manufacturing techniques, and greater care and attention to both surgical and restorative treatment planning have significantly improved treatment outcomes using overdentures.

Recently Cendres+Mateux introduced the Stress Free Implant Bar, or SFI-Bar, to the dental community. This unique, implant-platform-independ ent restorative bar overdenture solution allows the fabrication of a true passive-fit bar and clip system on two or more implants (Figs. 3a–c). Finite element studies and clinical evaluation of the system have found minimal stress transmission from the prosthesis to the implants under loading. (Figs. 2a–c), with most stresses being evenly distributed between the supporting implants. Vertical loads are transmitted effectively to the supporting implants, while unsteady lateral stresses are largely eliminated. More recent clinical studies have also shown it to be a viable immediate-loading treatment solution. The technique is in its infancy, so long-term (five years or more) data is not available. The SFI-Bar is a modular system that connects multiple dental implants with no soldered or laser-welded joints. An implant-level master cast will be required for cutting in the laboratory. The cutting of the tube bar must always be carried out extra- orally. Once the tube bar has been cut, the ball joints are inserted into each end of the tube bar prior to seating on the implant adapters (Figs. 7a–d) and torqued into place. The SFI-Bar is now complete and the patient is ready for the retentive element to be housed in the denture. The ball joints can accommodate non-par allel implant placement up to a maximum of 15° angulation correction. The absence of any soldered or welded joints means that a greater length of the bar can be engaged by the retentive clip. In conventional techniques, the presence of a weld increases the bar thickness, at that point preventing any retentive clip engaging that area. In the SFI-Bar, the clip engages the full length of the bar between the ball joints (Fig. 6). The bar assembly must be parallel with the occlusal plane; therefore, a selection of implant adapters of varying lengths should be available.
denture. This denture functioned without surgical or prosthetic issues for a five-year period. Unfortunately, the patient revisited her dentist and complications arose after an attempted intra-oral relining procedure. On examination, it was determined that the ball abutments were no longer seated properly on the implant systems when fabricating the definitive denture. The dentist then chose to determine the vertical dimension of the occlusion and deactivation tools provided that the implants achieved transmission to and bone loss mitigation techniques, thus reducing stress to the supporting peri-implant tissues (mainly bone).

Several studies have shown that conventional bar- and clip-retained overdentures transfer significant stress to the supporting peri-implant tissues (mainly bone).[^4] The key to the SFI Bar system is that the bar is assembled in the patient’s mouth without the use of soldering, laser welding or conventional bonding techniques, thus reducing stress transmission to the bone around the implants. Studies have demonstrated that any laboratory-based technique that requires a master cast made from a dental impression will result in a bar that is not truly passive.[^5] As a result, several researchers have suggested that the only way to achieve a passive fit would be to assemble the framework intra-orally and then bond the bridge pontic in place.[^4] This is the method employed with this system.

There is no casting, soldering, laser welding or bonding of components when fabricating the conventional bar- and clip-retained overdenture. This, combined with the universal ball-joint nature of the components, provides a true passive fit when the bar is assembled. The finite element analysis clearly shows the stress-free nature of the bar when being assembled and when the prosthesis experiences loading (Figs. 2a–c).

No laboratory time is required to fabricate the bar and there are no costly implant components or gold-alloy charges. Clinically, there is no need for the bar sections to be soldered in an attempt to achieve passive fit—a step that may need re-peating—as with the conventional method.

There are no soldered or laser-welded joint points. The bar assembly has no inherent weak points that may fracture or corrode. The bar is assembled intra- or extra-orally. The reduced number of clinical appointments, laboratory time and component costs result in reduced treatment costs for the patient. In the case presented, for example, the bar assembly was completed in only six minutes. This is approximately the same time it takes for a polyether impression material (like Impregum) to set!

Conclusion

The SH Bar is relatively inexpensive compared with conventional gold castings and CAD/CAM options. The overall cost of the prostheses and treatment time are significantly reduced compared with conventional and CAD/CAM techniques. Precision-milled components provide an improved quality of fit. The physical and mechanical properties of the component materials can be controlled accurately, which provides better results for conventional casting methods. The SFI Bar can be used to manufacture implants to create a full-arch bar if needed, while the SFI-Bar system provides passive fit—a step that may need re-peating passively as demonstrated by finite element analysis. The passive-fit bar assembly can result in greatly reduced stress transmission to the supporting implants. Studies have demonstrated that this is also a viable treatment option for immediate-loading situations in the mandible, provided that the implants achieved insertion torques exceeding 50 Ncm approximately.[^4]

The finite element data and images were kindly provided by Dr Ludger Reiß, Endowed Chair of Oral Technologies, University of Duesseldorf, Germany.

Disclaimer: The SFI Bar, implant adapters and E clips were provided by Couders–Méjanes. The author did not receive any remuneration to write this article or payment towards laboratory charges, nor was he allowed to accept kind of payment given or received.

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