The advent of CAD/CAM technology and the more widespread utilisation of implants in modern dentistry have led to an explosion of treatment solutions designed to address any situation 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 always been 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 (AM-4-4, Nobel Biocare; Columbus Bridge, Biomet 3i), has resulted in a significant upturn of treatment by edentulous patients and those with 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.

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 1mm/day. This continuous movement of the prosthesis results in loss of the supporting bone (or mesial migration) of the mandible. Poor ridge form increases denture instability and this produces more remodelling. Edentulous fulfils the WHO definition of physical impairment.

**Treatment protocol**

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 reduces treatment time, improves efficiency and function in patients. Over the last two decades, attempts have been made to remodel 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 relining or changing the attachments needed to be major negative factors in dentists’ 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 these treatment modalities as a routine treatment option.

Most of the major implant companies offer CAD/CAM-fabricated bar and clip solutions. However, these bars are relatively expensive and are fabricated through a conventional impression and master cast technique. Studies have shown that 50% of all errors during impression making and cast fabrication result in non-passive fit of bars and frameworks. Thus, any bar fabricated through an impression or cast technique cannot be truly passive.3,4 A clinical case will be presented below in order to demonstrate the direct chair-side method (Fig. 1) and the indirect method (Fig. 2a–c) in addition to prosthetic result. The additional bulk would have produced a poor aesthetic result. The additional bulk of denture flanges allowed proper facial support.

**The implant-retained bar overdenture: The SFI-Bar**

In 2006, a 60-year-old female patient initially presented, complaining of an ill-fitting lower denture. The patient had worn a conventional complete mandibular denture for over 20 years, opposing a metal-based maxillary removable partial denture. The patient had visited a denturist on several occasions to try to improve the situation. After several refitting procedures, the patient decided to seek expert help. An OPG radiograph revealed a severely resorbed mandible that clinically presented as a classic bowl-shaped deficiency (Figs. 9a–c). Radiographic examination revealed that there was adequate bone volume in the anterior region for the placement of dental implants. However, a fixed solution would only have provided a short-term dental arch, a metal-based maxillary removable partial denture, the mesial bone loss to bone resorption. Placing implants distal to the mental foramen was not an option, owing to the proximity of the inferior dental nerve and lack of bone height. The patient was not keen to have any new repositioning or complex bone grafting. Another important factor negating the fixed solution was the size of the volume defect. This would have been difficult both to correct and to maintain and would have produced a poor aesthetic result. The additional bulk of denture flanges allowed proper facial support.

After discussing all the relevant issues, the patient agreed to a removable overdenture with two implants was the best and least complicated treatment option for her. The upper denture was not an issue for the patient, as it was relatively and stable. In order to limit costs, the upper denture was not replaced. A surgical guide was fabricated after the vertical dimension, aesthetic and phonetic parameters had been corrected in the wax denture try-in. Two 4.1 mm knurled dental implants (Straumann), each 8 mm in length, were placed in sites 452 and 454 (Figs. 7a & 9b). These were allowed to integrate for three months prior to the provision of the SFI-Bar. Simultaneous to the placement of the implants, a mould was taken, and a two-part silicone impression was taken. The procedure was then repeated on the opposing side.

Fig. 1

**The jig is designed to mimic a ball joint connection, ensuring a perfect section each time.** The jig slides along the tube bar until it reaches the implant adapter, accurately sizing the bar. The tube bar is then locked in place and cut to size with a cutting disc (Fig. 6e). This process can be carried out either chair-side (two-implant bar) or in the laboratory (four-implant bar or larger). 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–c) 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-parallell 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. 6d). The bar assembly must be parallel with the occlusal plane; therefore, a selection of implant adapters of varying lengths should be available.

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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 refining procedure. On examination, it was determined that the ball abutments were macerated and needed to be replaced. The female housing was removed, as there were no longer seated properly on the ball abutments.

The patient was then given the option of having either another ball-attachment retained overdenture or a bar-and-clip retained overdenture instead. The patient opted for the bar and clip overdenture. The first step was to remove the damaged ball abutments and seat the appropriate implant adapters on each implant (Fig. 9a in length: Figs. 4a & b). The tube bar was then inserted into the cutting tool and cut to correct length using the cutting disc (Fig. 9c). The adapter assembly was then connected to the implant adapters and torqued into place. The universal nature of the bar joint allows the tube bar to be located in the horizontal plane in a truly stress-free alignment (Figs. 2a & c).

The implant adapters were chosen so that when the bar is seated it is parallel to the occlusal plane, with at least 1.0 mm clearance between the underside of the bar and the mucosal tissues (Fig. 9b). This allows for the effective and reversible procedure around the denture implants and reduces the risk of tissue trauma from bar contacts. When the bar is seated, any dentures are then connected to the implant adapters to correct length using the cutting disc (Fig. 9c). The adapter assembly was then connected to the implant adapters and torqued into place. The universal nature of the bar joint allows the tube bar to be located in the horizontal plane in a truly stress-free alignment (Figs. 2a & c).

In the chairside technique, the denture is processed and a window is cut in the denture, through which the dentist can pick up the female part (made from Edilor – 0.6% per gold alloy), using self-curing acrylic resin in the patient’s mouth after seating the spacer and blocking out all undercuts (Fig. 10).

The total width of the bar with the E clip seated is 4.5 mm (Fig. 12) and 5.6 mm with the T clip seated (Fig. 11a). This is relevant for treatment planning, as ridge reduction is required for the chairside technique. A spacer is placed on the bar assembly was then connected to the implant adapters and torqued into place. The universal nature of the bar joint allows the tube bar to be located in the horizontal plane in a truly stress-free alignment (Figs. 2a & c).

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