

CLINICAL REPORT

An alternative approach for the management of fractured implant abutment screws on a mandibular implant-retained overdenture: A clinical report



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Implant-supported dental rehabilitations have been shown to be predictable, reliable, and highly successful for edentulous patients.¹⁻³ The McGill consensus statement has recommended mandibular 2-implant retained overdentures (IOD) as first choice standard of care for edentulous patients.⁴⁻⁷ Mandibular 2-implant overdentures provide patients with better outcomes than do conventional dentures, regarding satisfaction, masticatory ability, and oral health-related quality of life.^{3,5} Nevertheless, both technical and biologic problems may be encountered.⁸⁻¹¹ Biologic complications such as periimplant radiolucencies, periimplantitis, and radiographic signs of loss of osseointegration are uncommon.^{1-3,8,10} However, technical and prosthetic impediments,⁸⁻¹⁰ for instance, screw loosening, screw fracture, framework fracture, and crown fracture have been seen more regularly.¹¹⁻¹⁵ The 5- and 10-year estimates of abutment/screw fracture rates are 2.1% and 4.1%, respectively.¹⁶ The primary reason for screw fracture is undetected screw loosening, which can be due to a nonpassive superstructure, nonaxial biomechanical overloading, or manufacturing errors.^{9,10,15} Other causes include poor denture support, poor prosthetic fit, parafunction or occlusal interferences, inadequate or excessive screw tightening, fatigue character and yielding strength of the screw material, or inadequate seating of the abutment.^{8-11,17,18}

ABSTRACT

In contemporary implant and prosthodontic practice, high levels of surgical and biologic success rates have been achieved. However, mechanical and technical complications continue to exist. Of these, one of the biggest challenges to the clinician is the conservative retrieval of fractured screw fragments from within the implants and/or abutments. While removal is desirable, the fragments cannot always be removed, and alternative solutions for the management of such clinical situations must be considered. This clinical report describes the replacement of 2 fractured, irretrievable, Locator abutment screws of a mandibular implant-retained overdenture with a cast dowel and laser welded Locator attachments. This alternative method was successful in managing broken abutment screw fragments while using the existing prosthesis and implants. (*J Prosthet Dent* 2016;115:402-405)

Abutment screw fracture is uncommon, ranging from 0.5% to 8%,¹⁰ but a challenging complication due to poor visibility is related to the design of the implant-abutment connection, bone remodeling, screw joint mechanics, metal fatigue, and manufacturing defects.^{11,15,16,19,20} A fractured abutment screw must be removed without damaging the threads of the screw channel to reuse the prosthesis.^{15,17,18,20} Removing a fragment fractured at the junction of the screw head and shank and extending from the implant is generally easier by using a hemostat, explorer, or a sharp probe in a counterclockwise motion. However, a tightened screw fractured at the junction of the screw shank and screw thread is often difficult to retrieve.^{13,15,17}

For such arduous clinical situations, various screw removal kits (Retrieval Instruments; Nobel Biocare AG, Implant Repair Kit; ITI, Neo Screw Remover kit; Neo-biotech Co Ltd) have been introduced. These operate with a low-speed micromotor handpiece or a self-tapping rotary instrument with reverse action, but results are inconsistent.^{11,17-21} As a result, clinicians might

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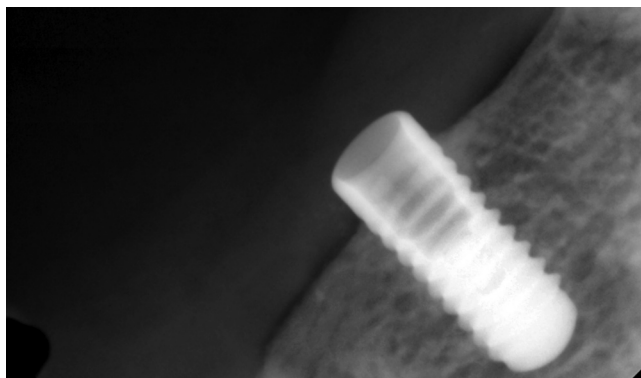


Figure 1. Fractured Locator abutment. Mandibular right implant.

choose to either replace the implant, which can be an expensive option, or abandon the implant and cover it with soft tissue, which may lead to compromised function, phonetics, or esthetics.^{16,17,19-21} Therefore, saving an implant with an irretrievable screw fragment may benefit patients.^{13,16-21} A few reports describe a technique for converting the screw chamber into a dowel space for a dowel-core and crown restoration.^{17-19,21} A technique of fabricating a cast ball attachment for 1 implant of a 2-implant overdenture has been recently reported.¹⁹ However, the routine use of a laser technique to weld similar metals to correct ill-fitting prosthetic components and the availability of laser-welded attachments may provide more predictability in using existing overdenture retention systems.²²⁻²⁴ Laser-welded titanium has been shown to have mechanical properties comparable to those of the original material.²²⁻²⁴

The purpose of this clinical report was to describe an alternative solution for the management of a clinical situation with irretrievable fractured Locator abutment screws inside both implants of a mandibular IOD using laser-welding technology.

CLINICAL REPORT

A 64-year-old man presented to the Advanced Prosthodontics clinic with a loose mandibular IOD. The patient had a maxillary fixed complete denture and a mandibular IOD for 4 years. Clinical examination showed that both Locator abutment screws were fractured within the implants (Fig. 1). The fractured abutments (female) remained attached to the denture. Screw removal was attempted using known clinical techniques such as a sharp explorer, probe, ultrasonic scaler at low vibrations in reverse action, and even peppermint oil to try to loosen the fragments to back them out. Attempts at screw retrieval with special screw retrieval kits (Screw Removal Kit NobelReplace; Nobel Biocare AG, Salvin Implant Rescue Kit; Salvin Dental Specialties) were unsuccessful. The fragments were small and far from the implant neck, and the retrieval methods caused some

damage to the inner threads of the right implant (Fig. 2A, B). The option of replacing 2 well-integrated implants was refused by the patient. The possibility of fabricating custom laser-welded Locator abutments (Locator bar attachments; Zest Anchors) was included as a possible solution.^{17,21} The patient approved this solution for salvaging the existing implants.

The implant interior was thoroughly irrigated with water and dried with a 3-way syringe. An impression was made using a 2-inch long, doubled 19-gauge orthodontic wire (Clasp Wire SS; Keystone Dental) and light-body polyvinyl siloxane (PVS) inside the implant bodies and putty PVS on the impression tray (Reprosil Light Body Putty; Dentsply Intl). A stone cast (Modern Materials Die-Keen, Heraeus Kulzer GmbH) was generated from the impression (Fig. 3). Custom-made dowels with a flat superior surface were waxed and cast using noble casting alloy, and laser weld Locator bar attachments (Zest Anchors) were welded onto these using a high-temperature laser welding system (LM-D60; BTI Laser) (Fig. 4).

The welded abutments were clinically evaluated, and periapical radiographs were made to ensure complete seating. The implant screw channels were thoroughly dried, the abutments were luted with a dual-polymerizing resin cement (NX3 Nexus; Kerr Corp), and any excess cement was cleaned and verified with periapical radiographs (Figs. 5, 6). The old housings were removed from the mandibular denture, and new attachments picked up intraorally with an autopolymerizing intraoral material (EZ PickUp; Sterngold Dental LLC). Appropriate retentive inserts were placed, and the denture was finished and polished. The IOD was evaluated for retention, stability, phonetics, and appropriate occlusal relationship with the existing maxillary prosthesis. Postoperative and home care instructions were given to the patient, and oral hygiene instructions were reinforced.

At the 6-month follow-up visit, the prosthesis and laser-welded abutments were examined visually and radiographically. The abutments exhibited stability with no signs of wear, and the prosthesis was stable with adequate retention. The patient was able to use the prosthesis with no discomfort and was very satisfied with the outcome.

DISCUSSION

Although retrieving a fractured screw and replacing it with a new one without any damage to the internal threads of the implant is the recommended solution, in some situations, the fractured screw cannot be removed.¹⁸ When all the screw retrieval techniques fail, the approach described here may be the best compromise. It represents a conservative, easy to perform, cost-effective, and time-efficient, nonsurgical solution.

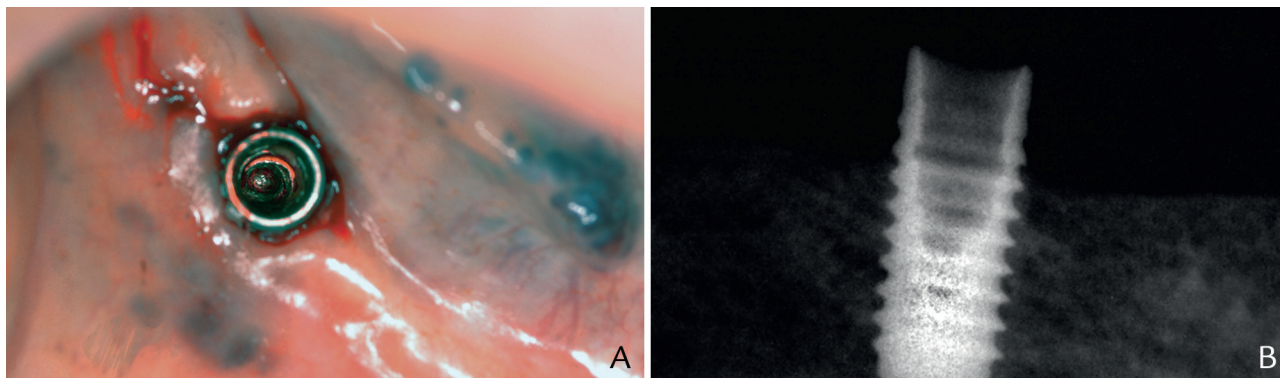


Figure 2. Damaged implant after screw retrieval. A, Clinical view. B, Radiographic view.

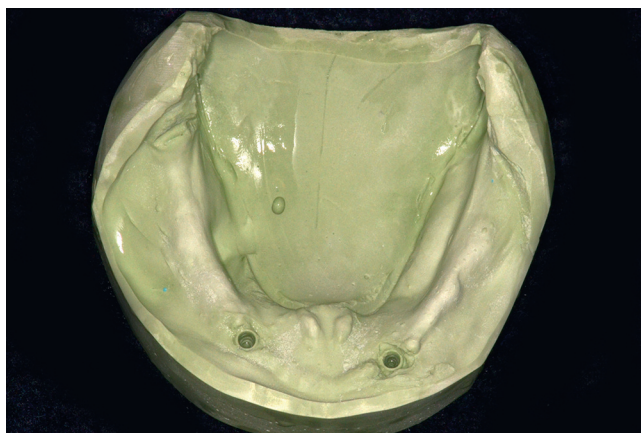


Figure 3. Definitive cast for new attachment fabrication.



Figure 4. Laser welded Locator attachment.

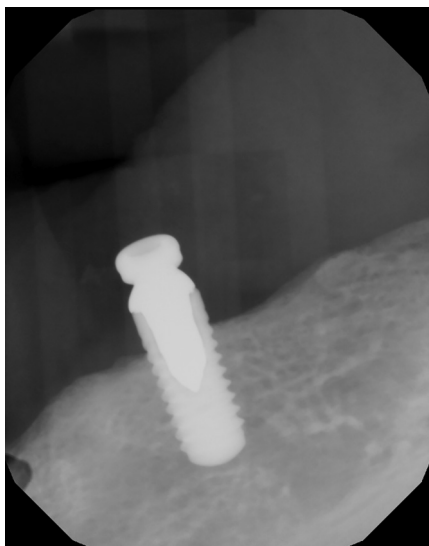


Figure 5. Periapical radiograph of seated abutment after cementation.

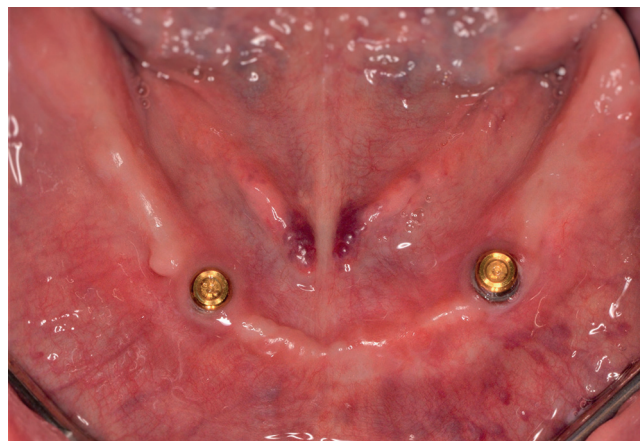


Figure 6. Intraoral view after cementation.

Nevertheless, the purpose of this technique should be to avoid any further complications such as loosening or fracture of the custom abutments. The authors of this article are of the opinion that, although retrieving the

fractured parts is important, it is perhaps even more essential to identify and eliminate causes of failure, including occlusion, premature contacts, parafunction, impassive prosthetic components, improper fit, and not following the appropriate manufacturer recommendations.¹⁹ One potential limitation of this technique is that the attachment system cannot be replaced once

cemented, and if changed before cementation, may require remaking the prosthesis. Over time, the abutments can wear, and replacing them may be difficult. Another complication is the fracture of these custom abutments, which necessitates replacement of the implants. Also, if more implants are intended for the patient in the future, for example, from 2 implants for an IOD to 5 implants for a fixed complete denture, these implants and attachments cannot be used.

SUMMARY

This clinical report describes a patient with IOD and fractured Locator abutments. Multiple attempts to retrieve the broken screw fragments were unsuccessful and possibly resulted in minor damage to the right implant's internal threads. It was then decided to fabricate custom laser-welded Locator attachments to allow continued use of the mandibular denture without sacrificing the implants. After PVS impression, custom laser-welded Locator attachments were fabricated from the stone cast. These were then cemented into the implants with autopolymerizing resin cement, and the existing IOD was fitted again directly in the patient.

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