The prevalence of peri-implant complications is significantly rising clinically as implant treatment increases in the US. Peri-implantitis is a frequent enough occurrence in the dental practice that treatment needs to be accomplished to prevent loss of the implant. As with periodontitis associated with natural teeth, periodontal disease can affect implants. This can range from gingival inflammation in the absence of bone loss to significant bone loss when the disease process is not identified early in the process or a wait and see attitude is taken that leads to significant bone loss and then mobility of the fixture.

Treatment has traditionally involved elevating a flap at the site and mechanical debridement with surgical hand instruments to remove any granulation tissue present on the implant threads. Owing to the limitations of the surgical tools, this might require removal of additional bone to attempt to reach areas not visible. Success depends on debridging and sterilising all exposed threads, with success diminishing as more surface area is left untreated.

Owing to the small diameter of their flexible fibre glasses, diode lasers offer several benefits for peri-implantitis treatment. This includes easier access to areas with limited access without the need to remove as much bone as may be required when only surgical instruments are utilised. Furthermore, the diode laser has the ability to sterilise the implant’s contaminated surface, eliminating any bacteria that caused the disease to prevent their hampering healing after treatment. An added benefit is biostimulation of the mesenchymal stem cells in the surrounding bone and soft tissue. This is important for regenerative therapy and tissue engineering to provide better healing. Thus, the diode laser is a good adjunct in the treatment of peri-implantitis, improving the clinical results observed with conventional methods.

Case presentation
A 64-year-old male patient presented in June 2010 with a fistula draining on the buccal aspect of the maxillary right canine. The fistula was located distal to the canine midline in close proximity to the gingival margin (Fig. 1). A gutta-percha cone was inserted into the fistula to trace the origin of the fistula present distal of the maxillary right canine in close proximity to the gingival margin. (Fig. 2). A radiograph was taken to document the bone fill of the osseous walls were created. Geistlich Bio-Oss (Geistlich Pharma North America), a biocompatible porous bovine bone mineral substitute, was packed into the defect around the implant and allowed to absorb blood from the surrounding tissue to form a coagulated mass. The osseous graft was built out buccally to create a new buccal plate covering the entire implant below the crestal level (Fig. 3). A piece of OSSIX PLUS (OraPharma), a resorbable membrane, was trimmed to overlay the osseous graft and end on native bone and was placed over the graft under the flap. The flap was repositioned and secured with nine interrupted sutures using 5-0 silk to achieve primary closure.

A radiograph was taken to document the bone fill of the osseous graft (Fig. 4). Haemostasis was confirmed and the patient dismissed. A prescription was given for a Z-Pak (ZITHROMAX, Pfizer) with the instructions to use as directed until finished, as well as for Dolo- bid 500 mg (Merck) to be taken b.i.d. for pain for the initial three days postoperatively. The patient returned after one week for suture removal and indicated that no significant postoperative discomfort had been felt. The site appeared to be healing normally and he was scheduled for a follow-up to check healing.

The patient was informed of the clinical issue identified and the options available, which included removal of the ailing implant and grafting the site. After the integration of the graft, a new implant could be placed and then restored after an appropriate healing period. The other option would be elevating a flap in the area, cleaning out any granulature tissue and treating the site with a diode laser and graft to replace any lost bone. The patient was also informed that, should the fistula could be traced to the apex of the implant situated at site #13 (maxillary right canine). Implants replacing teeth #12–16 had been placed and restored several years before. The implants at sites #13, 14 and 15 were identified as Bränenmark System Mk III RP and the implant at site #12 as NobelReplace (both Nobel Biocare).

Another image was taken to evaluate the underlying osseous structure around the implant, and it demonstrated a radiolucency around the apex of implant #13 (Fig. 2) and crestal bone loss with thread exposure under the soft tissue at implant #12. Clinically, no recession was noted and no implant mobility detected.

The latter option be selected, the site would need to be evaluated once entered and there was the possibility that the implant would need to be explanted should it be found to demonstrate mobility after the area had been debrided. The patient chose to attempt peri-implantitis repair and the necessary consent forms were signed.

An antibiotic (2 g amoxicillin) was administered orally 1 hour prior to the initiation of treatment. A local anaesthetic (Sept-ocone with epinephrine 1:100,000, Septodont) was administered for local infiltration at the buccal and palatal aspects of the treatment area. A horizontal incision was made from the distal aspect of the first premolar to the mesial aspect of the lateral incisor several millimetres apical to the gingival margin in order to limit potential postoperative recession. A vertical releasing incision was made at the mesial and distal extents of the horizontal incision and a full-thickness flap was elevated. Upon flap reflection, it was observed that a large dehiscence was present on implant #13, from the crest to several millimetres past the apex of the implant. Additionally, some dehiscence was noted on the buccal aspect of implant #14, with threads minimally covered with bone over the apical half of the implant. Implant #12 presented with 30 to 50 per cent of the threads circumferentially of the implant denuded of bone with complete soft tissue coverage.

A hand instrument was used to remove any gross granulation tissue adherent to the bone and exposed implant threads (Fig. 3). An activated 500 µm diode tip on the Picasso laser (AMD LASERS), set at 1.5 W in continuous mode, was used to remove any residual granulation tissue on the exposed threads at the defect and sterilise the defect area. The diode’s fibre tip was placed into physical contact with the implant surface to remove any residual granulation tissue and sterilise the area of any bacteria that had contributed to the peri-implantitis, leaving clean threads.

After debridement and sterilisation, bleeding points in the osseous walls were created. Geistlich Bio-Oss (Geistlich Pharma North America), a biocompatible porous bovine bone mineral substitute, was packed into the defect around the implant and allowed to absorb blood from the surrounding tissue to form a coagulated mass. The osseous graft was built out buccally to create a new buccal plate covering the entire implant below the crestal level (Fig. 3). A piece of OSSIX PLUS (OraPharma), a resorbable membrane, was trimmed to overlay the osseous graft and end on native bone and was placed over the graft under the flap. The flap was repositioned and secured with nine interrupted sutures using 5-0 silk to achieve primary closure.

A radiograph was taken to document the bone fill of the osseous graft (Fig. 4). Haemostasis was confirmed and the patient dismissed. A prescription was given for a Z-Pak (ZITHROMAX, Pfizer) with the instructions to use as directed until finished, as well as for Dolobid 500 mg (Merck) to be taken b.i.d. for pain for the initial three days postoperatively. The patient returned after one week for suture removal and indicated that no significant postoperative discomfort had been felt. The site appeared to be healing normally and he was scheduled for a follow-up to check healing.

At the next postoperative visit, the site appeared healed with a lack of inflammation and the patient was placed on periodontal recall, alternating with visits to his general dentist. At a five-year postoperative visit, a CNT scan was taken to evaluate the long-term status of the repaired area. The cross-sectional slice at the right maxillary
Discussion

Peri-implantitis can be a challenge to manage. As this case illustrates, bone loss may have been progressing for an extended period before the clinician becomes aware of it. In order to achieve any success, treatment requires a surgical approach to remove any granulation tissue that has replaced bone overlaying the implant. The benefit of the Picasso diode laser is that the fibre can be extended into areas around the implant that are difficult to reach in order to achieve better sterilisation and debridement without the need to remove additional bone for access, as would be necessary were only debridement with surgical hand instruments performed. The diode tip ensures better removal of the granulation tissue and site sterilisation to increase treatment success.

Conventional methods have reported mixed results regarding the ability to remove all of the granulation tissue from the exposed implant threads without altering the implant surface. The diode laser has been reported not to cause any visible surface alterations of either polished or coated implant surfaces. In contrast, surface alterations have been reported when irradiated with the pulsed Er:YAG laser.16

Scanning electron microscopy analysis has demonstrated no damage or alteration of titanium surfaces when in contact with a diode laser, regardless of the power setting. No visible difference between lased and non-lased titanium surfaces after irradiation has been reported. The result yields the best surface for guided tissue regeneration compared with either mechanical debride ment, which can alter the surface by gouging the titanium or coating, or use of an Er:YAG laser.

Success in peri-implantitis treatment is strongly linked to the ability to eliminate the bacteria in the site that could hamper regeneration. This becomes more critical with implants that have been surface treated during manufacture to provide a better surface for integration. These manufacturer-treated implant surfaces yield a micro-roughness that bone responds well to during the initial integration, but that will harbour bacteria when peri-implantitis has occurred. Their removal in these micro-irregularities is difficult to achieve by mechanical means. The diode laser has the ability to decontaminate the exposed surface and threads without any negative effects.

Once the site has been prepared, with the granulation tissue removed and all exposed surfaces decontaminated, osseous grafting is required to ensure the best healing long term. Without placement of osseous graft material to fill the osseous defects that resulted from the peri-implantitis, the site will most likely not achieve bone fill via organisation of a host clot in the void. Membranes too are recommended to allow the body to organise the osseous graft material before soft-tissue ingrowth can occur from the overlying flap, as soft tissue grows and heals at a much faster rate than hard tissue does. The membrane gives the hard tissue an advantage to overcome the soft tissue’s potential to invade the early osseous graft material. Placement of osseous graft material and barrier membranes has resulted in greater probing depth reduction and radiographic bone fill when either material is not used.16

The authors recommend avoiding probing these sites during the healing phase and thereafter because of the arrangement of connective tissue fibres found around implants. Implants, when viewed via a scanning electronic microscope, have the fibres in the gingival aspect where it connects with the implant surface running parallel to the long axis of the implant. This does not provide a physical barrier to the probe, allowing it to push bacteria deeper into the tissue, which may lead to inflammatory changes in the tissue. The fibre orientation around natural teeth is perpendicular to the tooth’s long axis, providing a physical barrier to the probe.

Conclusion

The key to successful peri-implantitis treatment is early identification to limit bone loss due to the inflammation and infection. The diode laser is a powerful adjunct in treating peri-implantitis, allowing better access to eliminate more granulation tissue than when only mechanical means are employed. It also provides the additional benefits of sterilisation of the area and biostimulation of the bone and soft tissue to improve tissue regeneration. This case illustrated that the protocol presented can provide long-term predictable results, showing five-year maintenance of the grafted area and an absence of inflammation over that time.

Acknowledgement

The case was treated by Dr Markus Weitz.

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