limited reduction in bleeding on probing was achieved and that the mean peri-implant probing depth (PD) remained unchanged (3.9mm) in the chlorhexidine group. On the other hand, in the minocycline group, the reduction of bleeding on probing was statistically significantly greater than that in the chlorhexidine group, coupled with an improvement in mean peri-implant PD (from 3.9mm to 3.6 mm). These results suggested that the topical application of chlorhexidine provides limited or no adjunctive clinical improvements when treating shallow peri-implant lesions as compared with using mechanical debridement alone.60

Moreover, in another study was compared the efficacy of sub-mucosal debridement alone for the therapy of peri-implantitis utilising an ultrasonic device versus hand instrumentation with carbon fibre curettes. He concluded that there was no statistically significant difference reported for the implants treated either by the ultrasonic device or manually scalers between baseline and three to six months regarding reduction in bleeding on probing and radiographical bone loss.60

An interesting treatment modality can be the laser decontamination of the implant surface. The use of Er:YAG laser was used alone and compared to the combination of mechanical debridement (using plastic curettes) and antiseptic (0.2 per cent chlorhexidine digluconate) administration for the treatment of peri-implantitis. In both studies the results obtained at six months after therapy suggested that the treatment modalities were equally efficacious in significantly improving peri-implant probing pocket depth (PPD) and clinical attachment level (CAL).

However, at 12 months in both groups, the mean values of peri-implant PPD and CAL was not statistically significantly different from the corresponding values at baseline. Therefore, the efficacy of the Er:YAG laser seems to be limited to a six month period, particularly for advanced peri-implantitis lesions and the main reason for this result can be found in the difficulty accessing the apical portion of the defect in those lesions.69

Treating advanced peri-implant lesions may include an attempt to regenerate as much as possible of the lost bone structure. The efficacy of two bone regenerative procedures for the treatment of moderate intrabony peri-implantitis lesions were also compared. The defects were either randomly treated either with a combination of access flap surgery and the application of nanocrystalline hydroxyapatite or with a combination of flap surgery and the application of a bovine-derived xenograft (Bio-Oss, Geistlich, Wolhusen, Switzerland) and the placement of a bioresorbable porcine-derived collagen membrane (Bio-Gide, Geistlich, Wolhusen, Switzerland).60 After two years the evaluation of the study showed that application of the combination of natural bone mineral and collagen membrane seemed to correlate with greater improvements in clinical parameters60.

Several treatment modalities have been suggested for treatment of peri-implantitis, however, it was demonstrated in the case series that it was possible, but not predictable, to maintain implants using a treatment modality consisting of surgical cleaning and a systemic antimicrobial treatment for five years. Long-term treatment modalities need to be assessed and there is a need for randomised-controlled studies evaluating treatment of non-surgical therapy of peri-implantitis.

**Conclusion**

The management of implant infections should be focused both on infection control of the lesion, detoxification of the implant surface, and on regeneration procedures.

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3
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3
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Infections should be focused both on infection control of the lesion, detoxification of the implant surface, and on regeneration procedures. Treatment options can be surgical or non-surgical. It was observed that non-surgical treatment of peri-implantitis was usually ineffective, while the use of chemical agents such as chlorhexidine had only limited effects on clinical and microbiological parameters.

Adjunctive local or systemic antibiotics were shown to reduce bleeding on probing and probing depths and some beneficial effects of laser therapy on peri-implantitis have been shown, but this approach needs to be further evaluated. Despite treatment and re-treatment of lesions, establishing an adequate healthy environment was found to be difficult since inflammation can be still present in a significant number of patients.

About the author
Varalakshmi Mallath graduated from the University of Mysore, India, in 2001 and completed her postgraduate training at the Indian Dental Association's training institute in Bangalore. She is currently working as a lecturer at the University of Mysore, India. She has been specialising in the department of periodontology and implant dentistry at the Department of Periodontics and Implant Dentistry at the National University of Dental Science and a clinical assistant fellow where he got involved in different clinical and research activities.
Initial findings and treatment plan

The 30-year old patient had lost tooth 21 in an accident about 15 years previously. Tooth 11 underwent root treatment (Fig. 1). As a result of fear of the dentist, the patient continuously delayed treatment of the two teeth and wore a temporary denture for years. The treatment plan envisaged an implant in position 21 and a crown on 11. Since the incisive papilla was directly in the implant region, cone beam tomography was performed in order to clarify the position of the incisive canal. The width of the bony ridge at position 21 was five mm measured in the sagittal plane (Fig 2).

Treatment

A mucoperiosteal flap was dissected for the implantation with vertical relief distally at tooth 22. As expected, the incisive canal was only slightly palatal to the ideal implant position. The implant site was prepared with the aid of a splint along the buccal boundary of the canal (Fig 3) without perforating the canal. A Straumann® Bone Level Implant (4.1 mm, length 12 mm) could be placed in correct prosthetic position without dehiscence (Figs 4, 5). Because of the thin buccal bone plate and the concavity of the ridge, augmentation was performed with a bone substitute and a collagen membrane, fixed with resorbable pins (Fig 6). At tooth 11, 1 mm of crown lengthening was performed on the buccal aspect. The flap was mobilised and sutured over the wound without tension (Fig 7). The sutures were removed ten days later; the wound area healed uneventfully.

After healing the soft tissue over the implant did not yet have the desired convex contour and had a rather uneven structure (Fig 8). Therefore, eight weeks after implantation, a split flap was dissected buccally in region 21 and a connective tissue graft from the palate was inserted (Figs 9-10); in addition, the mucosa was de-epithelialised with a diamond bur in order to smooth the surface. The connective tissue graft allowed volume to be gained buccally (Fig 11). Eight weeks after graft insertion a mini rolled flap was formed over the implant and folded in the buccal direction with a conical gingiva former (Fig 12). At the same time, tooth 11 was prepared for a crown and fitted with a direct temporary. Two weeks later, the impression for the indirect temporaries was taken. In the laboratory, a screw-retained.
temporary on the implant and a temporary crown for 11 were made using a temporary abutment. The temporaries were fitted (Fig 15); conditioning of the soft tissue began one week later with application of composite to the cervical region of the implant temporary. After conditioning three times, the desired emergence profile was achieved (Figs 14-15). For the final impression, an impression post was customized with composite so that it corresponded to the emergence profile of the temporary (Fig 16).

After taking an impression with polyether a model was made that reproduced the gingival conditions perfectly. The patient, dental technician and dentist had agreed to carry out all-ceramic reconstruction with the Straumann® CADCAM system. The “Wax Up Design” function of the CADCAM ektan™ visual software allows wax patterns to be scanned and zirconium oxide frameworks to be produced that optimally support the veneering porcelain. First, a try-in wax-up was made from resin and tried in the patient; minor esthetic corrections were made. Using a silicon index of the wax-up, the frameworks for crown 11 and the directly screwed implant crown 21 were formed from scanable wax (Fig 17). The modelled frameworks were placed in the 3D scanner and scanned (Fig 18). These data were then sent via the Internet to the milling center. Three days later the frameworks arrived in the laboratory and the accuracy of fit was checked on the model.