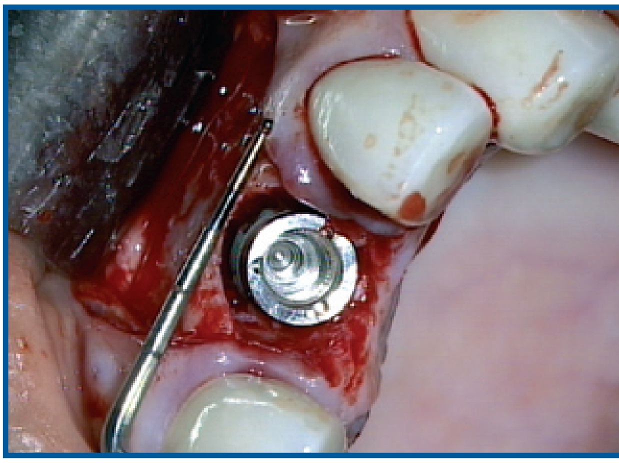
PARTNER MAGAZINE OF CAMLOG BIOTECHNOLOGIES AG ■ JUNE 2007

OFFPRINT 1

logo



Minimally invasive treatment approaches in oral implantology using a dental clinical microscope for magnification

Dr Behnam Shakibaie-M.,
Dr Willi Janzen,
Hans-Helmut Strothmann MDT

Offprint
June 2007

CAMLOG Biotechnologies AG
Margarethenstrasse 38
CH-4053 Basel
Tel.: +41 (0)61 565 41 00
Fax: +41 (0)61 565 41 01
www.camlog.com

Minimally invasive treatment approaches in oral implantology using a dental clinical microscope for magnification

Dr Behnam Shakibaie-M., Dr Willi Janzen, Hans-Helmut Strothmann MDT

Operating on fine anatomical structures without using optical magnification is simply unthinkable ever since the development of the surgical microscope by Dr Littmann and Prof Wullstein in 1953. The combined use of the dental microscope and micro-instrumentation provides the basis for microsurgical approaches in dentistry (Velvart 1997). Even though dental use of the surgical microscope has previously been limited for the most part to endodontics and periodontics (Baumann 2000), the following article should provide a sound argument for use of optical magnification also in minimally invasive implantology procedures.

Fig. 1. OPMI Proergo microscope from Carl Zeiss

Introduction

Implant-supported restorations have become an accepted part of the range of interventions in restorative dentistry (Buser et al. 2002). However, even though dental implants in functional areas are now routine if an adequate bone supply is available, there remains a formidable esthetic challenge for everyone involved if the bone and soft tissue supply at the implant site is inadequate (Block & Baughman 2005).

It is precisely under these indications that recourse to a microsurgical approach is advantageous, both to minimize tissue trauma and ensure predictable tissue maintenance or reconstruction (Wachtel et al. 2003). In addition to use of the OPMI Proergo Zeiss microscope (Fig. 1), our practice-oriented minimally invasive treatment approach involves the CAMLOG® Implant System, microsurgical instruments from the Helmut Zepf Medical Techniques company, bone augmentation materials from Geistlich company, microsurgical needle-suture combinations from Serag-Wiessner company, and coDiagnostix® as the 3D implant planning system from IVS-Solutions company (Figs. 2-4). We will explain this referrals-oriented treatment approach in detail via the following well-documented case report of an immediate implantation in the esthetic zone.

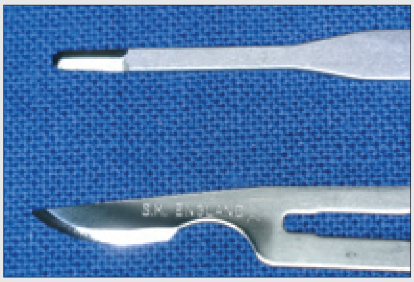


Fig. 2. Microsurgical scalpel no. 15C and microblade

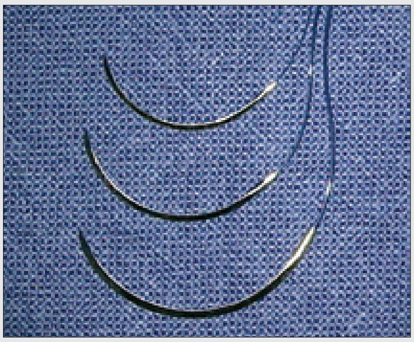


Fig. 3. Microsurgical needle-suture combinations – 5/0, 6/0 and 7/0

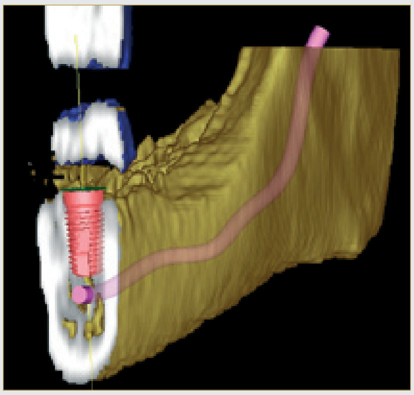


Fig. 4. CoDiagnostix® 3D implant planning system from IVS Solutions

History/Examination

The 36-year old patient presented to our office in the summer of 2006 on referral to implantology.
Her general medicodental history was unremarkable. She complained of episodic occlusal pain at tooth 21 which had been resected 5 years previously. Preoperatively, tooth 21 exhibited no pathological probing depth anywhere around it and only first degree mobility. It was slightly tender on vertical and horizontal percussion. There were no signs of acute inflammation. On radiography, periapical mesiolateral osteolysis appeared to be present but vertical and interproximal bone levels were intact bilaterally (Figs. 5-7). The patient's profile from the perspective of individual risk factors for implantological treatment of the esthetic zone (Renouard & Rangert 2006) was determined as follows:

1. High smile line
2. Type B gingival morphology (thick gingival biotype) with short thick papillae
3. Apparently good three-dimensional bone supply
4. Esthetically very challenging
5. Good compliance and oral hygiene
6. No financial limitations.

Fig. 5. Pretreatment frontal view

Fig. 6. Pretreatment coronal view

Fig. 7. Preoperative radiograph, tooth position 21

Diagnosis

Hopeless tooth 21 because of a combined periodontal/endodontal lesion in status post apexectomy and moderate to high risk implantology profile in the esthetic zone.

Minimally invasive extraction and immediate implantation in the esthetic zone

The indication for immediate implantation is generally determined directly following tooth extraction. Tissue-sparing during extraction therefore becomes a key factor (Hämmerle et al. 2004). Microelevators are usually employed in the preparation of the encircling periodontal ligament. Tooth luxation is performed primarily within the socket or with a palatal approach to preserve the facial bone wall and the interproximal bone, which will guide the future papillae (Terheyden & Iglhaut 2006).

If an osteotomy is required, a palatal approach is also the first-line option to preserve the facial bone wall (Sclar 2004).

In the case of an intact residual root, one may alternatively fall back on the Benex Extractor® from the Helmut Zepf Medical Techniques company (Fig. 8). Once the minimally invasive extraction is completed, the dental microscope becomes the indispensable diagnostic tool for inspecting the open socket. It enables precise excochleation of any residual intra-alveolar inflammatory tissue and precise determination of the bone volume in the facial and interproximal areas of the fresh alveolar cavity. Even at this stage, a closer prognosis can be made about peri-implant soft tissue maintenance in the future (Figs. 9-10).

Depending on the indication, an incision is made with the 15C scalpel or the microblade to create the trapezoid full-thickness vestibular flap (Fig. 11).

This is basically how we begin to preserve the papillae and interproximal bone.

We also use microelevators in the initial flap preparation to prevent microfractures to the limbus alveolaris and interproximal bone.

Next, the slightly orally placed pilot hole and enlargements are microscopically monitored step by step on both horizontal and vertical planes until the implant can be finally placed and given primary stability in the so-called esthetic low-risk zone (Figs. 12-16).

The vertical position of the implant should be spaced about 3 mm from the cement-enamel junction and about 5 mm from the interproximal contacts of the adjacent teeth (Hartmann & Steup 2006) (Fig. 17). The next steps involve harvesting of autologous bone from the spina nasalis area and perforation of the vestibular compacta to ensure blood drainage (Figs. 18-19).

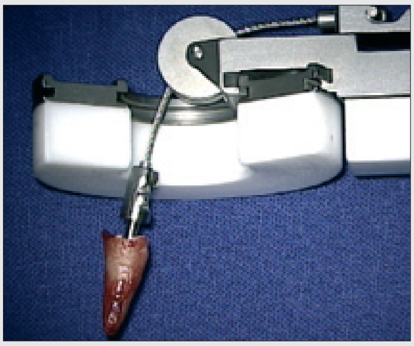


Fig. 8. Benex System® immediately after clinical use

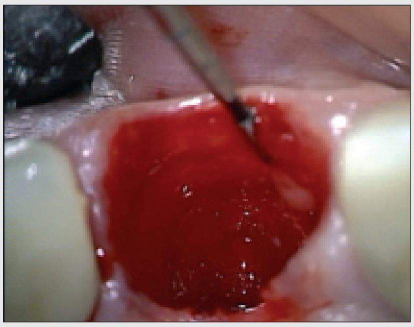


Fig. 9. Intra-alveolar view with OPMI Proergo shows preservation of facial bone lamella

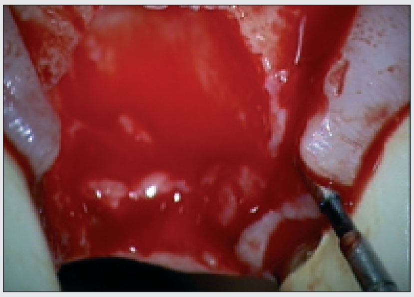


Fig. 10. Microscopic view of interproximal bone lamellae and limbus alveolaris after flap preparation

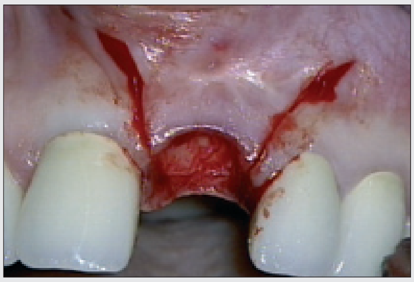


Fig. 11. Trapezoid incision to spare the papillae

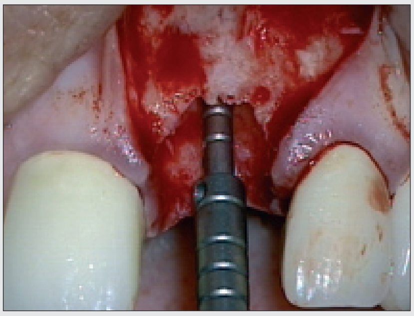


Fig. 12. Sagittal check of pilot drilling with direction indicator

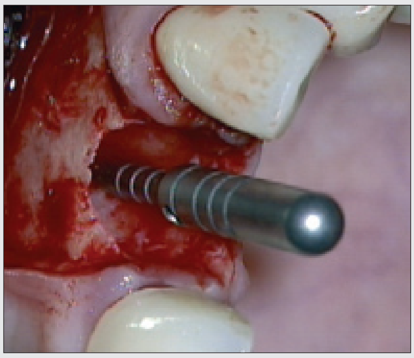


Fig. 13. Horizontal check of the pilot hole with the direction indicator

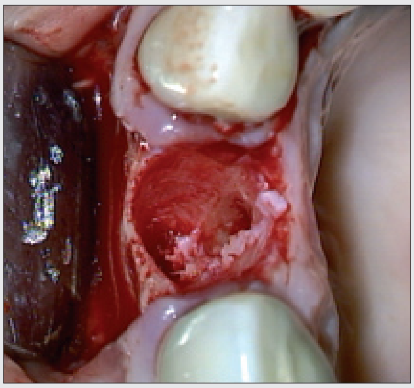


Fig. 14. Intra-alveolar view with the OPMI Proergo to check the pilot hole

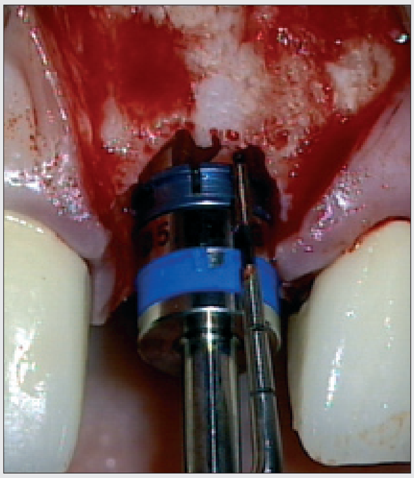


Fig. 15. Checking the drilling depth with the OPMI Proergo

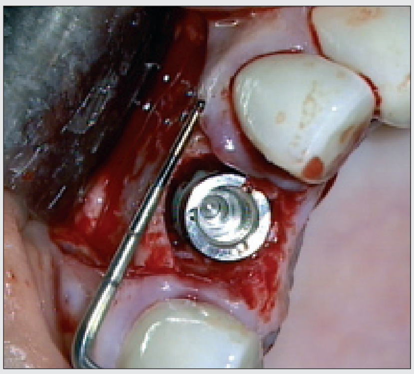


Fig. 16. Implant placement in the horizontally low-risk zone

In this case, transgingival healing is selected since the implant's primary stability is above 35 Ncm. By consistently using a microscope for guidance, a controlled periost cut can be performed with a sharp scissors to mobilize the existing mucoperiostal flap.

The subsequent overaugmentation of the vestibular site with BioOss® and autologous bone is intended primarily to support the prevention of gingiva resorption later on (Buser et al. 2002) (Fig. 20).

A mixture of heterologous particulate matrix material and autologous bone is also used in the jumping gap area (space between implant and vestibular alveolar wall). The GBR is performed then by using a contoured BioGide® membrane (Fig. 21).

We use 5/0 and 6/0 Seralon® (monofile needle-suture combinations) for tension-free attachment of the coronally displaced mucoperiostal flap (Fig. 22).

Frontal and coronal views through the dental microscope demonstrate secure coronal repositioning of the mucoperiostal flap and the degree of vestibular overaugmentation (Figs. 22-23).

The postoperative radiographs show the position of the CAMLOG ROOT-LINE implant (5.0 mm, 11 mm) with a 4-mm high cylindrical healing cap (Fig. 24). A wireless interim prosthesis prefabricated by the family dentist is inserted with very little adaptation immediately after the implantation. Special care must be taken at this point that the base of the prosthetic tooth does not touch the healing cap to avoid compromising the implant osseointegration process (Figs. 25-26).

When the sutures are removed 10 days after surgery, the site proves to be totally free of inflammation (Figs. 27-28).

The patient exhibits optimal periimplant tegmentum and successful vestibular overaugmentation before she is referred back to her family dentist 6 weeks after the implantation for treatment with a provisional crown (Figs. 29-30).

The provisional crown helps to promote a gradual buildup of the implant emergence

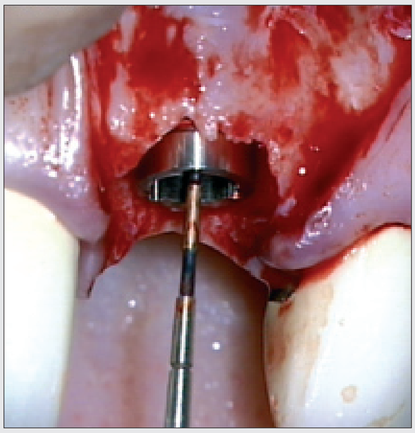


Fig. 17. Implant placement in the vertically low-risk zone

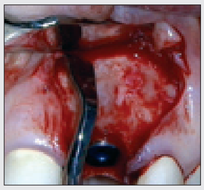


Fig. 18. Harvesting of autologous bone from the spina nasalis area

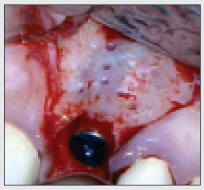


Fig. 19. Perforation of the vestibular compacta for blood drainage

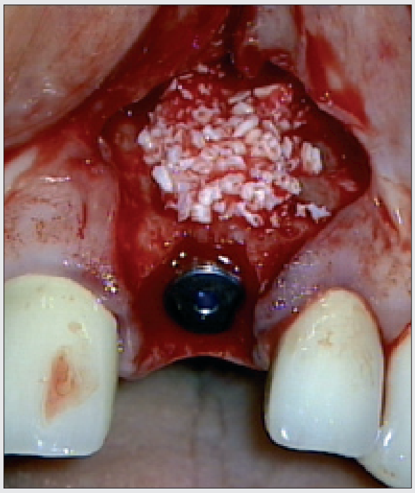


Fig. 20. Overaugmentation of the facial bone wall with autologous bone and BioOss®

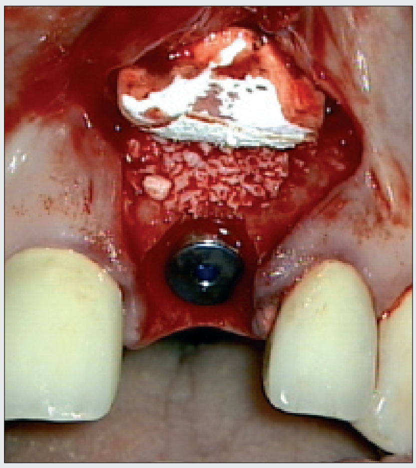


Fig. 21. Covering the augmentation with a contoured BioGide® membrane

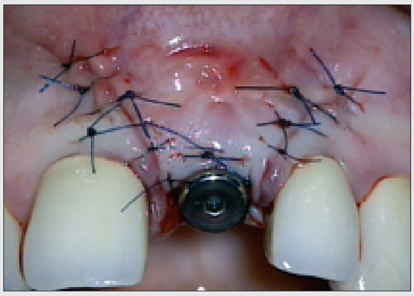


Fig. 22. Vestibular view of the implantation site after microsurgical suturing

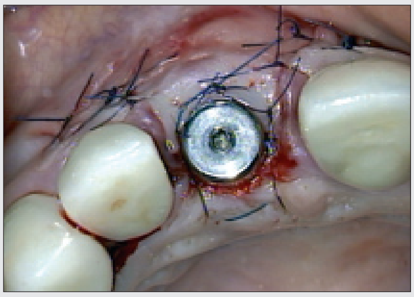


Fig. 23. Coronal view of the implantation site after microsurgical suturing

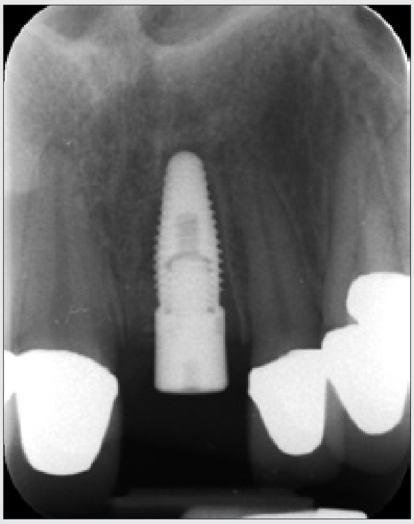


Fig. 24. Postoperative radiographic follow-up of tooth 21 position

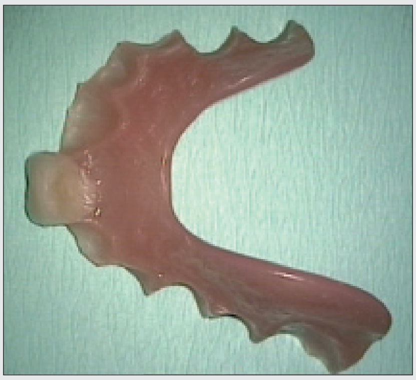


Fig. 25. Wireless interim prosthesis prior to insertion

Fig. 26. Extraoral view following postoperative insertion of the interim prosthesis

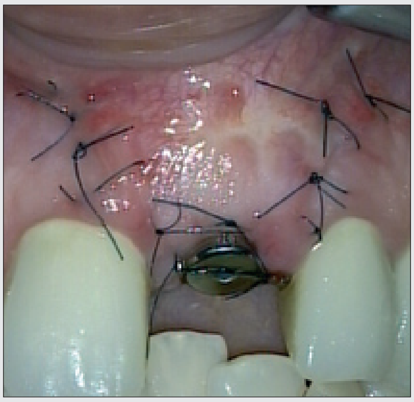


Fig. 27. Vestibular view of tooth 21 position 10 days postoperatively

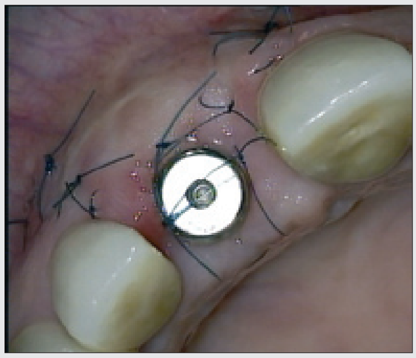


Fig. 28. Coronal view of tooth 21 position 10 days postoperatively

Fig. 29. Vestibular view of tooth 21 position 6 weeks postoperatively

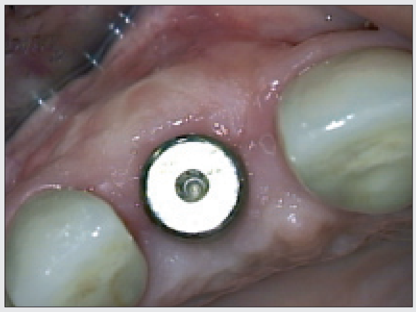


Fig. 30. Coronal view of tooth 21 position 6 weeks postoperatively

Fig. 31. Frontal view 4 weeks after insertion of the provisional crown

Fig. 32. Coronal view 4 weeks after insertion of the provisional crown

profile and to meet the following requirements (Hartmann 2004) (Figs. 31-32):

1. The implant cervical diameter should have an intermediate step between the healing cap and the definitive crown to prevent an anemia-induced collapse of the periimplant soft tissue.
2. The interproximal contacts should be reconstructed as naturally as possible to guide the papillary growth pattern.
3. No antagonist contacts should occur in dynamic or static occlusion.
4. The patient's esthetic wishes should be met.

If the emergence profile is stable, the provisional crown is replaced with a definitive high-quality model after two months. The regeneration potential of the papillary structures should be the focus of attention at this point; it depends for the most part on maintenance of interproximal bone in the adjacent dentition (Figs. 33-35). Other key factors are the minimally invasive surgical manipulation of the soft tissue and the natural-looking prosthetic reconstruction of the interproximal contacts with the suprastructure. In the light of the successfully contoured augmentation of the facial wall (with BioOss®/autologous bone/BioGide® membrane), it is evident that this kind of overaugmentation in the presence of a thick gingival biotype can provide

Fig. 33. Frontal view 4 weeks after insertion of the definitive crown at tooth position 21

Fig. 34. Optimal hard- and soft-tissue profile at position 21

Fig. 35. Coronal view 4 weeks after insertion of the definitive crown at position 21

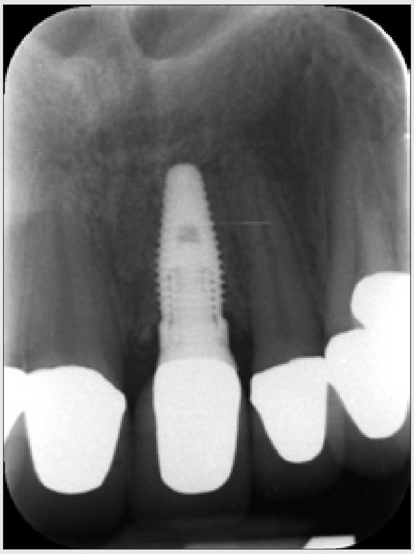


Fig. 36. Follow-up radiograph after insertion of the definitive crown at position 21

adequate gingiva recession compensation. This also means that there might be no need in such cases for additional connective/soft tissue augmentation.

Summary

Without a shadow of doubt, optimal illumination and magnification of peri-implant dental and soft tissue structures through the dental microscope along with the use of microsurgical instrumentation enhance surgical precision in implantology interventions. The diagnostic benefits of visual magnification can substantially improve the predictability of treatment success in critical cases involving the esthetic zone. In addition, the integration of the dental microscope with CCD cameras provides digital photographic and video documentation of unparalleled quality. Assuming the presence of efficient teamwork, the quality of the outcome in implantology is certainly enhanced by adopting a minimally invasive microsurgical treatment approach that involves the use of the dental microscope.

LITERATURE

Baumann, M.A. (2000) Mikroskopie in der Endodontie. ZMK 11/00: 720-731

Block, M.S. und Baughman, D.G. (2005) Reconstruction of severe anterior maxillary defects using distraction osteogenesis, bone grafts and implants. J Oral Maxillofac Surg 63: 291-297

Buser, D., Ingimarsson, S., Dula, K., Lussi, A., Hirt, H.P. und Belser, U.C. (2002) Long-term stability of osseointegrated implants in augmented bone: a 5-year prospective study in partially edentulous patients. Int J Perio Rest Dent 22: 108-117

Hämmerle C.H.F., Chen, S., Wilson, Jr. T. (2004) Consensus statements and recommended clinical procedures regarding the placement of implants in extraction sockets. Int J Oral Maxillifac Impl 19: 26-28

Hartmann, H.-J. (2004) Sofortimplantation und Sofortversorgung - Eine Restauration mit Galvanokronen. Oralchirurgie Journal 1: 47-53

Hartmann, H.-J. und Steup, A. (2005) Ästhetische Langzeitergebnisse der Sofortimplantation. Z Zahnärztl Impl 21: 258-272

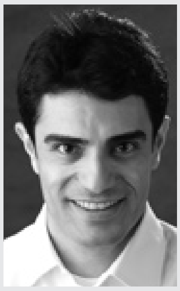
Renouard, F. und Rangert, B. (2006) Risikofaktoren in der Implantologie. Quintessenz Verlags-GmbH, S. 21-36

Sclar, A.G. (2004) Weichgewebe und Ästhetik in der Implantologie. Quintessenz Verlags-GmbH, S. 79-92

Terheyden, H., Iglhaut, G. (2006) Chirurgische Versorgung der Extraktionsalveole. Z Zahnärztl Impl 22: 42-45

Velvart, P. (1997) Das Operationsmikroskop in der Wurzelspitzenresektion - Teil 1. Schweiz Monatsschr Zahnmed, 107: 507-515

Wachtel, H., Hürzeler, M., Köttgen, C., Bolz, W., Zuhr, O. und Wenig, D. (2003) A microsurgical approach to guided tissue regeneration treatment. J Clin Priodontol 30: 496-501



Dr Behnam Shakibaie-M.
Specialist in oral surgery and microsurgical dentistry
Mastership implantology (DGI/BDIZ/EDI/BDO)
Fellowship periodontology (DGP)

Address
Hauptstr. 124
33378 Rheda-Wiedenbrueck
Germany
Tel. +49 (0) 52 42-378 700
e-mail: praxis@implantat-op.de
Homepage : www.implantat-op.de

Curriculum vitae:

Dental studies at Charité and the Free University of Berlin
Oral surgery and postgraduate implantology studies at the Oral & Maxillofacial Surgery clinics of Charité Berlin (Prof Reichart, Prof Bier), Jung-Stilling hospital in Siegen (Prof Beckers, Prof Hell), and Neukölln Hospital, Berlin (Dr Viehoff, Dr Sander).

Doctoral dissertation on preimplant-guided bone regeneration at the Charité Berlin (Prof Reichart).

2004	**Acceptance** of oral surgery and surgical dentistry specialization by the GDC, London, UK
2004–05	Private practice in implantology in London
2005	**Referral practice** in Rheda-Wiedenbrueck in implantology/periodontology with specialization in microsurgery
Since 2006	Official consultant for CAMLOG and Geistlich companies for **microscopically guided implantology/periodontology**
Since 2007	**Guest lecturer** at the National University in Teheran, Iran, and consultant for Dental Council Westfalen-Lippe for microsurgical **implantology/ periodontology.**

Qualified auditor/reviewer of DGI (German Society of Implantology)
Developer of various microsurgery/implantology instruments in collaboration with the Helmut Zepf Medical Techniques company

Co-author of various domestic and international publications on implantology, microsurgery and periodontology.

Co-authors

Dr Willi Janzen
Specialist in periodontology
MSc in functional diagnostics and therapy
Amselstr. 22, 33775 Versmold, Germany
Tel. +49 (0) 5423-7273
e-mail: praxis@willi-janzen.de

Hans-Helmut Strothmann MDT
Buschortsstr. 8
33775 Versmold, Germany
Tel. +49 (0) 5423-5540
e-mail: das-kleine-labor@t-online.de