Report of a Prospective Study Using a Titanium Membrane in Implant Surgery

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Introduction

Membrane technique can be very helpful today in implant surgery.Barriers of pure titanium are discussed as possible alternative to non-resorbable membranes which present a relatively high affinity to infection. In the presented prospective study the results of a special titanium membrane (BoneShield) are demonstrated for various indications.

Material and Methods

363 patients (204 females, 159 males) were treated between 1997 and 2001 with the titanium FRIOS® BoneShield membrane (FRIADENT, Mannheim, Germany) for various indications (fig.1-2). The BoneShield is a pure titanium membrane with a thickness of 0.025 mm and a pore diameter of 0.03 mm (fig. 1). Prophylactic antibiotics were started pre-operatively and administrated for one week (Penicillin V 3 M/d). The defects were always filled with autogenous bone; biomaterials were only used as space retainer or to fill the chin area after harvesting bone (fig. 3).
The reentry with the removal of the titanium membrane was carried out at different times (fig. 4).

Patients : 363 = 204 = 159
Smokers: 207 (57%)
Age: 18-78
Mandible: 229
Maxilla: 134

Characteristics BoneShield:
Material: pure titanium
Thickness: 0.025 mm
Pore diameter: 0.03 mm

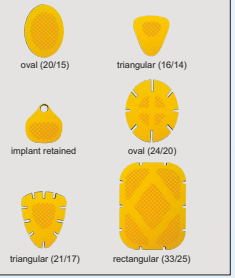

Fig.1

Indication of the BoneShield Membrane
1997-2001 (n=363)

Bone Spreading:	21	(5.8%)
Vestibular Dehiscence: (lateral augmentation)	116	(32%)
Bone Block Graft:	47	(12.9%)
Sinus Floor Elevation:	127	(35%)
Chin: (after harvesting bone)	52	(14.3%)

Fig.2

Bone Grafting Material
under the BoneShield membrane (n=363)

Mandibular bone:	147	(40.5%)
Maxillar bone:	36	(9.9%)
Bone + ALGIPORE®:	96	(26.5%)
Bone + Bio-Oss®:	28	(7.7%)
ALGIPORE®:	34	(9.4%)
Bio-Oss®:	19	(5.2%)
Biogran®:	3	(0.8%)

Fig.3

Reentry Time

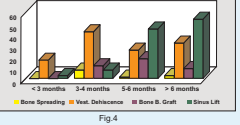

Fig.4

Results

A first evaluation of the results on 363 patients was done macroscopically at reentry and radiographically. The results are presented in table 1. Sinus lift, bone block graft and chin donor site presented the best results. Complications occurred more often with smokers than with non-smokers (tab.3).
Early exposures occurred mostly in the "vestibular dehiscence" indication (tab.2), but only 13 cases resulted in damage of the grafting material (tab.4).

Bone Regeneration Under the BoneShield Membrane
Macroscopically during the Reentry with x-ray (chin donor site)

	good	incomplete	bad	total
Bone Spreading	15 (71.4%)	6 (28.6%)	0	21
Vestibular Dehiscence	89 (76.7%)	14 (12.1%)	13 (11.2%)	116
Bone Block Graft	45 (95.7%)	2 (4.3%)	0	47
Sinus Lift	123 (96.8%)	4 (3.2%)	0	127
Chin Donor Site	50 (96.1%)	2 (3.9%)	0	52
Total	332 (88.7%)	28 (7.7%)	13 (3.6%)	363

Tab.1

Complications

	Exposure	Abscess	Fistula	total
Bone Spreading	0	0	0	0
Vestibular Dehiscence	21	2	0	23
Bone Block Graft	0	0	0	0
Sinus Lift	11	2	1	14
Chin Donor Site	3	1	0	4
Total	35	5	1	41 (11.3%)

Tab.2

Complications

	Exposure (n=35)	Abscess (n=5)	Fistula (n=1)	Total (n=41)
Smokers	21	3	0	24 (58.5%)
No smokers	14	2	1	17 (41.5%)
Denture wearer	12	2	1	15 (36.8%)

Tab.3

Complications

Exposure without damage to the grafting material:	22
Exposure with damage to the grafting material:	13

Tab.4

Lateral Crestal Defect

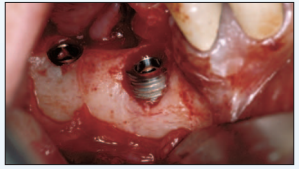
Fig. 5: 4 mm vestibular dehiscence after insertion of a FRIALIT®-2 Synchro implant in the premolar region of the mandible.

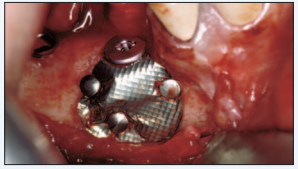
Fig.6: The defect is filled with autogenous bone which is stabilized with an implant fixed BoneShield membrane and three titanium FRIOS® tacks.


Fig 7: The typical collagen layer is seen under the membrane 4 months post-op.

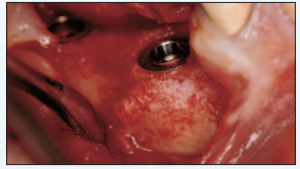
Fig. 8: Good regenerated bone is present under the collagene layer.

Lateral Fenestration

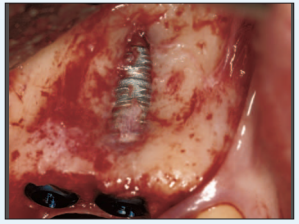
Fig. 9: A vestibular fenestration after the placement of a FRIALIT®-2 Synchro implant in the front region of the maxilla.

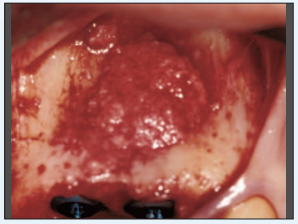
Fig 10: The defect is filled with autogenous bone chips.

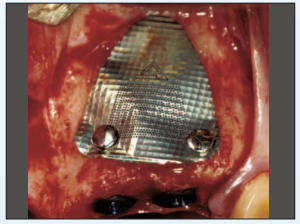
Fig.11: Stabilization of the grafted bone with a triangular BoneShield membrane and two titanium FRIOS® tacks.

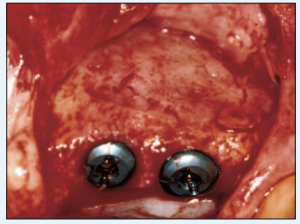
Fig. 12: The clinical situation five months post-op after removing the titanium membrane and the collagen layer.

Full Arch Rehabilitation


Fig. 13: Exposure of BoneShield membranes in the anterior maxilla six weeks post-op.

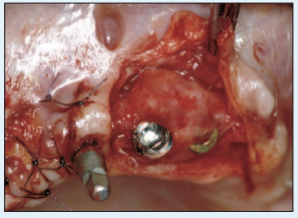
Fig. 14: The clinical situation after removing the exposed membranes: the underlying grafted bone is not affected.

Discussion

Our study shows favorable results in restricted indications. The complication rate of 11% is lower than that of other non-resorbable membranes. Complications in our study did not always lead to a failure of the bone graft. In more than 63% of the complications there was no risk for the bone graft. Only 13 cases showed a failure of the augmented site.

In comparison to resorbable membranes the titanium membrane has the advantage that it does not collapse over the bone graft. Also there is no negative influence on the bone graft due to the inflammatory resorption of the membrane. The prognosis of the bone graft is in most cases positive.

Literature

1. Becker W, Dahlin C, Becker B E, Lekholm U, van Steenberge D, Higuchi K, Kultje C. The use of e-PTFE barrier membranes for bone promotion around titanium implants placed into extraction sockets: A prospective multicenter study. Int J Oral Maxillofac Implants 1994; 9: 31-40
2. Buser D, Dula K, Hirt H-P, Schenk R K. Lateral ridge augmentation using autografts and barrier membranes: A clinical study with 40 partially edentulous patients. Int J Oral Maxillofac Surg 1996; 54: 420-432
3. Khoury F, Happe A. Zur Diagnostik und Methodik von intraoralen Knochenentnahmen. Z Zahnärztl Implantol 1999; 15: 167-176
4. Simion M ,Misitano U, Gionso L, Salvato A. Treatment of dehiscenses and fenestrations around dental implants using resorbable and non resorbable membranes associated with bone autografts: A comparative clinical study. Int J Oral Maxillofac Implants 1997; 12: 159-167
5. Von Arx T, Kurt B. Implant placementand simultaneous ridge augmentation using autogenous bone and a micro titanium mesh: A prospective study. Clin Oral Implants Res 1999; 10: 24-33.

17th Annual Academy of Osseointegration Conference
March 14 - 16, 2002
Dallas, Texas

1st Prize for Table Clinics
17th Annual Meeting Academy of Osseointegration
March 14-16, 2002 in Dallas/Texas

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In This Issue

Academy News

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Announcement

American College of Prosthodontists co-sponsors 2003 Meeting

I am pleased to inform you that the American College of Prosthodontists (ACP) has joined in co-sponsorship of the 2003 Annual Meeting of the Academy of Osseointegration in Boston, Massachusetts. The ACP's decision to co-sponsor the AO meeting is a welcome addition to the 2003 program, in light of its commitments to several other national meetings that overlap with the AO meeting. It attests to the ACP's commitment to collaborative scientific and multi-disciplinary relationships.

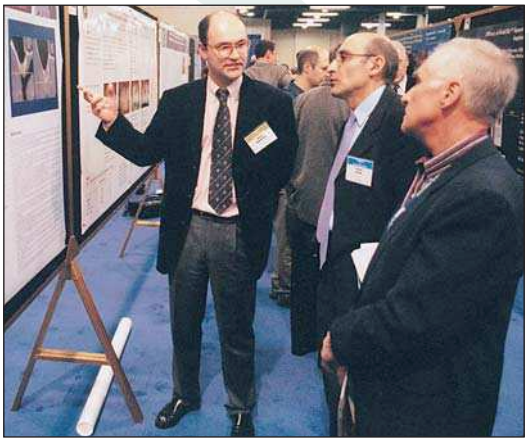
18TH ANNUAL MEETING
COLLABORATIVE STRATEGIES IN IMPLANT DENTISTRY
A MULTI-DISCIPLINARY MEETING
CO-SPONSORED BY AAOMS, AAP AND ACP
FEBRUARY 27 - MARCH 1, 2003, BOSTON

The ACP joining the American Association of Oral & Maxillofacial Surgeons (AAOMS) and the American Academy of Periodontology (AAP) as co-sponsors of the AO meeting reinforces the collaborative premise of the meeting and strengthens the inter-professional relationship of these multiple clinical disciplines involved in implant dentistry.

In addition, ACP members have participated in the development of the program and will have an integral part of the scientific presentations.

On behalf of the AO, AAOMS and AAP, I wish to welcome the ACP's co-sponsorship of the 2003 meeting on "Collaborative Strategies in Implant Dentistry." It will be the first time that such a collaborative meeting in implant dentistry will be held. It promises to be a unique and exciting meeting by virtue of its multi-disciplinary collaboration.

James H. Doundoulakis, DMD, MS
President, Academy of Osseointegration



2003 Annual Meeting Highlights on page 8

*Dr. **Adolfo S. Magalhaes**, New York City, describes his poster presentation at the 2002 Annual Meeting.*

Awards honor the year's top achievers

Prestigious award presentations made during the Dallas Annual Meeting included:

- Best Oral Abstract Presentation: Dr. **Dario A. Miranda**, University of Illinois, Chicago, College of Dentistry, Department of Periodontology, "Evaluation of rhBMP-2 on Repair of Alveolar Ridge Defects in Baboons"
- Best Poster Abstract Presentation: Dr. **Jorg Neugebauer**, Heidelberg, Germany, "Immediate Bridge Restored Implants Under Functional Loading — A Study in Mini-Pigs"
- Best Table Clinic Presentation: Dr. **Alessandro Ponte**, Olsberg, Germany, "Report of a Prospective Study Using a Titanium Membrane in Implant Surgery"
- **Quintessence Award** – Best Article Published in the *International Journal of Oral and Maxillofacial Implants (IJOMI)*, 2000 Edition: Dr. **Ann Wennerberg**, Institute of Surgical Sciences, Goteberg University, Goteberg, Sweden, "Suggested Guidelines for the Topographic Evaluation of Implant Surfaces"

*Dr. **Dayn C. Boitet** (left), outgoing AO President, congratulates Dr. **Dario A. Miranda**, winner of the award for Best Oral Abstract Presentation.*

*Table Clinic Subcommittee Chair Dr. **Edward M. Amet** (right), Overland Park, KS, presents the award for best table clinic to Dr. **Alessandro Ponte**.*

IJOMI *Editor Dr. **William R. Laney** (right) presents the award for best article published in 2000 to Dr. **Ann Wennerberg**.*

- 2001 Osseointegration Foundation Research Grant: Dr. **Kyumin Whang**, Department of Restorative Dentistry, University of Texas Health Science Center, San Antonio, Texas, "Efficacy of Novel Osteogenic Biomaterial, Og-Plg"

*Dr. **Takahiro Ogawa** (right) accepts a plaque from outgoing Osseointegration Foundation President Dr. **Laureen Langer** for his 2000 Foundation Research Grant, "Identification and Application of Osseointegration Genes: Strategies to Gene Therapy for Rapid and Enhanced Establishment of Osseointegration." Dr. Ogawa presented his research at the Dallas Annual Meeting. This year's winner, Dr. Kyumin Whang, will present next year in Boston.*

Annual Meet

Over 90 exhibitors vied for the attention of 1,171 registered professionals.

Our photographer captured the intensity of participant involvement in the scientific program.

*Past AO Presidents participating in the Dallas Annual Meeting included (left to right) Drs. **Michael S. Block** (1995-96), **Stephen M. Parel** (1994-95), **William R. Laney** (1986-88), **Paul H.J. Krogh** (1988-89), **Dayn C. Boitet** (2001-2002), **Bejan Iranpour** (1998-99), and **Melvyn S. Schwartz** (2000-2001).*