

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 administered 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).

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:	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

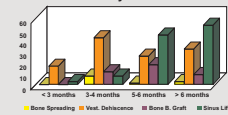


Fig 4

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 a 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=3)	Abscess (n=5)	Fistula (n=1)	Total (n=9)
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

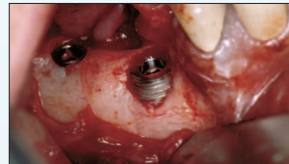


Fig. 5: 4 mm vestibular dehiscence after insertion of a FRIALIT®-2 Synchro implant in the premolar region of the mandible.



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 collagen layer.

Lateral Fenestration

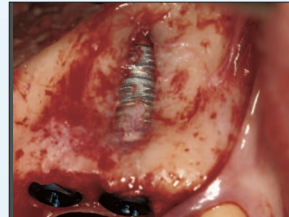


Fig. 9: A vestibular fenestration after the placement of a FRIALIT®-2 Synchro implant in the front region of the maxilla.

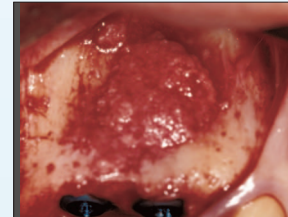


Fig 10: The defect is filled with autogenous bone chips.

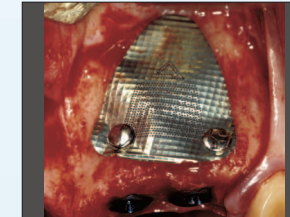


Fig. 11: Stabilization of the grafted bone with a triangular BoneShield membrane and two titanium FRIOS® tacks.

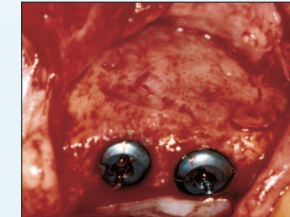


Fig 12: The clinical situation five months post-op after removing the titanium membrane and the collagen layer.

Full Arch Rehabilitation



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

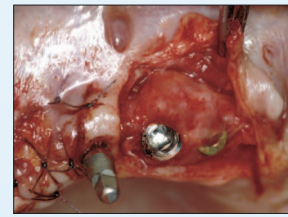


Fig. 14: The clinical situation after removing the exposed membranes; the underlying grafted bone is not affected.

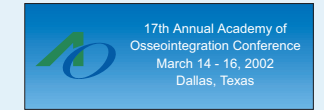
Discussion

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

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

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