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Preliminary Report of a Prospective Study Using a Titanium Membrane (BoneShield) 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.

Results

A first evaluation of the results on 257 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 10 cases resulted in damage of the grafting material (tab.4).

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

	good	incomplete	bad	total
Bone Spreading	8 (80%)	2 (20%)	0	10
Vestibular Dehiscence	68 (74.7%)	13 (14,3%)	10 (11%)	91
Bone Block Graft	29 (96.7%)	1 (3.3%)	0	30
Sinus Lift	81 (95.3%)	4 (4.7%)	0	85
Chin Donor Site	39 (95.1%)	2 (4.9%)	0	41
Total	225 (87.5%)	22 (8.6%)	10 (3.9%)	257

Tab.1

Complications

	Exposure	Abscess	Fistula	Total
Bone Spreading	0	0	0	0
Vestibular Dehiscence	19	2	0	21
Bone Block Graft	0	0	0	0
Sinus Lift	11	2	1	14
Chin Donor Site	2	1	0	3
Total	32	5	1	38 (14.8%)

Tab.2

Complications

	Exposure (n=32)	Abscess (n=5)	Fistula (n=1)	Total (n=38)
Smokers	19	3	0	22 (57.9%)
No smokers	13	2	1	16 (42.1%)
Denture wearer	9	2	1	12 (37.5%)

Tab.3

Complications

Exposure without damage to the grafting material: 22

Exposure with damage to the grafting material: 10

Tab.4

Material and Methods

257 patients (144 females, 113 males) were treated between 1997 and 2000 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).

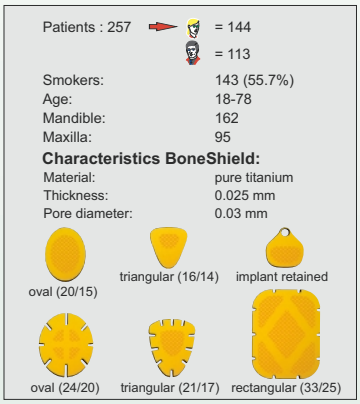

Fig.1

Indication of the BoneShield Membrane
1997-2000 (n=257)

Bone Spreading:	10	(3.9%)
Vestibular Dehiscence: (lateral augmentation)	91	(35.4%)
Bone Block Graft:	30	(11.7%)
Sinus Floor Elevation:	85	(33.1%)
Chin: (after harvesting bone)	41	(15.9%)

Fig.2

Bone Grafting Material
under the BoneShield membrane (n=257)

Mandibular bone:	102	(39.7%)
Maxillar bone:	28	(10.9%)
Bone + ALGIPORE®:	63	(24.6%)
Bone + Bio-Oss®:	23	(8.9%)
ALGIPORE®:	23	(8.9%)
Bio-Oss®:	15	(5.8%)
Biogran®:	3	(1.2%)

Fig.3

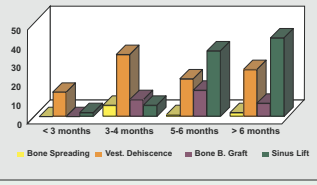

Fig.4

Case 1

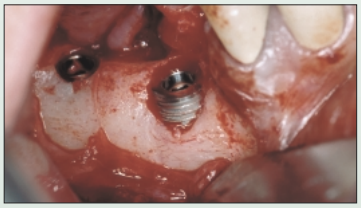

Fig. 5: 4 mm vestibular dehiscence after insertion of a FRIALIT®-2 Synchro implant in the premolar region of the mandible.

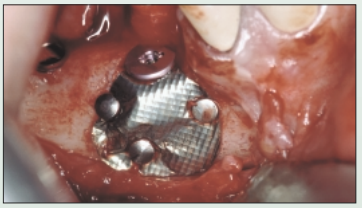

Fig.6: The defect is filled with autogenous bone which is stabilized with an implant fixed BoneShield membrane and three titanium FRIOS® tacks.

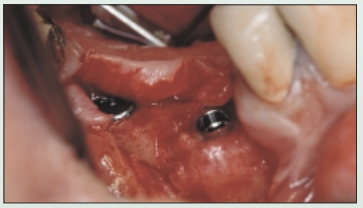

Fig 7: The typical collagen layer is seen under the membrane 4 months post-op.

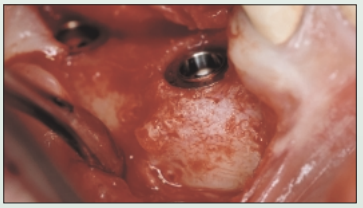

Fig. 8: Good regenerated bone is present under the collagene layer.

Case 2

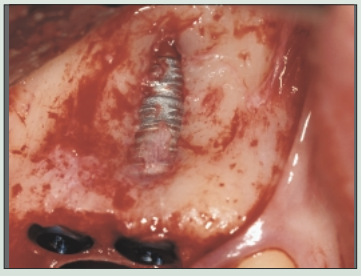

Fig. 9: A vestibular fenestration after the placement of a FRIALIT®-2 Synchro implant in the front region of the maxilla.

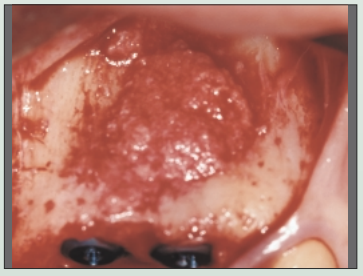

Fig 10: The defect is filled with autogenous bone chips.

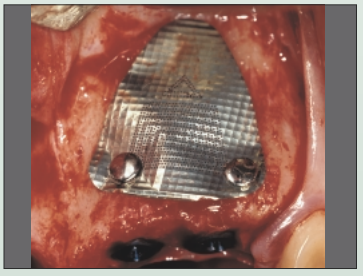

Fig.11: Stabilization of the grafted bone with a triangular BoneShield membrane and two titanium FRIOS® tacks.

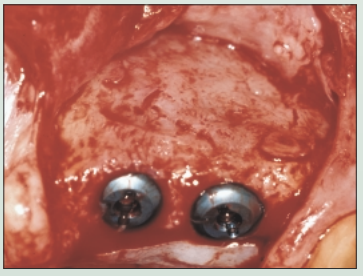

Fig. 12: The clinical situation five months post-op after removing the titanium membrane and the collagen layer.

Case 3

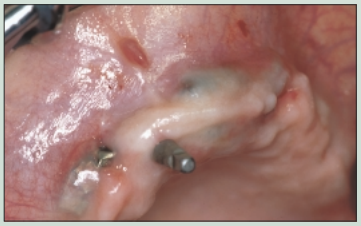

Fig. 13: Exposure of BoneShield membranes in the anterior maxilla six weeks post-op.

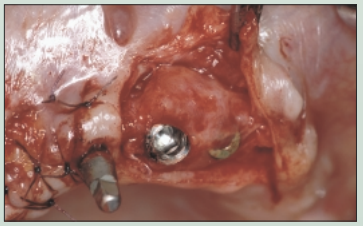

Fig. 14: The clinical situation after removing the exposed membranes: the underlying grafted bone is not affected.

Literature

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Discussion

Our study shows favorable results in restricted indications. The complication rate of 15% 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 65% of the complications there was no risk for the bone graft. Only 10 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.