

### Abstract

#### Aim

To evaluate the effect of resorbable membranes on one-stage ridge augmentation procedures in small (2-4 mm) buccal bony dehiscences in anterior maxillary single-tooth replacement.

#### Materials and Methods

Patients with a buccal bony dehiscence after implant placement in the aesthetic zone were randomly allocated to one-stage ridge augmentation with (M+) or without a membrane (M-). Second-phase surgery was performed after 8 weeks and follow-up was performed 1, 6 and ≥12 months after loading. Outcomes included implant survival and success, complications, clinical and radiographic parameters, aesthetic results and patient satisfaction.

#### Results

Fifty-two patients were randomized to one-stage ridge augmentation with (n=25) or without use of a membrane (n=27). No significant differences in implant survival and success have been observed. In the M+ group more small mucosal dehiscences were seen (P value<0.050, Fisher's exact test) and the bleeding index was marginally higher (P value=0.011, Pearson Chi-Square test). There was less marginal bone loss in the M+ group at the last follow-up (P value=0.006, Mann-Whitney U test). The M+ group showed an average change in marginal bone of 0.16 mm (SD 0.26, 95% CI=0.03 to 0.28), and the M-group showed an average change of 0.65 mm (SD 0.64, 95% CI=0.37 to 0.93). Total PES and WES scores and combined PES/WES scores were not significantly different between treatment groups at more than 12 months after loading. However, root convexity/soft tissue colour scored worse in the M+ group (P value=0.019, Mann-Whitney U test). No differences were found in patient satisfaction.

#### Conclusion

The use of a resorbable membrane in small buccal bony dehiscences in anterior maxillary single tooth replacement resulted in less marginal bone loss, but showed more mucosal dehiscences, higher bleeding scores and lower scores on root convexity and soft tissue colour after at least 1 year of loading. No effect was seen on implant survival and success, overall aesthetic results and patient satisfaction.

The research protocol was registered at the Dutch Trial Register (NTR) with ID NTR6137.

### Background and Aim

#### Background

Ridge augmentation procedures are performed with the use of autogenous bone and bone substitutes.

Membranes can be applied to direct the growth of new bone, a principle called guided bone regeneration (GBR).

Since Nyman et al. (1990)<sup>1</sup> and Dahlin et al. (1991)<sup>2</sup> described GBR in their first clinical studies, the use of membranes has become a widely applied concept in oral implantology.

#### Current evidence

In several systematic reviews, the success of implants placed in one-stage ridge augmentation procedures has been reported (Chiapasco & Zaniboni 2009<sup>3</sup>, Kuchler & von Arx 2014<sup>4</sup>).

However, there is no consensus about the beneficial use of a membrane in these procedures, especially in small buccal dehiscences (Jonker et al. 2016<sup>5</sup>).

#### Aim

To determine the effect of resorbable membranes on one-stage ridge augmentation in small buccal bony dehiscences in anterior maxillary single-tooth replacement.

### Methods and Materials

#### Inclusion Criteria

Aesthetic zone, healed ridges and a buccal bony dehiscence after implant placement (2-4 mm)

#### Surgical Protocol

Straumann Bone Level Implants

Locally harvested autogenous bone + Straumann BoneCeramic

Randomly allocated to one-stage ridge augmentation with (M+) or without a membrane (M-)

Membrane: Straumann MembraGel

#### Follow-up

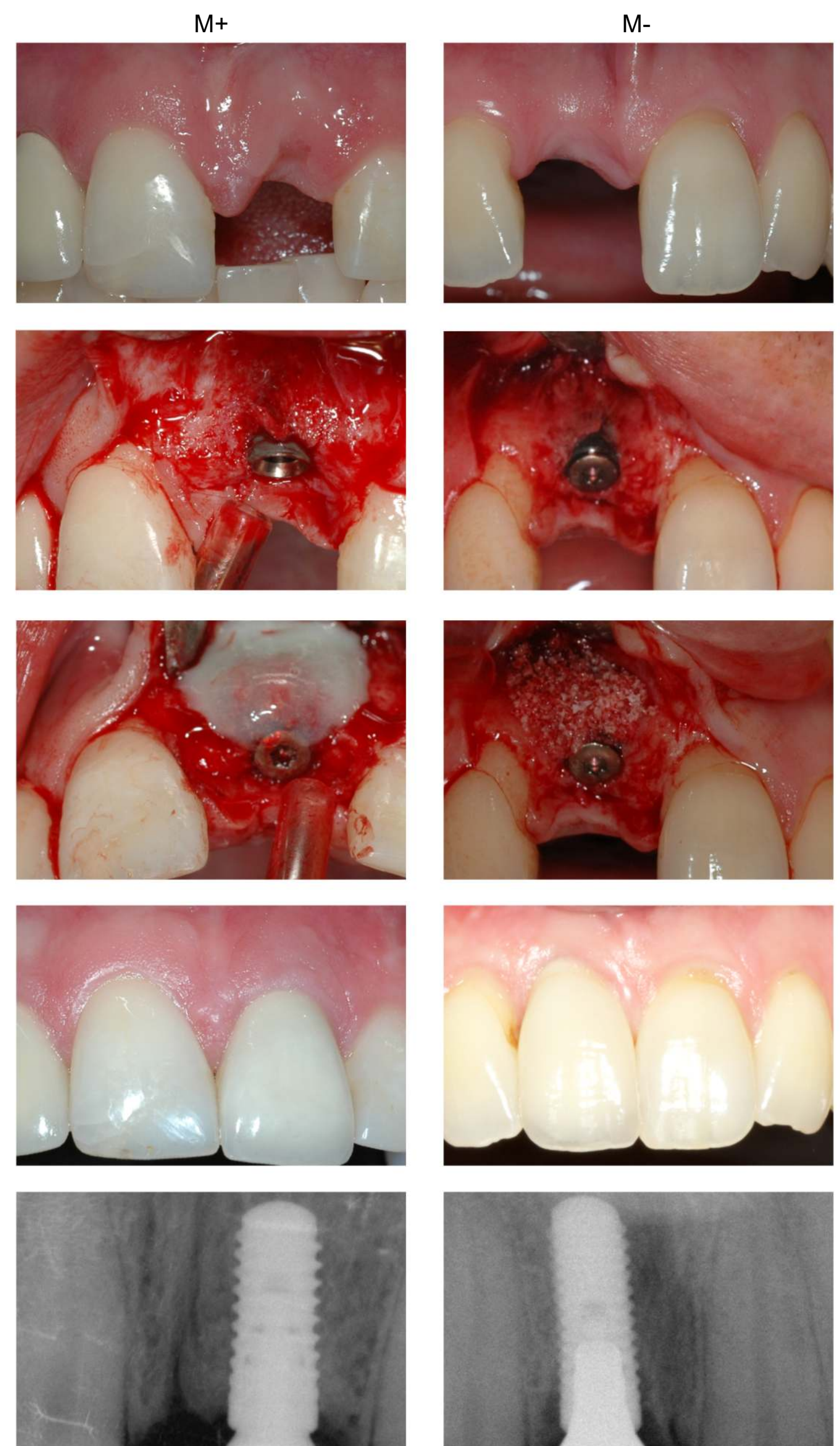
1, 6 and ≥12 months after loading

#### Outcome Parameters

Implant survival and success, complications, clinical and radiographic parameters, aesthetic results and patient satisfaction

### Results

	M+	M-	P value
n	25	27	
Implant survival	25	26	1.000
Implant succes	24	23	0.325
Dehiscences (6 wks)	6	1	<0.050
Bleeding index	14/9/2/0	24/2/0/0	0.011
Bone level change (mm)	0.16 SD 0.26	0.65 SD 0.64	0.006
PES Root convexity, soft tissue colour	1.39 SD 0.46	1.70 SD 0.41	0.019
VAS Crown	9.12 SD 0.81	8.95 SD 1.49	0.726
VAS Soft tissue	8.45 SD 1.21	8.18 SD 2.24	0.545



### Conclusions

At least one year after loading, resorbable membranes resulted in:

- Less marginal bone loss
- More mucosal dehiscences
- Higher bleeding scores
- Lower scores on buccal aesthetic outcomes

#### No effects on

Implant survival and success, overall aesthetic results and patient satisfaction

### References

1. Bone regeneration adjacent to titanium dental implants using guided tissue regeneration. A report of 2 cases. *International Journal of Oral and Maxillofacial Implants*
2. Bone augmentation at fenestrated implants by an osteopromotive membrane technique. A controlled clinical study. *Clinical Oral Implants Research*
3. Clinical outcomes of gbr procedures to correct peri-implant dehiscences and fenestrations: A systematic review. *Clinical Oral Implants Research*
4. Horizontal ridge augmentation in conjunction with or prior to implant placement in the anterior maxilla: A systematic review. *International Journal of Oral & Maxillofacial Implants*
5. The clinical value of membranes in bone augmentation procedures in oral implantology: a systematic review of randomised controlled trials. *European Journal of Oral Implantology*