The Influence of Implant Design and Insertion Technique on initial Bone Loss

A prospective, clinical, controlled Cohort Investigation

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Introduction

The success of dental implants is dependent on the integration of the implant surface in the oral hard and soft tissue. Some initial loss of marginal bone around dental implants is generally accepted. The breakdown of the implant-tissue interface begins at the crestal region regardless of submerged or non-submerged approaches. Studies have shown an average bone loss between 0.9 and 1.6 mm during the first year of function[1]. The purpose of this investigation was to examine the influence of a conical implant-abutment interface (ANKYLOS®) and flapless Implant insertion on initial bone loss.

Material and Methods

From a total number of 447 implant sites, 207 offered the possibility of implantation without augmentative procedures in the marginal region (Fig. 1, 7). 103 implant sites were assigned to the flapless test-group (Fig. 2) and 104 implants were inserted by preparing a full flap (Fig. 8).

All implants healed non-submerged (Fig. 3, 4, 9, 10). The height of the marginal bone was measured by digital x-rays at the end of surgery and after 12 months. The radiographs were digitally calibrated to evaluate the changes in bone height (Fig. 13). The patients noted their feeling of pain on a visual-analogue-scale (Fig. 14).

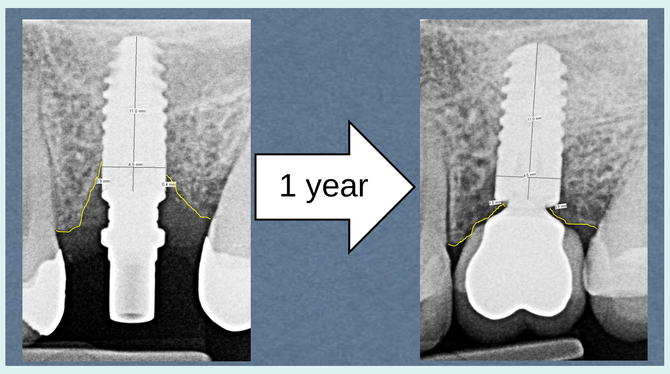

Fig. 13: Change of marginal bone in test-group (flapless surgery)

Results (Fig. 15 – 23)

After one year an overall marginal bone loss of 0.24 mm (±0.62) was measured. The remodeling led in the flapless-group to a slight increase in marginal bone height of 0.09 mm (±0.49). In the full-flap-group an average bone loss of 0.55 mm (±0.57) was measured. The difference was highly significant ($p < 0.001$). No recessions were observed (Fig. 5, 6, 11, 12). The patients recorded an overall pain of 2.9 (±1.2). The felt pain was significantly lower in the flapless-group with 2.3 (±0.9), compared to the full-flap-group with 3.5 (±1.2).

Discussion

The x-rays did not offer the possibility of a three-dimensional evaluation. An error of measurement of 0.1 mm was determined. Other studies confirmed advantages of flapless surgery[2], platform switching[3] and a conical interface[4-6].

Conclusion

Flapless implantation led to no bone loss and was less painful. The conical connection of the examined implant system has a positive influence on the initial marginal bone loss. The reasons are assumed in platform switching and reduction of micro movements.


Fig. 1: Site 26 before flapless implant insertion


Fig. 2: Flapless approach (test group)

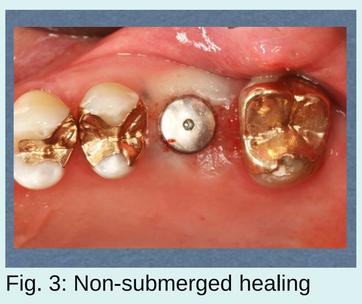
Fig. 3: Non-submerged healing

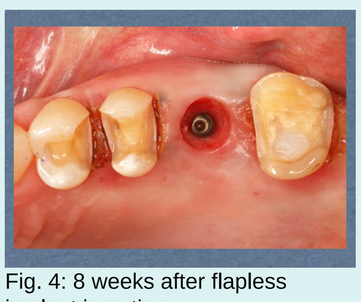
Fig. 4: 8 weeks after flapless implant insertion


Fig. 5: 1 year after flapless implantation (occlusal view)


Fig. 6: 1 year after flapless implantation (side view)


Fig. 7: Site 36 before flap elevation

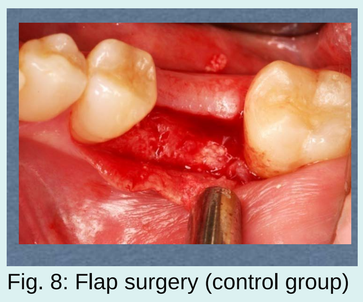
Fig. 8: Flap surgery (control group)

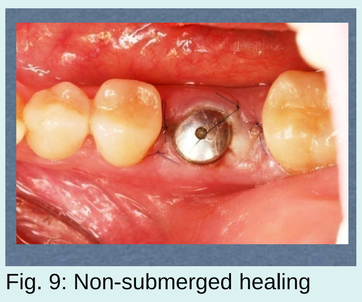
Fig. 9: Non-submerged healing

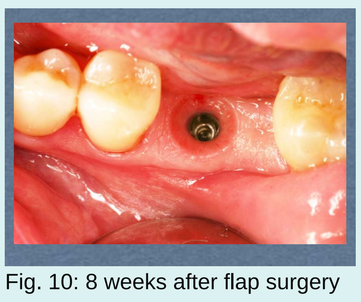
Fig. 10: 8 weeks after flap surgery


Fig. 11: 1 year after flap surgery (occlusal view)


Fig. 12: 1 year after flap surgery (side view)

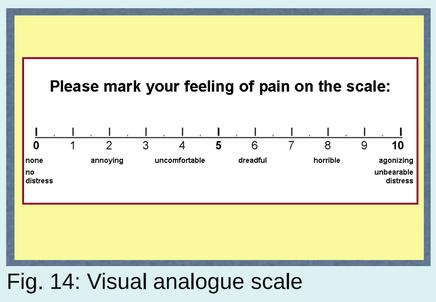

Fig. 14: Visual analogue scale

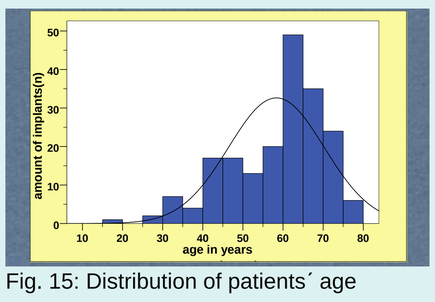

Fig. 15: Distribution of patients´ age

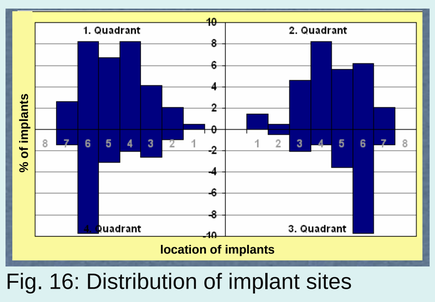

Fig. 16: Distribution of implant sites

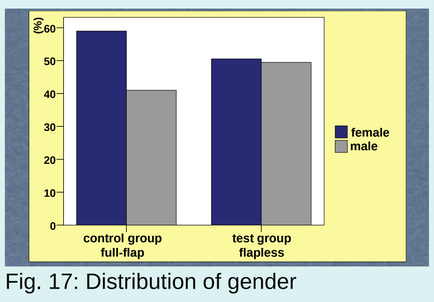

Fig. 17: Distribution of gender

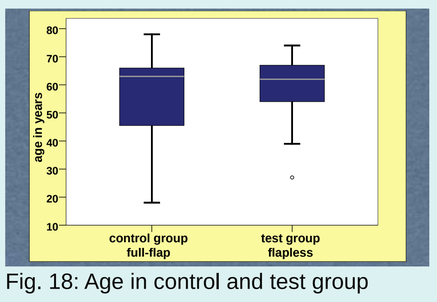

Fig. 18: Age in control and test group

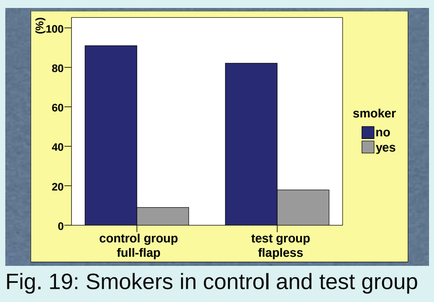

Fig. 19: Smokers in control and test group

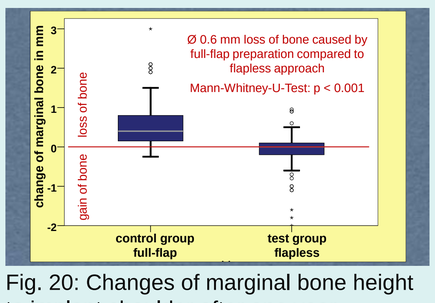

Fig. 20: Changes of marginal bone height to implant shoulder after one year

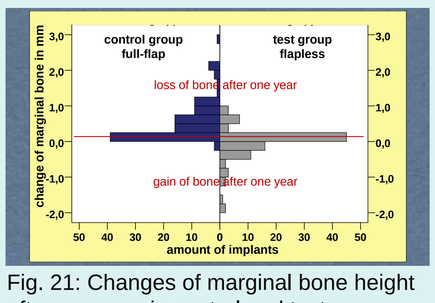

Fig. 21: Changes of marginal bone height after one year in control and test group

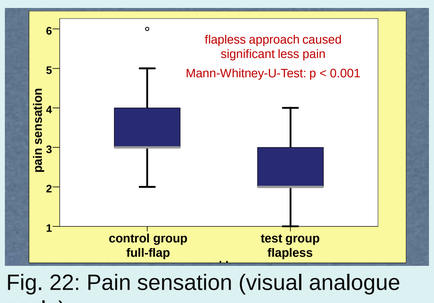

Fig. 22: Pain sensation (visual analogue scale)

ANKYLOS®	Control group full-flap	Test group flapless
Amount of inserted implants (n)	104	103
Failures	1 (early loading)	1 (aggress. period.)
Change of marginal bone (- = loss, + = gain)	- 0.55 mm (±0.57)	0.09 mm (±0.49)
Pain (0 - 10)	3.5 (±1.2)	2.3 (±0.9)

Fig. 23: Summary

References:

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