Piezotome-crest-split versus buccal autologous onlay grafts- results of a randomized clinical trial

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Background: In 2009 a novelty procedure for horizontal alveolar crest augmentation was developed as alternative to buccal augmentation with autologous bone-blocks. The flapless piezotome-crest-split (FPCS) of the narrow alveolar ridge is based on the ultrasonic cavitation-effect and enables a bone-lossless vertical osteotomy and horizontal distraction of up to 6 mm width. With the FPCS-technique both the distracted buccal and or lingual bone-plate stay fully attached to the nourishing periosteum.

Aim/Hypothesis: The authors hypothesized the flapless piezotome-crest-split (FPCS) to allow alveolar ridge-width widening for implant insertion comparable to autologous onlay-bone-grafting with comparable or better clinical outcome regarding overall long-term surgical success and post-surgical patient-morbidity.

Material and Methods: A randomized clinical trial was conducted on 1,064 patients. 533 patients were treated with FPCS (study-group) and 531 patients with buccal autologous onlay-bone-grafts (control-group). Alveolar ridge width had to be less than 3 mm in presurgical CBCT-scans. The horizontal distraction-gap of FPCS-sites was filled with self-hardening biphasic biomaterial to maintain the achieved distraction-width, autologous bone-blocks for buccal onlay grafting were harvested from the chin and fixated with osteosynthesis screws. Overall surgery time for both procedures and postsurgical morbidity were recorded on day 1,2,3,7 and 14 based on the Universal Pain Assessment Scale (UPAS) and overall intake of Ibuprofen 400 mg medication. Pre- and immediate post-surgical alveolar ridge-widths were recorded by CBCT-scans each and compared with follow-up CBCT-scans 6 months after surgery as well as possible failures in the healing period. Recorded data were processed with SPSS 20.0 for statistical analysis.

Results: Overall surgery time was significantly shorter in the test-group (38 minutes ± 9) than in the control-group (92 minutes ± 22) (P < 0.05). Postsurgical morbidity was significantly lower in the test-group (4.32 ± 0.82 + 4.12 ± 0.72+ 3.62 ± 0.97+ 2.23 ± 0.52+ 1.13 ± 0.28) compared to the control group (8.74 ± 1.23+ 7.28 ± 1.05+ 6.83 ± 1.62+ 4.79 ± 1.12+ 3.02 ± 1.09) throughout day 1,2,3,7 and 14 (P < 0.05). Analgesic intake of Ibuprofen differed significantly between test-group (14.04 ± 1.92) and control-group (28.78 ± 3.62) (P < 0.05). No significant difference was found in the presurgical CBCT between the test-group (1.9 mm ± 0.4) and the control-group (2.1 mm ± 0.5) (P > 0.05). Postsurgical CBCT-analysis revealed better results for the test-group (6.7 mm ± 0.6) compared with the control-group (6.4 mm ± 0.5), but not significant (P > 0.05). CBCT follow up after 6 months showed better results for the test-group (6.5 mm ± 0.7) than for the control-group (5.8 mm ± 0.8), but again not significant (P > 0.05).

Conclusions and Clinical Implications: The flapless piezotome crest-split (FPCS) seems to be a viable alternative to buccal onlay grafting with autologous bone-blocks mostly harvested from the patients chin. FPCS achieves comparable results regarding final horizontal alveolar crest-width of the horizontally augmented narrow alveolar ridge after healing but provides significant less surgery time-consumption and postsurgical morbidity. FPCS completely avoids harvesting of autologous bone-blocks with possible donor-site complications.