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CLINICAL INNOVATIONS

An innovative self-tapping underprepared implant: in vivo histologic and histomorphometric analysis

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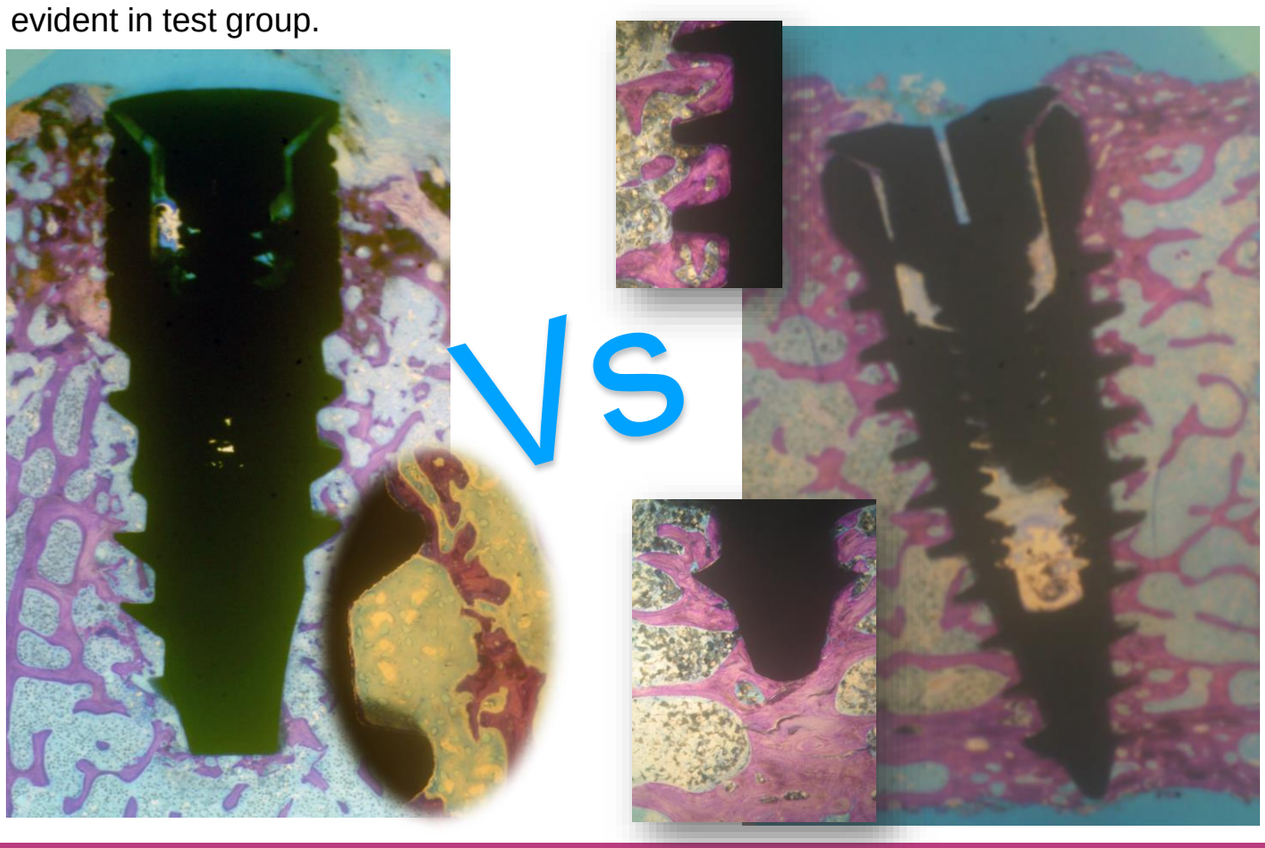
Abstract

Purpose: The aim of the present paper is to evaluate a simplified implant site preparation technique to preserve bone bulk and enhance osseointegration. **Materials and Methods:** Ten Expander® 4 x 10 mm implants (NoDrill®, Milano, Italy) were inserted in right side (test group) of sheep's iliac crest using only the pilot drill 1.8 mm in diameter. Ten 3.8 x 10 mm Dynamix® implants (Cortex, Shlomi, Israel) were inserted in the right side (control group) of the same animals following the drilling protocol provided by the manufacturer. Histological, histomorphometric and biomechanical analyses were performed after 2 months. **Results:** Implants that belonged to test group showed a %BIC of 70.91 ± 7.95 while control group implants had a %BIC value of 49.33 ± 10.73. The %BV was 41.83 ± 6.30 in test group and 29.61 ± 5.05 in control group. These differences were statistically significant. **Conclusion:** A new phenomenon of osseocorticalization, characterized by more bone volume percentage around implant area than in the neighboring areas, was evident in test group.



Background and Aim

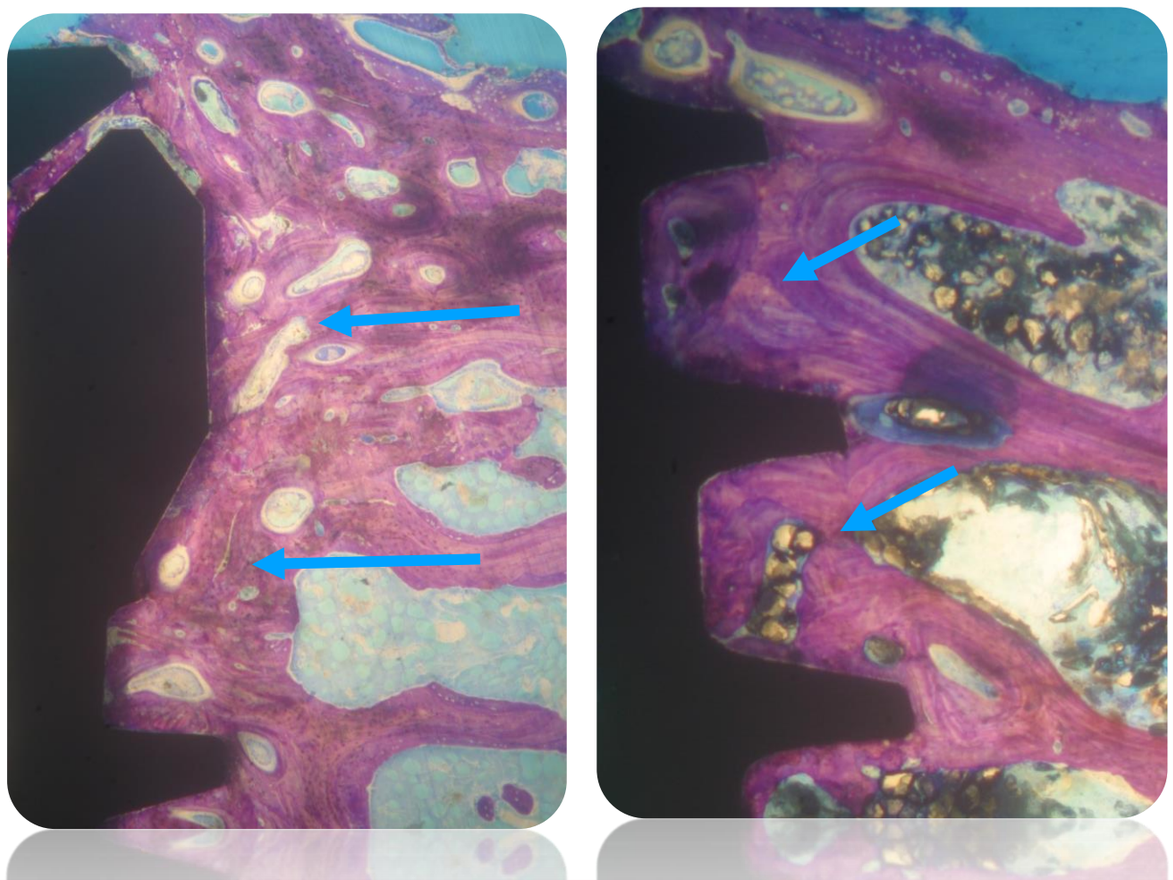
The bone site preparation plays a key role in osseointegration development because it allows to obtain an implant bone bed adequitely adapted to the implant geometry thus ensuring enough primary implant stability without excessive bone compression. Surgical trauma and bone temperature raise during standard drilling procedures are other crucial factors related to the surgeon whose role is often underestimated. Recent studies showed improved healing and biomechanics by preserving the bone bulk using osseodensification drills.

Methods and Materials

Two female sheep were included in the study. In the right side of iliac crest of each animal (test group) implant bone sites were prepared using only the pilot drill 1.8 mm in diameter. Ten Expander® 4 x 10 mm implants (NoDrill®, Milano, Italy) were inserted. In the left side (control group) implant bone sites were prepared using the following burs sequence: pilot drill 1.8 mm, twist drill 2.8 mm in diameter and the final drill 3.2 mm in diameter. Ten 3.8 x 10 mm Dynamix® implants (Cortex, Shlomi, Israel) were used. Animals were sacrificed after 2 months and histological, histomorphometric and biomechanical analyses were performed.

Results

The host bone density (basal %BV) measured 26.17% ± 2.35%. Implants in the test group showed a BIC of 70.91% ± 7.95%, while control group implants showed a BIC value of 49.33% ± 10.73%. The peri-implant Bone Volume measured 41.83% ± 6.30% in test group and 29.61% ± 5.05% in control group. The biomechanical analysis of secondary implant stability revealed a micromobility value (VAM) of 82.6 ± 23.27 µm in test group and 60.5 ± 16.58 µm in control group. The reverse torque (RT) was 98.2 ± 16.81 N/cm in test group and 98.8 ± 24.40 N/cm in control one. The condensation phenomenon characterized by a higher bone volume percentage around implant than in the neighboring areas, caused by implant threads geometry, was evident (arrows).



Conclusion

Results from the present study show that it is possible to insert a self-tapping implant using a single drill protocol in low density bone achieving a histologic and biomechanical integration comparable to the standard implants placed using standard drilling sequence. This innovative fixture geometry (coupled with minimum bone removal) was able to achieve higher osseointegration value than control group and to cause a bone corticalization around implant threads. Further clinical studies are needed in order to confirm the results of the present paper.

References

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