SURFACE POLISHING POSITIVELY INFLUENCES EASE OF FRACTURE FIXATION PLATE & SCREW REMOVAL, & THE SURGICAL TIME REQUIRED FOR EXTRACTION.

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INTRODUCTION: Difficulty to remove fixation devices due to excessive bony on-growth results in extended surgical time which can lead to excessive blood loss, debris contamination, and other potential risks associated with superfluous surgery. Commercially available locking compression plates (LCP) and screws are manufactured for clinics with a standard, micro-rough surface. However, it is this surface, which we believe contributes to the excessive bony on-growth reported. We have recently shown that by reducing the surface micro-topography of commercially available materials via surface polishing, that the removal torque required for intramedullary nails can be reduced. In this study, we have applied this technology to LCP constructs, to assess if surface polishing can alleviate problems with excessive bony overgrowth, in a locked plate system.

METHODS: Materials are outlined in fig1. The surface topography of each material was characterised using non-contact white-light profilometry, SEM, and contact angle while the surface chemical composition was analysed using XPS. Approval to perform the *in vivo* part of this study was granted by the Cantonal Animal Ethics Committee (GR #6/2006). Eighteen Swiss Alpine sheep were implanted with two test constructs on each tibia, in a bilateral (all 4 constructs were implanted within the same sheep), non-fracture model. Sheep were separated into 3 groups according to the timepoints for euthanasia; (6, 12 &18 months).

RESULTS: Electropolished (EP) TAN (NE) screws (p=0.001), paste polished (PP) TAN (NP) screws (p=0.01) and stainless steel (Ss) screws (P=0.000) were significantly easier to remove compared to standard micro-rough (Std) TAN (NS) screws. Similarly, PP significantly (p=0.000) influenced the quantity of bone contact, compared to NS. However, compared to NS screws, NE screws were not found to have significant differences in bone contact (p=0.066).

DISCUSSION&CONCLUSIONS: After explantation it was observed that soft tissue was present in the combination holes of the EP, PP and Ss constructs. This tissue was easily removed with a scalpel and K-wire, and generally took less than 5 minutes per construct. For the majority of Std systems, bone overgrowth on the plates, and in-growth into the combination holes was noted. This bone became increasingly difficult to remove with time, and dramatically increased the operational time (4 times that for polished systems) for removal. The significant reduction in time required for tissue removal from polished devices, will directly reduce the surgical time associated with implant removal, thus improving, not only the economic burden associated with surgical procedures, but also the surgical related complications with regards to the patient, which are both principal deciding factors for implant removal.

Fig.1. Constructs used included Std cpTi LCP/TAN screws; EP cpTi LCP/ TAN screws; PP cpTi LCP/ TAN screws; Ss LCP/ screws.

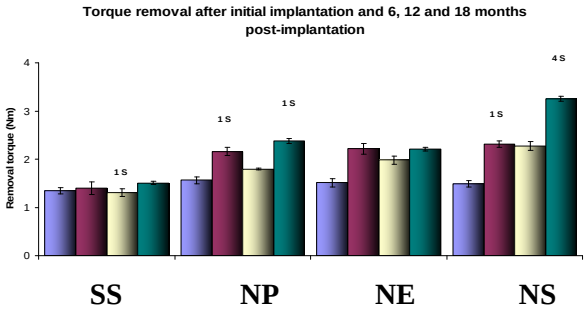

Fig2. Screw removal torque after initial insertion (blue), 6 (Red), 12 (yellow) and 18 (green) months implantation.

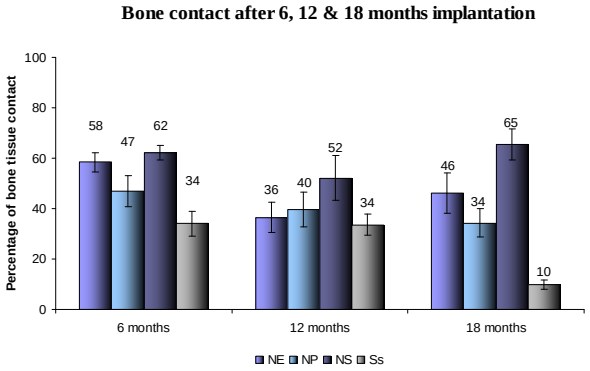

Fig.3. Percentage of bone contact for (left to right) NE, NP, NS, SS screws after 6, 12 and 18 month implantation.