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Locking plates: SOP

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The SOP is a novel locking plate system developed specifically for use in veterinary orthopaedics. SOP is available in three sizes, designated 2.0mm, 2.7mm and 3.5mm according to the screw size. Standard cortical bone screws are used exclusively. The “plate” comprises a series of almost spherical nodes (the pearls) which accept the screw and which are connected by a short, cylindrical internode. The system is available in 316LVM surgical stainless steel or the Titanium alloy, Ti6Al4V ELI.

The SOP features an increase in cross-sectional diameter of the pearl over the internode which compensates for the loss of metal caused by forming the screw hole. The result is an implant with an almost uniform stiffness profile along its length - the screw holes are not notable weak points. SOP uses standard cortical bone screws which lock firmly and predictably into the pearl. According to long established engineering principles, a “double lock” mechanism is employed: the first lock is achieved through a threaded portion in the base of each pearl which coincides with the thread on the bone screw. A second lock is achieved when the spherical contour of the screw head is drawn into the pearl and encounters a precisely under-size ridge - the resulting metal on metal impingement provides a secure fix.

The SOP can be contoured with six degrees of freedom. Dedicated bending instrumentation allows the locking function to be preserved despite contouring and ensures that contouring is achieved in a manner sympathetic to the implant metal - for example, four point, rather than three point, bending. The stainless steel SOP was designed to be stiffer and stronger than the corresponding DCP implant and bench studies of the 3.5 SOP have confirmed that this design criterion was achieved. Furthermore, mechanical testing of the 3.5 SOP following bending or twisting indicates that the contouring of a SOP that might be required in surgery has a relatively modest effect on stiffness or strength.

SOP has been used in a wide range of orthopaedic and neurosurgical applications including long bone fractures, pelvic fractures, mandibular and maxillary fractures, arthrodesis (shoulder, elbow, pan-tarsal), limb-sparing surgery, spinal fractures (cervical, TL, lumbar and lumbo-sacral), spinal stabilisations (cervical,TL, lumbar and lumbo-sacral). The initial clinical recommendations were based on experience with external fixators, experience with locking compression plates and mathematical modelling. Over the last three years or more, this has been supplemented by an ever increasing clinical case experience and this information has been collated to produce a set of clinical guidelines. As case experience expands and further biomechanical studies are published, these guidelines may be subject to minor modification.

An increasing number of clinical reports and basic research papers relating to the use of SOP have appeared in the veterinary literature over the last two years and further studies are known to be underway. 

REFERENCES

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