LagLoc: A New Surgical Technique for Locking Plate Systems

Miguel Alvaro Triana, MD*; Boyko Gueorguiev, PhD; Yash Agarwal, PhD; Christopher Sommer, MD; Ivan Zderic, MSc; Tobias Helfen, MD; Fabian Krause, MD; Matthias Knobe, MD; Robert Geoff Richards, PhD; Mark Lenz, MD*
ARI AO Foundation, DAVOS, Switzerland

Purpose: Treatment of oblique and spiral fractures still remains challenging. The aim of this study was to introduce and investigate the new LagLoc technique for locked plating of such fractures with generation of interfragmentary compression, combining the advantages of lag screw, locking-head screw, and far-cortical screw techniques.

Methods: Oblique fracture was simulated by a 30° osteotomy in 18 artificial diaphyseal bones, assigned to three groups for plating with a 7-hole locking compression plate. Group I was plated with three locking screws in holes 1, 4, and 7. The central screw crossed the fracture line. In group II, the central hole was occupied with a lag screw perpendicular to the fracture line. Group III was instrumented applying the new LagLoc technique as follows. Hole 4 was predrilled perpendicularly to the plate, followed by overdrilling of the near cortex and insertion of a locking screw whose head was covered by a holding sleeve to prevent temporarily the screwhead from locking in the plate hole and thus generate interfragmentary compression. Subsequently, the screwhead was released and locked in the plate hole. Then holes 1 and 7 were occupied with locking screws. Interfragmentary compression in the fracture gap of all specimens was measured using pressure sensors.

Results: Interfragmentary compression in group I (167 ± 25 N) was significantly lower in comparison to groups II (431 ± 21 N) and III (379 ± 59 N), the latter representative for the new LagLoc technique, $P \leq 0.005$. The difference in compression between group II and III remained not significant ($P = 0.999$).

Conclusion: The new LagLoc technique offers an alternative tool to generate interfragmentary compression using locking plates. It unites the biomechanical and clinical advantages of lag screw, locking screw, and far-cortical locking screw fixations and can be recommended for treatment of oblique and spiral fractures.