Experimental biomechanical study of the primary stability of different osteosynthesis systems for mandibular reconstruction with an iliac crest graft.

We did biomechanical loading tests to compare the quantity and quality of interfragmentary movement in fractured human cadaver mandibles that had been reconstructed with iliac crest using 3 different osteosynthesis systems. Eighteen mandibles from human cadavers with a 4.5 cm paramedian L-type defect were reconstructed with bone from the iliac crest using 3 different osteosynthesis systems and continuously loaded on the "Mandibulator" test bench. Six mandibles each had the bones joined together using 2 monocortical non-locking plates, 2 monocortical locking plates, or a single bicortical locking plate/fracture gap. Macroscopic deformation, failure mechanisms, and movement of the fracture gap in all 3 dimensions were assessed and quantified over increasing loading by PONTOS® optical measurement systems. Final mechanisms of failure were excessive deformation of the plate, fracture of the mandibular fragments, and failure of the iliac crest graft. The plate became deformed mainly in the miniplate group. The iliac crest graft failed in all the specimens in which osteosynthesis was performed by a 6-hole TriLock® plate. Interfragmentary movement was minimised in the miniplate group. All three osteosynthesis systems provided sufficient stability for reconstruction when mechanically stable.
loaded up to 100 N. The miniplate allowed less movement in the gap and gave better stability than the
two TriLock(®) plate systems. The superiority of the miniplate was significant when compared with the
4-hole TriLock(®) plate. The transplant failed mainly in the 6-hole TriLock(®) group, which suggests
that the iliac crest graft works better with the miniplate as a more malleable osteosynthesis system.