BACKGROUND: Fractures of the condylar head are traditionally managed by closed techniques, despite a considerable rate of dysfunctional problems. PDS pin osteosynthesis (presented by Rasse 1992) via a preauricular approach failed to become established as a standard procedure due to a lack of stability. Alternatively, mini- or microplating, as performed in our patients (101 condylar head fractures between 1993 and 2000), showed high-grade limitations of translatory movements in about 30% due to scarification after loosening of osteosynthesis materials. The aim of this study was to establish an efficient procedure for achieving a functionally stable and atraumatic osteosynthesis.

METHODS: For the definition of a suitable procedure, models of the mandible (standardized fractures, types A, B, and C) were osteosynthesized (six samples for each type of fracture and type of screw), each with three PDS pins, 2.0 mm resorbable, 2.0 cortical, 1.7 and 1.2 mm small fragment screws, and exposed to increasing loads in centric (0-20-35 mm opening) and eccentric (35 mm opening) condylar positions. A computerized biomechanical test stand allowed a dynamic simulation of chewing forces (16 hydraulic drives). The resulting fracture gaps were measured without contact by a motion capture system.

RESULTS: Within physiological limits, only 1.7 small fragment and 2.0 mm cortical screws
were able to bear occlusal loadings up to 200 N (1.2 mm small fragment screws up to 150 N, resorbable 2.0 mm screws up to 100 N, and PDS-pins up to 50 N). In a pullout experiment (condylar spongious bone of young pigs, aged 4-6 months), 1.7 mm small fragment screws showed superior retention. A consecutively developed small fragment screw-system has been applied clinically in 74 condylar head fractures (58 patients). After removal of osteosynthesis material, 41 of 49 TM joints have so far shown complete restitution. CONCLUSIONS: The newly developed osteosynthesis system using a retroauricular approach based on 1.7 mm small fragment screws makes maxillomandibular immobilization unnecessary. The extra-articular position of the screw heads prevents scar-induced articular limitations. Preexisting degenerative alterations of the TMJ soft tissues, however, will affect functional results adversely.