Patient-specific implants for corrective osteotomies of malunited distal radii

M. Wehrli¹, E. Bodmer², M. Marks¹, St. Schindele²
¹Department of Teaching, Research and Development, Schulthess Klinik, Zurich, Switzerland
²Department of Hand Surgery, Schulthess Klinik, Zurich, Switzerland

Background
Computer-assisted surgical planning, including patient-specific surgical tools, have the potential to improve the preoperative understanding of patient anatomy as well as enhance the intraoperative accuracy of corrective osteotomies for malunited radius fractures. Standard anatomical plates for corrective osteotomy of the distal radius are prone to malpositioning because of missing anatomical landmarks, which results in a less precise correction. As there are significant correlations between malpositioning and poor clinical outcome, patients might benefit from patient-specific implants. The objective of this project was to describe the outcome of a pilot series of patients treated with radius corrective osteotomy using a patient-specific implant.

Materials & Methods
Preoperative 3D planning requires a CT scan of both the malunited and contralateral healthy radius. Based on these data, each patient-specific osteotomy templates and titanium plates was designed and printed by KLS Martin, Tuttlingen, Germany. Patients receiving a personalised plate for corrective osteotomy due to distal radius malunion were assessed at 6, 12 weeks and 12 months after surgery.

Results
We included six distal radius malunion patients with a mean age of 53 years. Five radius fracture patients were each treated conservatively and one patient underwent enucleation of a cyst located in the distal radius prior to osteotomy. The mean time between injury or treatment and the corrective surgery was 6 years. The average follow-up time was one year. At follow-up, all patients stated that they would have the surgery again due to considerably improved wrist function and subjective stability. All patients had improved pronation/supination and flexion/extension compared to before the corrective osteotomy. No adverse events were documented. However, we removed two implants, one because of a screw tip irritation at the extensor tendon and the other due to a skelettally immature patient.

Conclusion
The initial results of patients treated with a custom-made implant for corrective osteotomies of the distal radius are promising. These implants offer the surgeon greater accuracy in the preoperative planning and implementation of the surgical procedure. As a next step, we plan to analyse the safety and effectiveness of these implants, and believe that this “gadget” has the potential to evolve into an essential tool for hand surgeons.

Contact
Dr. med. Stephan Schindele
Schulthess Klinik, Lengghalde 2, 8008 Zurich
E-Mail: stephan.schindele@kws.ch