Preoperative planning for complex reconstructive surgery in orthopaedic trauma

LEUNG KS, CHUI CSE, TANG N, TSO CY

Department of Orthopaedics and Traumatology, Prince of Wales Hospital, The Chinese University of Hong Kong, Hong Kong

elvis_chui@cuhk.edu.hk

Reconstructive surgery for complex pelvi-acetabular fractures remains one of the most challenging surgeries in orthopaedic trauma management. Careful preoperative study of the fracture configuration, analysis of the surgical approach, trial reduction and osteotomy followed by implant contouring and planning will facilitate intraoperative execution. This will ensure minimal complication and satisfactory clinical outcome. Since 2011, we have setup a special laboratory to facilitate such approach and with the installation of a Rapid Prototype machine with biocompatible material, our service is extending to more complex orthopaedic surgeries. We report 2 trauma cases here to illustrate the effectiveness of such approach.

Case 1: An 82 years old male Caucasian who fell down from 3 meter height and sustained a central dislocation of left hip. Initial planning with non-operative treatment by skeletal traction failed because of the development of multiple complications of recumbence. It was then decided to have open reduction and internal fixation. Preoperative planning was done with Mimics to analyse the CT images. The normal hemipelvis was mirrored for reduction and fixation planning. The positions of the pelvic plate as well as the screws were planned by virtual image. The length of the plate and the screws were determined and finally the selective plate was contoured in the laboratory and sterilised for surgery. The fracture was exposed via an ilio-inguinal incision and the implants were inserted exactly as planned. The duration of surgery was 90 minutes with minimal blood loss. The patient recovered quickly and was ambulatory 3 weeks after surgery and full weight bearing walking 2 months after surgery.

Case 2: A 45 years old lady lawyer who was injured in a motorbike accident resulted in multiple fractures. Initial treatment was done with Damage Control Surgery. Multiple fractures were finally fixed. She developed malunion pubic rami fractures and nonunion ipsilateral sacro-iliac joint and strongly requested for revision. Pelvis was examined with CT scan and the images
were analysed and segmented with Mimics. Rapid prototype model was manufactured and the revision surgery was planned with trial reconstruction, fixation and plate contouring. The pre-contoured plate was used during the surgery after sterilisation. Postoperatively, she resumed full weight bearing after 6 weeks with good union and satisfaction.

Preoperative preparation with careful planning and trial surgery can facilitate intraoperative execution in complex reconstructive surgery for pelvi-acetabular fractures. With powerful image analysis and advanced Rapid Prototype machine, we are expecting better clinical services to our patients. In fact, CAOS should not only limit to intraoperative execution. The comprehensive approach, including preoperative planning, feasibility trial, design of specific/personalised instruments and implants, precise intraoperative execution and postoperative monitoring and rehabilitation program should be the contemporary roles of Computer Aided Orthopaedics to meet the advanced clinical demands.

References