

Evaluation of Efficacy of Three-Dimensional Printing Patient-Specific Plates in Treating Acetabular Fractures Involving Disruption of the Quadrilateral Plate

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Purpose: Our objective is to introduce the procedure of design, production, and application of three-dimensional printing patient-specific (3DPPS) Ti-6Al-4V plates in treating complicated acetabular fractures involving disruption of the quadrilateral plate (QLP) and evaluate the efficacy of 3DPPS plates in comparison with the conventional method of intraoperative contouring of reconstruction plates for acetabular fracture fixation.

Methods: From January 2016 to June 2017, 50 patients with acetabular fractures involving disruption of the QLP were included in this study. Patients were divided into 2 groups. Group A contained 15 patients treated with 3DPPS Ti-6Al-4V plates. In Group B (35 patients), the conventional method of shaping reconstruction plates intraoperatively to adapt the fracture region was used. Blood loss, operative time, reduction quality, postoperative residual displacement, and complications were compared between the 2 groups. Reduction quality was measured using criteria described by Matta.

Results: The study showed no significant differences in all preoperative variables ($P > 0.05$). The operative time and blood loss in Group A were decreased compared to Group B; the difference was statistically significant ($P < 0.05$). There was no significant difference in reduction quality between the 2 groups ($P > 0.05$). Reduction quality in Group A was anatomic in 10 (66.7%), satisfactory in 4 (26.7%), and poor in 1 (6.7%). In Group B, quality was anatomic in 18 (51.4%), satisfactory in 13 (37.1%), and poor in 4 (11.4%). Residual displacement in Group A was less than Group B, which was statistically significant ($P < 0.05$). One case in Group A exhibited a loose pubic screw postoperatively. One case of wound infection, 1 deep vein thrombosis (DVT) in the ipsilateral lower limbs, 1 traumatic arthritis, and 2 obturator nerve injuries were observed in Group B.

Conclusion: With a 3DPPS Ti-6Al-4V plate, surgeons can simplify the surgical procedure and improve the surgical outcome of complicated acetabular fracture surgery. It is a feasible, accurate, and effective implant for acetabular fracture treatment.

