



PSI GUIDED SHOULDER REPLACEMENT PROSTHESIS IN THREE TO FOUR PARTS OLD MALUNITED FRACTURE BASED ON A PSI SHOULDER MODEL AND MEASUREMENTS FROM THE NORMAL OPPOSITE SIDE

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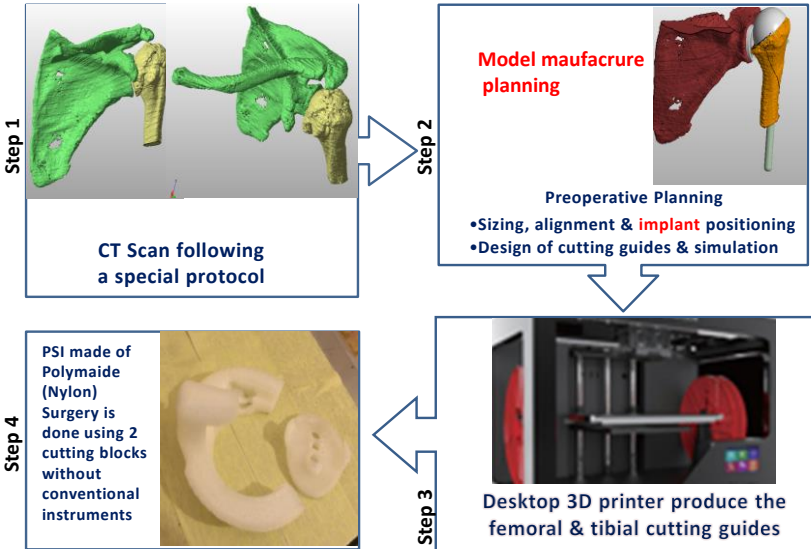
Aim

The aim of this in vivo study was to assess the accuracy of a new technique of PSI (Patient Specific Instrumentation) of the hemiarthroplasty in old malunited three and four parts fracture using measurements from the normal opposite shoulder and a preoperative PSI planning model of the affected side as well as cutting guides, in a consecutive series at a single center. Based on the fact that the shoulder muscular biomechanics were functioning according to certain bony measures of the glenohumeral joint in respect of size and angles, the outcome of hemiarthroplasty in cases of old four or three parts malunited fractures in the literature are not satisfactory

Methods

We proposed a new technique which is a device and method for preparing a shoulder joint in a patient undergoing hemiarthroplasty surgery. The device is patient specific, based on a method comprised of image-based 3D preoperative planning (CT, MRI or computed X-ray) to design the templates (PSI) that are used to perform the shoulder surgery by converting them to physical templates using computer-aided manufacturing.

Patient specific instrument (PSI)



Eleven consecutive hemiarthroplasties (7 three parts and 4 four parts and two with glenoid prosthesis) were performed using custom-made patient-specific positioning guides for the head component and two for the glenoid component as well as a planning PSI model. Each patient had preoperative computed tomography scans and guides produced to allow head width, height, retroversion, valgus angle, head center to shaft center offset, and shaft width. Clinical evaluation and postoperative radiography to determine accuracy of component implantation was performed. Patients were observed to the 1-year after surgery.



Measurements right damaged and sound left

**Right side: cominuted head – no measurement
Left side measuring the offset, head size, retroversion**

Measuring length of the humerus for height and the elbow epicondyles in relation to the head for head retroversion

Head height and offset Shaft Length

Humeral head resection guide

Results

Eleven head replacements were done for 11 patients. The size of the head, its retroversion, height, valgus angle and head offset were done according to measurements of the normal opposite side. All cases had a range of motion between 170° to 180° elevation and 60 to 70 degrees external rotation. There is 30% reduction in surgical time. According to Neer classification the results were excellent in nine cases and one case satisfactory and the other unsatisfactory

Conclusions

This technique of PSI guided shoulder prosthesis in malunited three and four parts proximal humeral fracture using the other normal shoulder measurements increase accuracy in the placement of the humeral component, which improves the likelihood of an optimal outcome