

Computer navigation aided precision resection part of acetabular and reconstruction with total hip prosthesis for malignant bone tumor around acetabular

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Introduction: Complex anatomy of acetabular malignant tumors increased surgical difficulties, which has poor prognosis. The postoperation complications are complex and varied, including local recurrence, infarction and poor function of hip joint. Surgical procedures in the acetabular region may be the most challenge in areas of complex anatomy. Up to now, surgical planning has been based almost exclusively on the surgeon's experience and on the interpretation of 2-dimensional (2D) radiologic information. Computer assisted navigation technology has been widely used in various Orthopaedic branch. The advantage is instantly real-time identification tumor edge. In the operation, can instantly conform the resection boundary with preoperative planning. The image-guided computer navigation technology will facilitate surgical resection and save more normal bone for reconstruction.

Objective: The aim of this study was to report our experience of the precision resection and reconstruction for musculoskeletal tumor around acetabular using image-guided computer navigation.

Methods: Between December 2007 and October 2010, surgical resections and hip joint reconstructions were performed for 6 patients with bone tumors with the assistance of the image-guided computer navigation. There were 1 female and 5 males with an average age of 32 years (18 to 65). Tumors were around acetabular. There were four chondrosarcoma and two Ewing's sarcoma. Pre-operative CT of each patient and bone models were performed. We made the pre-operation planning for each patient with the Navigation system software that included conforming the tumor surgical margin, designing resection and reconstructions. Intro-operation, we carried out the process of registration and match the operative anatomy to the virtual image generated by the Navigation System software. Then we performed these surgical processes according the pre-operation planning. The defect of acetabular wall were reconstructed with the patient's femoral head. Then the total hip was replaced.

Results: All cases were follow-up. The tumor precision resections of all cases were done as pre-operation planning and hip joint reconstructions with the patient's femoral head and total hip prosthesis. All the resection specimens showed a safe and clear margin.

Conclusions: The adequate surgical margin is very important for tumor resection. The navigation system is very helpful for the precision tumor resection and realization hip joint reconstruction for the patients with bone tumor around acetabular. The real-time operation is helpful for the surgical team cooperation.

Case	1	2	3	4	5	6
Age (yrs)	33	31	56	65	18	23
Gender	Male	Male	Female	Male	Male	Male
Diagnosis	Chondro-sarcoma	Ewing's	Chondro-sarcoma	Chondro-sarcoma	Ewing's	Chondro-sarcoma
Location	PI+II	PI+II	PI+II	PI+II	PI+II	PIII+II
Surgery & Reconstruction	resection construc-tural	resection construc-tural	resection construc-tural	resection construc-tural	resection construc-tural	resection construc-tural
Registration accuracy (mm)	4.3	0.5	2.7	2.6	4.4	2.8
Navigation time (mins)	40	50	40	50	45	45
Tumor resection margin	wide	wide	marginal	wide	marginal	wide
Function (MSTS score)	24	22	23	23	24	24
Follow-up (mons)	46	12	28	21	15	13
	bone graft	Sarcoma bone graft + Cage	bone graft	bone graft + Cage	Sarcoma bone graft + Cage	bone graft + Cage
	Total hip prosthesis	Total hip prosthesis	Total hip prosthesis	Total hip prosthesis	Total hip prosthesis	Total hip prosthesis

Table 1. Details of six cases with bone tumor resection with computer navigation