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Image based computer assisted surgery in curettage of bone tumors.

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Introduction:

Intra-lesional treatment is a widely used surgical approach to benign and low grade malignant lesions like giant cell tumor, aneurysmal bone cyst, fibrous dysplasia and grade one chondrosarcoma.

Recurrence control is excellent with adjuvant therapy: either phenol/ethanol or cryotherapy. Intra-operative image assistance is usually proved with fluoroscopes.

Method:

We have used images-based computer assisted surgery (CAS) as an alternative to fluoroscopes in 64 surgeries. Advantages of CAS are real time three dimensional feedback, higher resolution and better quality image datasets and no ionizing radiation. An instrument tracker is attached to the curette and registered during the CAS setup procedure. CT and/or MRI data is uploaded to the CAS system and fused if necessary, combing the characteristics of CT and MRI.

Fluoroscopy is still used for smaller lesions located in the diaphysis. CAS is also used for curettage after RFA, these have not been included. 26 cases have been analyzed where CAS was used in grade 1 chondrosarcoma without additional RFA therapy or with fibrous dysplasia. These cases had either large lesions (> 5 cm in diameter) or lesions located in a difficult anatomical location like the femoral head and pelvis. These lesions are often treated with segmental resections. All lesions were treated with phenol/ethanol, most reconstructions were done with PMMA.

Results:

Average follow-up for the chondrosarcoma group of 21 lesions is 22,6 months (range 1-55), with 17 patients above one year of follow-up. In one cases there was a non complete curettage. MRI follow-up showed residue along the border of the resection. Pathological examination after re-do showed vital chondrosarcoma. For the fibrous dysplasia group follow-up is 28 months (range 6–58). There were no recurrences in this group.

Average lesion diameter was 7,6 centimeters (range 2,9–16,1). Locations were humerus (2), femur (20), tibia (2) and pelvis (2). There were five lesions in the femoral head/neck and two in the humeral head. There were two pathological fractures and one fracture after adequate trauma.

Conclusion:

CAS can be an adequate replacement for fluoroscopes, especially in large or anatomically difficult locations. MRI before/after assessment and patient scoring is currently under analysis.

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