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Applications of computer assisted surgery in orthopedic oncology; 130 cases

Paul Jutte[1], Jasper Gerbers[2]

[1] University Medical Center Groningen [2] MD/PhD Student, UMCG Groningen, Netherlands

The use of computer assisted surgery (CAS) in orthopedics has become more common. Application of CAS in orthopedic oncology, however, is not well described in literature.

In orthopedic oncology CAS can be applied to five types of surgeries. These are excochleations of benign and low-grade malignant tumors, resections of small surface or intra-medulary bone tumors, segmental resections in larger/malignant tumors, reconstructing defects of resections and finally in the placement of tumor prostheses.
Most of the above named types of surgeries require intra-operative imaging. All of them require control over resection margin both for recurrence prevention as to prevent unnecessary bone, and often functionality, loss. Since 2006 we have performed 130 oncological surgeries with CAS.

Most have been excochleations, 64, where CAS replaces fluoroscopy as an intra-operative imaging modality. Some of these patients have been treated with radio frequency ablation before surgery. Advantages over fluoroscopy are real time three dimensional feedback, high-res image and no use of ionizing radiation. It is especially useful in larger lesions or lesions located in the femoral head or pelvis. Currently a study is being performed on patient satisfaction, recurrence and complications.

Another application where CAS has often been used is in resections and segmental resections (36 and 13). These can be preplanned before surgery, incorporating the margin required, and checked intra-operatively. Coloration of the tumor, critical structures is useful to avoid these. Sometimes it's possible with careful planning to spare structures that otherwise probably would not confidently have spared.

With hemicortical resection (6) it's possible to use CAS to exactly copy the shape of the resected bone to an allograft. A Ct scan of one case shows an average gap between host and graft of 0.9 mm (range 0-5.4) along the 6 cm resection.

Finally in 8 cases of imageless use in placement of tumor prostheses it feels greatly helpful in reconstructing the joint line, length and correct rotation.

There were 8 failures with the system or software. Setup time was measured in 47 cases and was on average 6:50 (range 2:26-14:27). In our opinion CAS shows great promise in the field of orthopedic oncology.

E-mail (main author): p.c.jutte@umcg.nl