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Patient Specific Instrument Can Achieve Same Accuracy With Less Resection Time Than Navigation Assistance In Periacetabular Pelvic Tumor Surgery: A Cadaveric Study

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Background

Inaccurate resection in pelvic tumors can result in compromised margins with increase local recurrence. Navigation-assisted and Patient Specific Instrument (PSI) techniques have recently been reported in assisting pelvic tumor surgery with the tendency of improving surgical accuracy. We compared the accuracy of transferring a virtual pelvic resection plan to the actual surgery using Navigation or PSI assistance in a cadaver study.

Questions/Purposes

We asked 1) what are the deviation errors from the planned resection in Navigation and PSI techniques; 2) is there any difference in deviation error between two techniques; and 3) what is the time required for bone resections using two techniques.

Patients and Methods

We performed CT scan in twelve cadaveric bodies including whole pelvic bones. Either supraacetabular or partial acetabular resection was virtually planned in a hemipelvis using engineering software. The virtual resection plan was transferred to a CT-based navigation system or was used for the design and fabrication of a PSI. Pelvic resections were performed using navigation assistance in six cadavers and PSI in another six. Post-resection images were co-registered with preoperative planning for comparative analysis of resection accuracy in the two techniques.

Results

The mean average deviation error from the planned resection was no different ($p=0.1$) for Navigation and PSI groups: 1.9mm versus 1.4mm respectively. The mean time required for the bone resection was greater ($p=0.004$) for Navigation group than for PSI group: 16.2 minutes versus 1.1 minutes respectively.

Conclusions

In simulated periacetabular pelvic tumor resections, PSI technique enabled surgeons to reproduce the virtual surgical plan with similar accuracy but with less bone resection time when compared with navigation assistance. Though the study had no control group, the results still suggested that PSI technique may be a simpler method to enhance surgical accuracy in selected pelvic tumors. Further studies are required to investigate the real clinical benefits of PSI technique in pelvic tumor surgery.