

Erste Erfahrungen mit der navigationsgestützten Resektion von Beckentumoren

First experiences in navigation-assisted resection of pelvic tumors

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Introduction

The accurate transfer of preoperatively planned resection planes on the patient in the OR is a frequent intraoperative problem in particular with malignant tumors. The aim is to support the surgeon by means of a navigation system to implement the preplanned procedure accurately.

Materials and Methods

Our navigation system consists of an optical tracking system (Polaris, NDI) with passive probes and a navigation computer with planning and visualization software (Amira, Indeed). Between October 2003 and May 2004 six consecutive patients underwent surgery of pelvic tumors (chondrosarcoma n=1, Ewing-sarcoma n=1, soft tissue sarcoma n=2, metastases n=2). For each patient a virtual three-dimensional model was reconstructed from CT data and resection planes were interactively defined (Fig. 1). This model was spatially related to the real intraoperative patient position by surface matching. By fixation of a reference tracker at the pelvic bone it was possible to compensate for movements of the pelvis. For the intraoperative navigation a spatially tracked pointer was used, which was displayed in relation to the model of the pelvic bone and the planned resection planes.

Results

A detailed accuracy study based on postoperative CT data was carried out (Fig. 2). For this pre- and postoperative CT data were rigidly registered by an automatic voxel based method. Mutual Information was used as the similarity measure. However only grey values above 150 HU were considered, which correspond to voxels containing bone tissue. The registration produced good results.

The registration of two patients had slight deviations caused by the operative opening of the pelvic girdle and the following deformations of the whole pelvic bone. In all cases of surgery of pelvic tumors the preoperatively planned resection planes could be reproduced and achieved intraoperatively.

Discussion

The next step is to increase the accuracy and manageability further by the use of a navigated chisel or navigated oscillating saw. Up to now it is partially difficult to keep the exact orientation of the resection plane only with the aid of the navigated pointer. The navigation-assisted resection of pelvic tumors is able to optimize the operative intervention as well as to influence the oncological outcome positively by realization of a R0-resection as a predictive factor in healing of tumor patients.



