

Computer navigation aided precision resection of sacral chordomas

Yongkun Yang¹, yangykhhhh@163.com

Xiaohui Niu ^{1*}, niuxiaohui@263.net

Chungming Chan², chancm@ortho.ufl.edu

Qing Zhang¹, zhangqing6863@vip.sohu.com

Hairong Xu¹, pagexu@126.com

1. Department of Orthopedic Oncology Surgery, Beijing Ji Shui Tan Hospital, Peking University, Beijing, People's Republic of China.

2. Division of Musculoskeletal Oncology, Department of Orthopaedics and Rehabilitation, University of Florida, Gainesville, Florida, United States of America.

*Corresponding author

Xiaohui Niu, MD

Professor, Director of Department of Orthopedic Oncology Surgery

Beijing Ji Shui Tan Hospital, Peking University, Beijing, China

Phone: 00 86 10 58516506

Fax: 00 86 10 58516736

Email: niuxiaohui@263.net

Abstract

Background: Resection of sacral chordomas is challenging. The anatomy is complex and often there are no bony landmarks to guide resection. Achieving adequate surgical margins is thus difficult, and the recurrence rate is high. Use of computer navigation may allow optimal preoperative planning and improved precision in tumor resection. The purpose of this study was to evaluate our institution's experience of using computer-assisted navigation for precision resection of sacral chordomas.

Patients and Methods: Between 2007 and 2013, a total of 26 patients with sacral chordoma underwent computer navigation-aided surgery at our institution and were followed for a minimum of 18 months. There were 21 primary cases and five recurrent cases, with the mean age being 55.8 years (range: 35–84 years). Tumors were located above the level of the S3 neural foramen in 23 patients and below the level of the S3 neural foramen in three patients. Three-dimensional images were reconstructed with a computed tomography-based navigation system with fusion of magnetic resonance images using the navigation software. Tumors were resected via a posterior approach assisted by computer navigation. Mean follow up was 38.6 months (Range: 18–84 months).

Results: Mean operative time was 307 minutes. Mean intraoperative blood loss was 3065 ml. For computer navigation, the mean registration deviation during surgery was 1.7 mm. There were 19 wide resections, 4 marginal resections and 3 intralesional (extensive curettage) resections. All patients were alive at the final follow-up, with 2 (7.7%) exhibiting tumor recurrence. The other 24 patients were tumor-free. The mean Musculoskeletal Tumor Society score was 27.3 (Range: 19–30).

Conclusions: Computer-assisted navigation can be applied to the resection of the sacral chordomas, allowing accurate execution of pre-operative plans, and achieving good results.