

Can you improve outcomes of P1+S resections using navigation?

Minna Laitinen^{a,b}, Michael Parry^a, Jose I Albergo^{a,c}, Robert Grimer^a, Lee Jeys^a

- a. Oncology unit, Royal Orthopaedic Hospital, Birmingham, UK
- b. Tampere University Hospital, Tampere, Finland
- c. Hospital Italiano Buenos Aires, Buenos Aires, Argentina

Abstract

Introduction: Due to the complex anatomy of the pelvis, and the proximity of vital structures, limb-sparing resections of pelvic tumours achieving adequate surgical margins, can often be difficult. The advent of computer navigation has improved the precision of surgical resections of the pelvis though, to date, little evidence exists comparing resection with or without the assistance of navigation.

Aims: The aim of this study was to compare the surgical and oncological outcomes in two cohorts of patients undergoing a pelvic resection for a primary sarcoma of bone with or without the assistance of intraoperative navigation.

Methods: A retrospective case control study of 21 patients who underwent P1+S resection for treatment of a primary sarcoma of bone arising from the pelvis between 1987 and 2015 was conducted. In 9 patients resection was performed with the assistance of navigation. This population was compared to 12 patients in whom resection was performed without navigation assistance. Outcomes assessed included differences in surgical parameters, as well as local recurrence. Differences in proportions were assessed using Fisher's exact test, with individual variables assessed using ANOVA.

Results: Tumours comprised 10 osteosarcomas (47.6%), 5 chondrosarcomas (23.8%), 4 Ewing's sarcomas (19.0%), 1 bone leiomyosarcoma (4.8%) and one malignant solitary fibrous tumour (4.8%). Tumours were defined as high grade in 13 (61.9%), intermediate grade in 3 (14.3%) and low in 5 (23.8%). In the navigation-assisted group, margins were intralesional in 0 patients, marginal in 6 (66.7%), wide in 2 (22.2%) and wide-contaminated in 1 (11.1%). In the non-navigation assisted group, margins were intralesional in 2 (16.7%), marginal in 6 (50.0%), wide in 2 (16.7%) and wide-contaminated in 2 (16.7%) ($p=0.584$). The duration of follow-up was shorter in the navigation-assisted group (mean 18.2 months vs 59.7 months) ($p=0.147$). Local recurrence occurred in 2 (22.2%) in the navigation-assisted group, which compared to 6 (50.0%) in the non-navigation-assisted patients ($p=0.201$). Estimated blood loss was significantly less in the navigation-assisted group when compared to non-navigation assisted group (1170 ml vs 2810 ml) ($p=0.047$). Operation time was shorter in the navigation-assisted group, 190 min compared to 355 min in non-navigation assisted group, though this was not statistically significant ($p=103$).

Conclusion: The use of intraoperative navigation during resection of tumours of the pelvis results in a reduction in intraoperative blood loss and operative time, and appears to reduce the risk of intralesional margins. Whilst the short follow-up time for the navigation assisted group in this study may account for the difference in local recurrence, it is likely that the improved margins achieved

with the assistance of navigation will translate into a beneficial effect on local control. The beneficial effect of navigation on reducing surgical time and intraoperative blood loss is clearly an advantage. The advent and introduction of navigation-assisted surgery for resection of tumours of the pelvis will, we expect, translate into an improvement in local disease control and a reduction in perioperative morbidity as a result of improved surgical outcomes.