

CORR Insights®: Is the Width of a Surgical Margin Associated with the Outcome of Disease in Patients with Peripheral Chondrosarcoma of the Pelvis? A Multicenter Study

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Where Are We Now?

Chondrosarcoma generally is resistant to radiotherapy and chemotherapy. Because of this, surgeons usually treat higher-grade chondrosarcoma malignancies with wide surgical excision [2]. Achieving this in the pelvis calls for a good understanding of local anatomy, the tumor margin, and the tumor's

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aggressiveness. A more-aggressive tumor with longer pseudopodia, more distant tumor satellites, and/or wider reactive zone warrants a wider resection margin.

The chondrosarcoma tumor grading system divides the chondrosarcoma into three grades (I, II, III) based on the degree of cellularity, nuclear pleomorphism, necrosis and chondroid, or myxoid matrix. The higher the grade, the more aggressive the lesion. Unfortunately, tumor grading of cartilaginous lesions, even among experienced musculoskeletal pathologists and radiologists, is not reliable [5]. In addition, although the histology report categorizes these tumors into three distinct grades, the reality is that chondrosarcoma probably is better considered as a continuum of disease; even within tumors of the same grade, aggressiveness may vary widely. Making matters more complex, the grade on a pre-operative biopsy may also be misleading [10] as it and may not reflect the true histological grade of the tumor.

In the current study, Tsuda and his colleagues [8] confirmed that there was a high percentage of under-reporting of the histologic tumor grade.

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This can cause serious harm, since a surgeon may tolerate a narrower margin in a lower-grade tumor, while doing so in a high-grade malignancy could result in an unacceptable risk of local recurrence or worse.

But in better news, this study also found that patients treated with a 1 mm surgical margin of the final resection specimen experienced no local recurrence, metastasis, or disease-related death regardless of chondrosarcoma tumor grade [8]. Based on this, a 1 mm surgical margin of the final resection specimen may be a reasonable goal in planning the resection plane pre-operatively.

Where Do We Need to Go?

If future studies with larger numbers of patients can confirm the current study's observations, then the next step is determining how to achieve a 1 mm surgical margin with precisely planned tumor resections. While we need to ensure adequate margins, in the interest of preserving each patient's function, we don't want to take any more normal tissue than is necessary. Improved imaging will help us do this; imaging tests must precisely reflect the boundary between the normal tissue and the tumor.

New studies on MRI or PET scan-based grading [1, 4] have been reported

to differentiate benign chondroid lesions from chondrosarcomas, and low-grade chondrosarcomas from high-grade chondrosarcomas. These technologies are promising, particularly with respect to distinguishing between benign and malignant disease. Still, they are less applicable to distinguishing low- from high-grade tumors because there isn't any specific distinguishing feature in these images. To help advance this important diagnostic area, future studies should attempt to combine all available current imaging technologies together. A scoring system might be useful.

Finally, confirmatory studies that support the findings of Tsuda and colleagues [8], and that ascertain with greater certainty whether different margins are or are not needed for chondrosarcomas of different grades, would be helpful. We also need to improve our approaches to grading chondrosarcomas.

How Do We Get There?

White and colleagues [9] studied the relationship between the tumor cells histologically and the signal in the MRI images in patients with soft tissue sarcoma by precisely correlating the histology and images. They then analyzed the likelihood of having a tumor satellite of a distance from the tumor shown in the MRI scan images. If similar research is conducted in pelvic peripheral chondrosarcoma, clinicians will have a better histologic basis to plan the resection.

There may be important histologic grade discrepancies between the biopsy and the definitive surgical specimen, which likely arise either from tumor heterogeneity and/or sampling

errors. Surgeons generally understand that the upgrading of the definitive chondrosarcoma is not unusual, and until we can resolve this, it seems important to err on the side of wider margins when possible at the time of the definitive tumor resection. Recent molecular studies examining Thy 1 (CD90, a cell surface protein), CD49f (Integrin alpha 6, a cell surface protein), and esRAGE (endogenous secretory receptor for advanced glycation end products, a cell surface protein) [3, 7, 10] have shown an association between the presence of these proteins and increased aggressiveness of chondrosarcoma. If molecular studies can predict a tumor's behavior using only a small piece of tissue from a preoperative biopsy, this may be a large step forward in terms of anticipating the behavior of chondrosarcomas, since it may eliminate the problems of sampling error and histological variation across the same tumor. In principle, a tumor's genetics should be the same throughout the lesion.

Preliminary studies have generally suggested that computer navigation software adds a measure of accuracy and precision to the process [6]. By using the software to expand the tumor image equidistant in all directions, the desired margin can be drafted and then the exact line of resection as preoperative plan can be carried out under computer-navigation during the definitive surgery [6].

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