Intraoperative Frozen Bone Marrow Margins During Long Bone Ewing Sarcoma Resection & More Trouble Than They're Worth?

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¹Vanderbilt University School of Medicine, ²Vanderbilt Orthopaedic Institute, ³Vanderbilt Medical Laboratories INTRODUCTION:

Ewing sarcoma (EWS) is an aggressive pediatric bone cancer that is histologically composed of small round blue cells, which can appear similar to regenerating bone marrow following neoadjuvant chemotherapy. Anecdotally, this visual similarity can result in false-positive assessment of intraoperative frozen bone marrow margins, which can lead to additional intraoperative resection. In this study, we sought to determine the rate and clinical implication of false-positive intraoperative frozen bone marrow margins during the resection of long bone EWS.

METHODS: After receiving institutional review board approval, we queried our institution's orthopaedic oncology registry, which includes all patients treated for a musculoskeletal bone or soft tissue tumor at our institution since 1987. Using this registry, we identified all patients who received treatment for EWS at our tertiary academic orthopaedic oncology center and we included all patients who underwent resection of a primary long bone EWS at our institution between 1994-2023 (n=64) (Figure 1). Patient, surgical, pathology, and outcome data were retrospectively collected (Table 1).

RESULTS: In this cohort, 81% (52/64) of patients had frozen bone marrow margins assessed intraoperatively. Of those, 88% (46/52) of marrow margins were called negative on intraoperative assessment, and 100% (46/46) of those were confirmed to be negative when read on final pathology. The remaining 12% (6/52) of intraoperative frozen marrow margins were called positive intraoperatively; however, 100% (6/6) of these intraoperative margins were read as negative on final pathology (Figure 2). Five of six (83%) of these patients with false-positive intraoperative margins had additional, unnecessary bone resection; in the remaining case, the orthopaedic surgeon documented a high threshold of suspicion for false-positive assessment and did not perform additional resection (Table 2). There were no differences in rates of local recurrence, development of metastatic disease, or death for patients who had bone marrow margins assessed intraoperatively via frozen sections compared with those patients who did not (Table 3). There were no differences in these rates for patients who had false positive intraoperative margins compared with all other patients (Table 4).

DISCUSSION AND CONCLUSION: In our cohort of patients with long bone EWS, 12% (6/52) of patients had a false-positive intraoperative assessment of bone marrow margins. These inaccuracies led to unnecessary additional resection and increased operative time. These findings suggest that intraoperative marrow margins lend little clinical benefit in the resection of long bone EWS and therefore are no longer routinely performed at our institution.

