Title: 11178—Predicting Limb Salvage Tumor Margins with Preoperative Imaging and The Significance of Those Margins

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Background: Guidelines for acceptable surgical margins for osseous sarcomas remain poorly defined by current published criteria.

Question/Purpose: Our goal was to review pathologic margins for pediatric limb salvage procedures and assess the extent of tumor contamination in those margins (with subsequent clinical outcome) and the ability of preoperative imaging to predict those margins.

Methods: This study reviewed cases involving pediatric limb salvage surgery of the distal femur or proximal tibia for diagnoses of osteosarcoma or ewing sarcoma treated with current COG protocols between 2009 and 2014. Patients were excluded if they had insufficient clinical follow-up, inadequate radiographic or pathologic reports or were treated with an amputation. The final cohort consisted of 38 patients that had at least twelve months of follow-up. MRI and PET imaging and pathology records were retrospectively reviewed for the assessment of tumor size, pre-and post chemotherapy MRI tumor margins, and tumor margins documented by final pathology. Final pathology tumor margin measurements (Figure 1) were compared with preoperative MRI predicted margins. Overall histologic tumor necrosis and patient disease status regarding local recurrence or metastases was also documented.

Results: Our review evaluated 38 patients treated with limb salvage resection and reconstruction with either an allograft or oncologic implant. The average age was of this cohort was 11.9 (2-22) years with an mean follow-up of

45(2-132) months. Average tumor size was 88.3(30-167)mm with a mean post-chemotherapy SUV ratio (PET2/PET1) of 0.33(0.10-0.56).

Patient tumor shrinkage of the inflammatory zone following chemotherapy occurred in 56% of patients. Average overall tumor necrosis was 74.6%. Final average osseous tumor pathologic margins were 9.3(0-28)mm, while preoperative (post-chemotherapy) MRI predicted margins averaged 10.2(0-25)mm. Contaminated margins were present in 18% (7/38) patients.

Conclusion:

Preoperative MRI predicted femoral tumor margins of 10.2mm were confirmed by final pathology as 9.3mm. Four patients (10.5%) suffered a local recurrence and only 2/7 patients with contaminated margins suffered a local recurrence. All patients who suffered a local recurrence or metastasis had a poor chemotherapy response (<90%) on final pathology. The majority of contaminated surgical margins occurred at the medial/lateral/soft tissue margins rather than at a bony margin. Pathologic margins were better described with specimen photographs (Fig 1).

Level of Evidence: III

Figure 1: Pathology diagram of a distal femur osteosarcoma resection specimen