POSTER 22

Evaluation of Intraoperative Tumor Margin in Sarcoma with Fluorescent Dye Imaging: A preliminary analysis of results

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Level of Evidence: II

Background: Sarcomas are rare malignant tumors that are often associated with poor outcomes. Tools for intraoperative and definitive margin assessments include frozen section and permanent pathology, respectively. Local recurrence (LR) is a devastating complication of sarcoma treatment. Global LR rates range from 10-20% with most occurring within two years of surgery. Indocyanine green (ICG) is a safe, low-cost fluorophore dye that has shown efficacy in intraoperative margin assessment in both breast and gastrointestinal cancer surgery. Its efficacy in sarcoma surgery has yet to be proved.

Questions/Purposes: The purpose of our study is to evaluate the efficacy of ICG in detecting sarcoma margins intraoperatively during sarcoma surgery as well as to develop a potential protocol for utilizing ICG to guide surgeons intraoperatively during sarcoma resection surgery. We hypothesize that the use of ICG may provide accurate and rapid intraoperative evaluation of tumor margin following sarcoma excision.

Patients and Methods: This is a prospective, non-randomized clinical study of patients diagnosed with primary sarcoma. Inclusion criteria were Age >18 years and biopsy-confirmed primary soft tissue or bone pathology not previously excised. Patients were excluded if they had underlying kidney disease or an anaphylactic reaction to IV contrast dye. Patients are infused with IV ICG (2.0 mg/kg) three hours before surgery. Following tumor excision, both the excised tumor and the tumor bed were imaged using Stryker SPY-PHI imaging system and florescence intensity in terms of arbitrary perfusion units was quantified using the SPY-PHI's proprietary software system. A positive ICG margin was classified as over 77% of highest tumor immunofluorescence (**Figure 1**). Surgeons were blinded to ICG results and asked to fill out a survey detailing whether they believed the margins were negative. Final pathology results obtained from chart review. Statistical analysis was performed using a Chi-Square test.

Results: Twenty-One patients have been enrolled into our study, with twenty undergoing successful ICG infusion. Average age of patients was 62.4 years old (Range 27-91). Three (15%) patients had surgery for local recurrence. Two (10%) had neoadjuvant chemotherapy, and seven (35%) had neoadjuvant radiation. Four patients (20%) patients had presumed positive margins, as determined by the operating surgeon. Four patients (20%) had positive ICG. Six (30%) patients had ICG-negative margins but positive margins on final pathology (p=0.090) (**Table 1**).

Conclusions: While ICG has been shown to be of benefit in detecting margins in gastrointestinal and breast cancer literature, its use in sarcoma margin detection is limited. Our preliminary findings so far do not show a significant benefit in using ICG over postoperative pathological margin detection. Our biggest limitation is the relatively small sample size of our study, which precludes us from making definitive conclusions as to the efficacy of ICG in sarcoma surgery. Further investigation and more patients are needed to definitively prove whether ICG may be a viable method of detecting margins intraoperatively in sarcoma surgery.

Figure 1: Intraoperative imaging of excised tumor and tumor bed demonstrating lack of margin as determined by ICG.

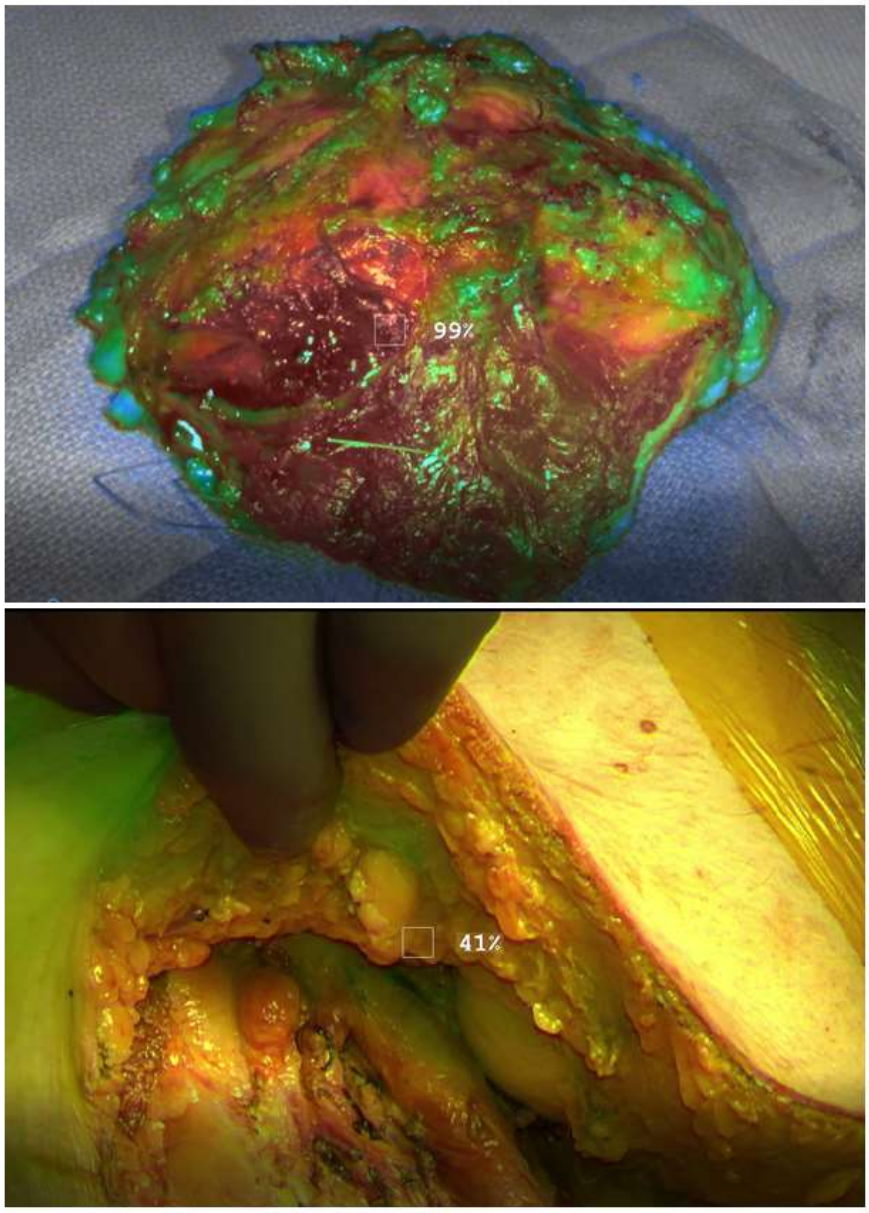

Table 1: Summary of the pathology and margin determination of our recruited patients to date.

Patient ID	Final Diagnosis (As determined by pathology findings)	Margins (Surgeon)	Margins (ICG)	Margins (Sathology)
001	Pleomorphic Liposarcoma	Negative	Positive	Positive
002	Dedifferentiated chondrosarcoma	Negative	Negative	Negative
003	High Grade round cell Sarcoma	Negative	Positive	Negative
004	Dedifferentiated Liposarcoma	Positive	Negative	Indeterminate
005	Pleomorphic Dermal Sarcoma	Negative	Negative	Negative
006	Epithelioid Inflammatory myofibroblastic sarcoma	Negative	Negative	Negative
007	Atypical Cartilaginous tumor	Negative	Positive	Margins Deferred (Cartilaginous tumor was curetted)
008	Leiomyosarcoma	Negative	Negative	Negative
009	High grade spindle cell/sclerosing rhabdomyosarcoma	Negative	Negative	Negative
010	High Grade Spindle Cell Sarcoma	Negative	Negative	Positive
011	malignant giant cell tumor of bone	Negative	Negative	Positive
012	Benign neurofibroma with degenerative nuclear atypia	Negative	Negative	Negative
013	Undifferentiated High grade pleomorphic Sarcoma	Negative	Negative	Negative
014	Recurrent High Grade Sarcoma	Negative	Positive	Positive
015	Chondroblastic Osteosarcoma	Positive	Negative	Positive
016	Dedifferentiated Liposarcoma	Positive	Negative	Positive
017	Recurrent High Grade Sarcoma	Negative	Negative	Positive
019	Spindle Cell Sarcoma	Negative	Negative	Positive
020	Synovial Sarcoma	Negative	Negative	Negative
021	Dedifferentiated Liposarcoma	Positive	Negative	Negative