

## Iatrogenic implantation of soft tissue sarcoma at skin graft donor site: Delayed manifestation of an avoidable complication

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Dear Editor,

Soft tissue sarcomas are rare mesenchymal tumors constituting <1% of all adult malignancies. Surgical excision forms the mainstay of treatment. Excision often necessitates subsequent reconstruction with split skin grafting or the use of local or free flaps to obtain adequate soft tissue coverage.

Surgical oncologists endeavor to obtain clear resection margins and also use adjuvant radiotherapy in order to reduce the incidence of local failure. Intraoperative contamination by tumor and involved surgical margins are associated with a higher rate of local recurrence and poorer oncological outcomes. Though not reported earlier in English literature, there exists a theoretical risk of tumor contamination at the skin graft donor site whenever skin grafts or flaps are harvested for reconstruction of post resection soft tissue defects.

We present a case of extremity soft tissue sarcoma where recurrence occurred at the skin graft donor site due to tumor implantation after index surgery.

### Case Report

A 33-year-old gentleman presented with a solitary swelling over left calf. On examination, he had a 3 cm × 2 cm, solitary swelling over a skin grafted area on the posterior aspect of left leg which was non tender, firm in consistency and had well-defined borders [Figure 1c]. Detailed evaluation revealed that the patient was operated for a non metastatic intermediate grade spindle cell sarcoma of the contralateral leg 8 years earlier [Figure 1a]. He underwent wide excision of the primary tumor with reconstruction of the defect with a cross leg flap at another hospital. The donor site over left calf was covered with a split-thickness skin graft harvested from the thigh of the same side. Postoperatively he received radiotherapy to the primary area. 8 years later, he developed a swelling over the left calf at the skin graft donor site.

He was additionally evaluated with a magnetic resonance imaging which revealed a 3 cm × 2 cm subcutaneous nodule at the donor site [Figure 1b]. A core needle biopsy was performed to confirm the diagnosis. The biopsy revealed high-grade spindle cell sarcoma consistent with metastasis from a known primary in the right thigh [Figure 1d]. A metastatic workup

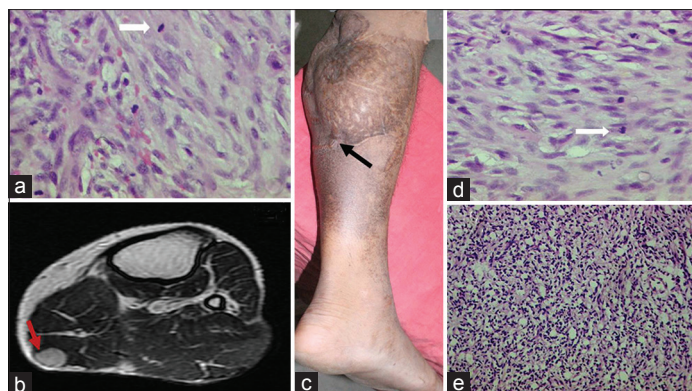
including a computed tomography scan of the chest and an ultrasound of the abdomen-pelvis did not reveal any other focus of disease. He underwent wide excision of the lesion with primary closure. The postoperative course was uneventful. Patient was disease free at the last follow-up at 24 months.

### Discussion

When a tumor develops at the donor site of a graft or flap, there can be three probable theories to explain its occurrence. It may be an implantation tumor, a second primary unrelated to the index tumor or it may be a soft tissue deposit due to hematogenous spread. In our case, implantation seems the most probable mechanism as the patient did not have either locoregional recurrence or any other site of distant metastasis.

This case report has two unusual features. Though an implantation tumor is well-recognized in squamous cell carcinoma, an implantation sarcoma is extremely rare. Second, most cases of implantation tumors usually manifest within 2 years of the index surgery. Our patient presented 8 years after the index surgery. This possibly occurred because of the indolent nature of the index tumor and the intermediate grade histology of the implanted lesion.

Gerster was the first to describe surgical implantation of tumor cells in 1885.<sup>[1]</sup> Lack and Ryall were among the pioneers who suggested that contamination of the surgical instruments may lead to implantation of the tumor cells and suggested precautions to prevent the same.<sup>[2,3]</sup> Modes of implantation



**Figure 1:** (a) Histopathology of the primary tumor showing intermediate grade spindle cell sarcoma. (b) Magnetic resonance imaging, T2-weighted axial cut showing the subcutaneous recurrent nodule at donor site (red arrow). (c) Clinical profile of the patient showing the nodule at the donor site (black arrow). (d and e) Histopathology of excised nodule showing intermediate grade spindle cell sarcoma similar to the primary tumor

include tumor cell dissemination during surgery, use of the same instruments for both resection of the tumor as well as reconstruction or use of the same hollow needles for infiltration.<sup>[4]</sup> Necrotic tumors are difficult to handle during surgery and frequently result in tumor cell dissemination. Prior studies have shown that surgically altered surfaces act as a fertile ground for implantation of detached tumor cells.<sup>[5]</sup>

Tumor cell dissemination during surgery has been well-documented in cases of colorectal carcinomas with reports of recurrence in hemorrhoids and perineal scar wounds.<sup>[6]</sup> Implantation of tumor cells at the donor sites of flaps as well as the skin graft have been described in cases of squamous cell carcinoma.<sup>[7-9]</sup> Implantation of tumor at other sites that have been described include chest wall implantation following lung tumor biopsy, gastrostomy site implantation from the aero digestive tumor following percutaneous gastrostomy tube insertion and laparoscopic trocar site implantation from ovarian tumors.<sup>[10]</sup>

Though there is an isolated case report of osteogenic sarcoma developing at the bone graft donor site, an extensive review of literature did not reveal any previous report of implantation of sarcoma cells at the donor site of skin graft or flap.<sup>[11]</sup> We had previously reported a case of giant cell tumor developing at the bone graft donor site secondary to iatrogenic implantation and suggested some of the precautionary measures which can be taken to avoid this complication.<sup>[12]</sup> Similar precautions are warranted during harvesting flaps or skin grafts in oncologic reconstructions:

- A common draping for the primary tumor and flap donor site should be avoided
- Ulcerated or fungated tumors should be sealed with impermeable skin barriers to avoid tumor spillage in the operative field
- Harvesting of the flap should be started only after resection of the primary is complete to avoid cross contamination.
- Change of gloves is mandatory for all the surgeons and nurses after resection of the primary and before reconstruction begins
- Separate surgical trolley with a separate set of instruments including cautery tip should be used for both the procedures
- Hollow needles if used for infiltration during primary surgery should not be reused at flap donor sites
- Proper irrigation of the operative field at the end of resection decreases chances of implantation of the tumor cells
- Gentle handling of the tissues so that tumor cell

dissemination can be minimized particularly in the case of necrotic tumors.

## Conclusion

Recurrence of tumor has implications that could impact on overall disease control. Tumor recurrence due to implantation is a complication that can be easily avoided by adhering to simple precautions during surgery. Through this case report, we would like to reassert the importance of basic principles during cancer surgery to prevent an eminently avoidable complication that may result in long-term morbidity and mortality.

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