

# Tumor-to-tumor Metastasis in the Spine

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## ABSTRACT

Tumor-to-tumor metastasis (TTM) is a rare phenomenon and usually involves urological malignancies. This case report describes a 68-year-old female with end stage metastatic breast cancer that underwent excision of thoracic intradural tumor. Histopathological analysis of the lesion revealed two separate cell population. This is the first documented case of TTM seen going to the spine.

**Keywords:** Tumor-to-tumor metastasis, Thoracic spine, Schwannoma, Adenocarcinoma.

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**Conflict of interest:** None

## INTRODUCTION

The intriguing phenomenon that is tumor-to-tumor metastasis (TTM) was first described in 1902 by Berent and a comprehensive review of case reports was done by Campbell in 1968. In Campbell's series, he defined the following criteria: (1) more than one primary tumor must exist, (2) recipient tumor must be a true malignant or benign neoplasm, (3) there must not be contiguous growth (local spread) or embolization of tumor cells, (4) tumors that metastasize to the lymphatic system where lymphoreticular malignant tumors already exist. Our case describes the first documented case of TTM where the recipient site is the thoracic spine.

## CASE REPORT

A 68-year-old female was admitted to hospital under the oncology service for ongoing management of end stage metastatic breast cancer. She had previously undergone a radical right sided mastectomy with adjuvant chemo/radiotherapy some 10 years earlier. Neurosurgical consultation with sought in regards to her lower limb weakness

and hyperreflexia. On examination, she was resting in bed with 4/5 power bilaterally in her lower limbs, brisk ankle jerk reflexes and otherwise neurologically intact. Urgent magnetic resonance imaging (MRI) scan showed a nodular intradural lesion with extramedullary deposits evident (Fig. 1). There was no significant canal stenosis nor any cord signal change. Two days later, she underwent a resection of the T10/11 intradural lesion. T10 laminectomy was performed followed by dural opening using the operating microscope. Arachnoid was opened to reveal bilobed tumor ventral to the cord, attached to thickened pia/rootlet (Fig. 2). The tumor was divided into two parts and removed. The dura was closed reinforced with fibrin sealant and surgical.

Intraoperative frozen section was not available at the time of surgery due to the procedure being carried out on a weekend. Postoperatively, our patient was transferred to intensive care where she lay flat for 48 hours due to the dural opening. Over the next 5 days, she regained her lower limb power and suffered no complications from surgery.

## HISTOPATHOLOGY

The T10/11 bilobed tumor seen at the time of operation was completely removed and sent for histopathology. The tissue was received as two pieces of firm tan tissue 12 × 5 × 4 mm and 10 × 5 × 4 mm. The tissue was stained with hematoxylin and eosin (H & E) and was microscopically examined on multiple levels cut at a 4 μm thickness. The bulk of the unencapsulated tissue showed a background nerve sheath tumor with densely packed bland tapered spindle cells arranged in fascicles. There were two small vessels seen with hyalinized walls. There were no distinct Antoni A or Antoni B areas, no verocay bodies, no necrosis, no foamy macrophages or hemosiderin deposition and no myxoid change or mast cells. The nerve sheath tumor stained pericellularly with reticulin.

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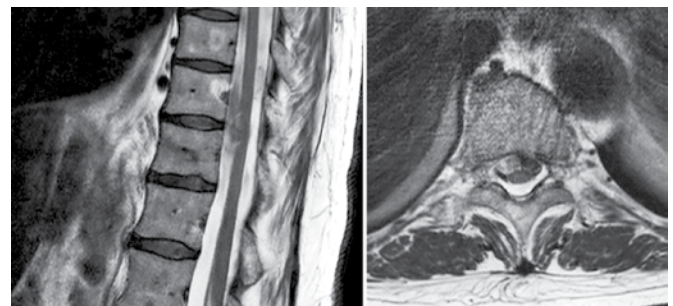
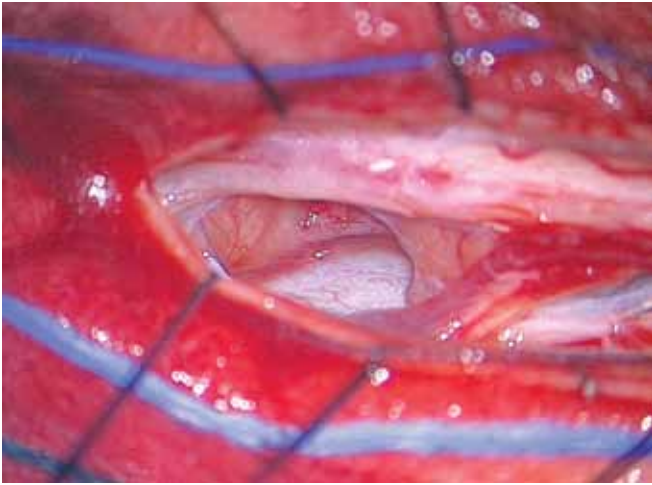


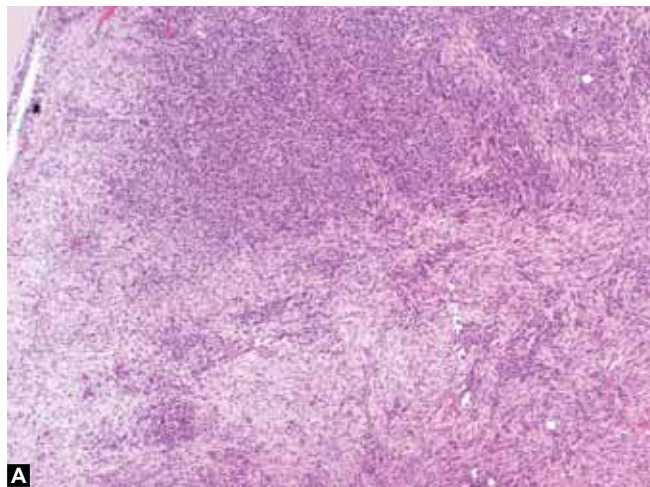
Fig. 1: T2 sagittal and axial images of T10/11 intradural lesion

In addition, there was also an infiltration of metastatic poorly differentiated adenocarcinoma with intracytoplasmic mucin droplets seen. The invasive cells were arranged in aggregates, cords and as single cells. The nuclei were pleomorphic with frequent mitoses and there was no distinct tubule formation. Given the strict previously established criteria for TTM,

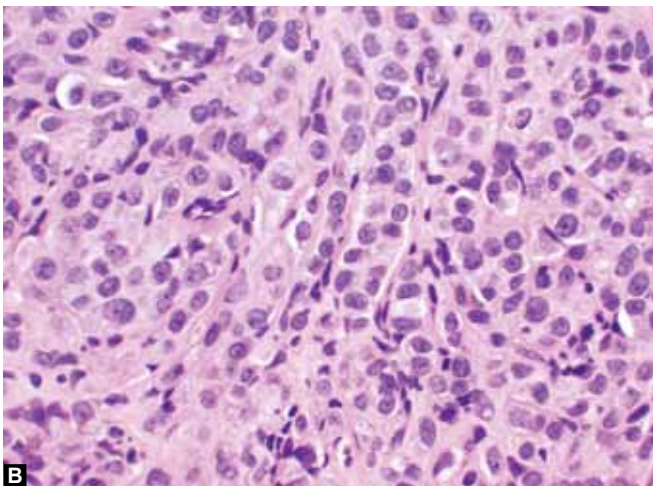
immunohistochemistry was performed to identify the origin of both tumors.<sup>1</sup> The nerve sheath tumor was diffusely positive for S100 and negative for epithelial membrane antigen (EMA). Neurofilaments highlighted scattered aligned axons. Given the lack of morphological schwannoma features and the alignment of the neurofilaments, the appearances were consistent with a neurofibroma (Fig. 3).<sup>2</sup> The poorly differentiated adenocarcinoma was positive for AE1/AE3 and EMA, weakly positive for progesterone receptor (PR) (in 25% of cells) and was initially negative for estrogen receptor (ER), however a repeat stain showed moderate positivity (in 10% of cells) (Fig. 4). The adenocarcinoma was also negative for E-cadherin, paired box gene 8 (PAX8), caudal type homebox 2 (CDX2) and transcription termination factor 1 (TTF1). Human epidermal growth factor receptor-2 (HER-2) immunohistochemistry and silver *in situ* hybridization (SISH) status was performed on this case and was found to be negative. This staining pattern confirms the tumor to be of breast origin and is of pleomorphic lobular morphology.<sup>3</sup> The previous histopathology from the original breast carcinoma diagnosis was unavailable for comparison.



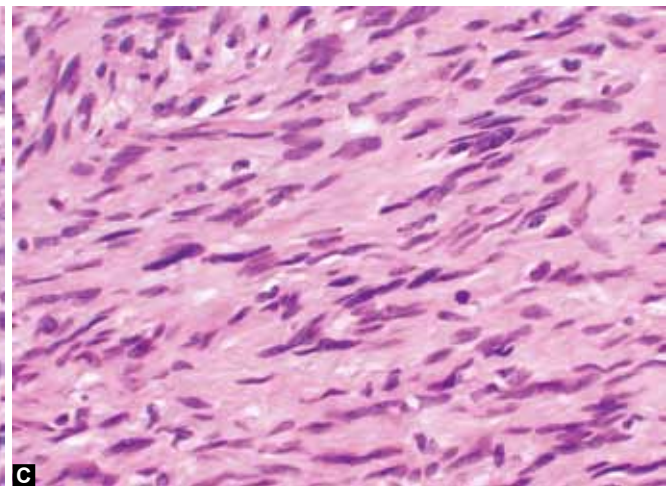
**Fig. 2:** Intraoperative photograph demonstrating tumor *in situ* using operative microscope



**A**

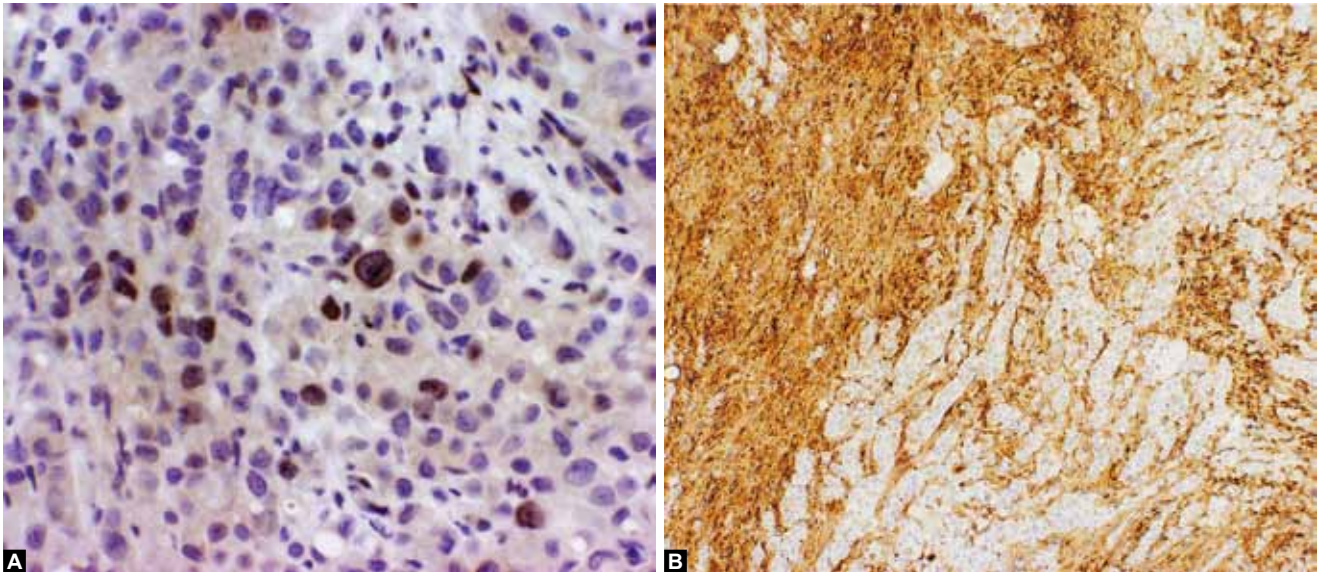


**B**



**C**

**Figs 3A to C:** Low and high power photomicrographs of the excised tumor mass. Both tumors can be seen in A, the invasive breast carcinoma is seen in B and the neurofibroma is seen in C (H & E, original magnifications 20x for A and 400x for both B and C)



**Figs 4A and B:** Low and high power photomicrographs of the excised tumor mass. The positive PR staining (brown) can be seen in A in the breast carcinoma cells and positive S100 staining (brown) can be seen in B in the neurofibroma cells (Hematoxylin and eosin stain, original magnifications 400x for A and 100x for B)

## DISCUSSION

Tumor-to-tumor metastasis is very uncommon and even large institutions may only see 1 or 2 cases over many decades. In Anthens in 2003, Petraki<sup>4</sup> reviewed all histopathology from his institution over 20 years and found only two documented cases in over 75,000 reports. The most common donor site involved in larger case series is carcinoma of the lung, followed by breast, gastrointestinal tract, prostate and thyroid. Recipient sites favor renal cell carcinoma followed by sarcoma, meningioma and thyroid neoplasm.<sup>5</sup> This is the first case described in the medical literature describing a TTM to the spine. This case highlights the need for caution when using results from intraoperative specimens. Their primary purpose is to ensure that sufficient sample has been obtained and should not be used to make a diagnosis. It needs to be used in clinical context as an adjunct to the working diagnosis.

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