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Case Report

Granulomatous Reaction Induced by Metallosis from Spine Implants Confused with Ewing's Sarcoma Relapse on PET-CT

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Introduction

The wide use of spinal implants in spinal reconstruction following neoplastic diseases calls for cross-disciplinary knowledge and handling of these patients. It is known that metal ions from the implants may elicit local damage and alteration in tissue characteristics. This process is called metallosis [1,2]. MRI and PET-CT are routinely used as diagnostic tools in tumor surgery as well as during the follow-up period. The presence of spinal instrumentation in cancer imaging with PET-CT is known for challenges such as false positive or negative uptake and misinterpretation of artefacts arising from scar tissue or material used for surgical treatment [3,4].

Case

A previously healthy 21-year-old female was acutely admitted due to rapid neurological deterioration. Urgent MRI of the whole spinal column revealed a tumor in a thoracolumbar junction area with severe compression of the conus medullae at the level of Th11-Th12 (Figure 1). Urgent CT of thorax, abdomen and pelvis with intravenous contrast showed no signs of disseminated disease (Figure 2). We performed wide laminectomy, tumor removal and instrumentation with a construct from T8 to L1 (Figure 3). Histological tissue analysis of the tumor confirmed Ewing's sarcoma with intralesional surgical margins. Post-operatively, the patient recovered uneventfully. Control MRI confirmed removal of the tumor and cleared spinal canal (Figure 4).

Figure 1: Preoperative MRI (without contrast) T2

Figure 2: Preoperative CT

Figure 3: Postoperative standing X-ray

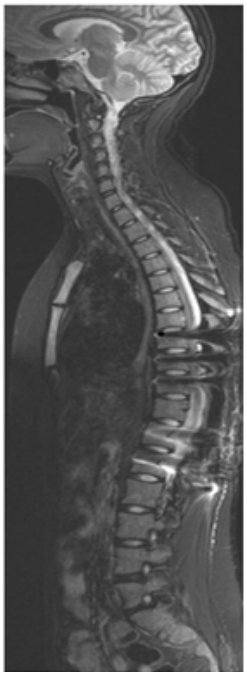

Figure 4: Postoperative MRI T2 TIRM (with contrast Dotarem)

The patient was afterwards treated in the Sarcoma Center at Aarhus University Hospital in accordance with the EURO-EWING 99 protocol. She received six cycles of combination chemotherapy (Vincristine, Ifosfamide, Doxorubicin and Etoposide) followed by localized intensity-modulated radiotherapy (IMRT) delivering 45 Gy in 25 fractions to the primary tumor site (Figure 5). The radiotherapy was delivered concomitantly with Ifosfamide. This was followed by further six cycles of combination chemotherapy (Vincristine, Ifosfamide and Actinomycin D). No additional surgery was performed, and the whole oncological treatment was tolerated well and without lasting complications.

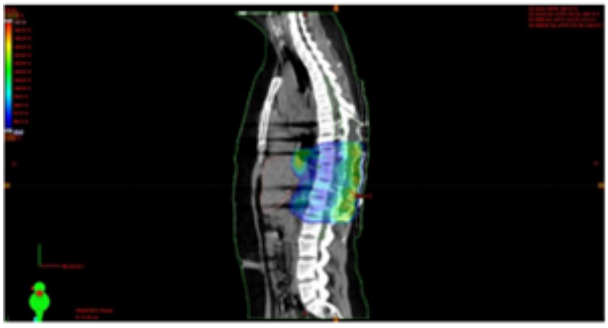

Figure 5: Raditation dose color wash histogram. The figure shows the 107%-95% dose color wash of the 45 Gy given by IMRT technique to the affected vertebrae. A bolus was used to give full dose to the surgical scar. The artefacts caused by the metal plate and screws could be seen

Two years after the diagnosis, the patient started to complain of non-specific pain in the previous surgery area arising while loading the back. X-rays of the spine and the construct showed no changes from previously. MRI and CT confirmed a process at the level of the costovertebral joint on the left side of Th9 level (Figure 6). PET-CT showed positive activity in the area of the process verified by MRI and CT (Figure 7). Patient had no signs of infection. The findings were suspicious for possible relapse of the sarcoma. A CT-guided biopsy was performed (Figure 8).

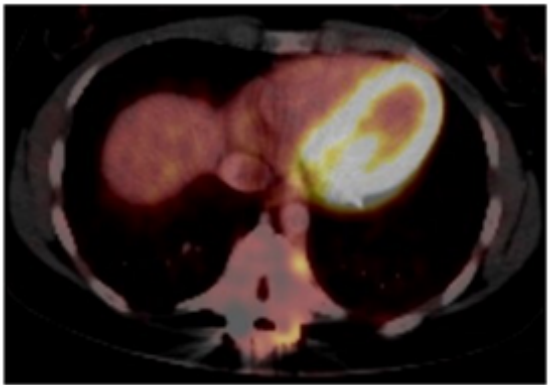

Figure 6: CT with findings of possible tumor relapse atrge level Th9, left side

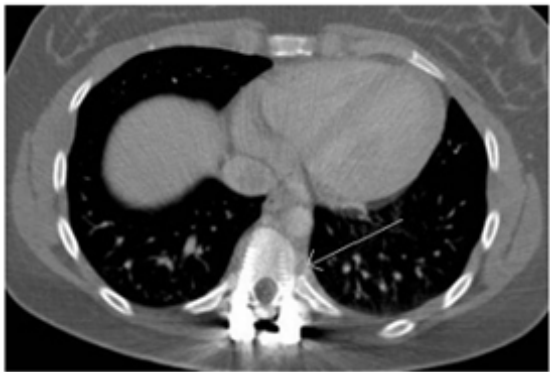

Figure 7: PET-CT with findings of possible tumor relapse at thr level Th9, left side

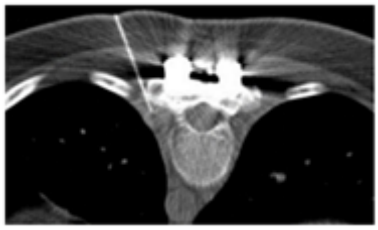

Figure 8: CT-guided biopsy of the process suspicious for the tumor relapse

Histological tissue analyses showed non-specific reactive changes without tumor cells, leaving uncertainty as to whether the biopsy was sufficiently representative, and the patient was scheduled for revision surgery. During surgery, we found severe metallosis along cranial fixation points on the left side. Plugs in two pedicle screws were loose, making micromotion possible that generated severe metallosis from the titanium alloy construct. We performed deep dissection towards the verified process. It proved to be a well-delimited solid tumor. It looked like a lymph node with a drainage system from the area with severe metallosis. The tissue analysis revealed non-specific reactive changes and non-necrotic granulomatosis reaction with pigment deposition. No signs of malignancy. We revised the construct, and the patient's back pain symptoms were eliminated.

Discussion

The loose nut from the pedicle screw head caused micromovements in the screw-rod connection, leading to fretting corrosion. Metal wear debris accumulated in the tissues adjacent to the implant and in segmental lymph nodes. These metal elements elicited an inflammatory process which resulted in a granulomatous reaction in the draining lymph node. This granulomatous reaction produced a hyperintense signal in MRI and was slightly PET positive, leading to the suspicion of local recurrence of the sarcoma.

Currently, in cases where standard curved rods can accommodate the natural curve of the spine, we use PEEK (Polyetheretherketon) or carbon-based spine implants for tumor patients. 'Artifact-free' implants allow and facilitate post-operative CT and MRI controls as well as the use of modern high-dose radiotherapy.

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