



Fracture of fusion mass after hardware removal in patients with high sagittal imbalance

Cara L. Sedney MD, MA; Scott D. Daffner MD; Sanford E. Emery MD, MBA; John France MD
West Virginia University Departments of Neurosurgery and Orthopaedics



Introduction

As spinal fusions become more common and more complex, so do the sequelae of these procedures, some of which remain little understood. The authors report on a series of patients who underwent removal of hardware after CT-proven solid fusion, confirmed by intraoperative findings, who went on to develop a spontaneous fracture of the fusion mass, not associated with trauma. To our knowledge, this is the first single series of such patients, enabling closer examination of possible risk factors.

Methods

A retrospective review of the surgical logs of three, fellowship-trained spine surgeons from the West Virginia University Department of Orthopaedics yielded 7 patients with fracture of a fusion mass after hardware removal. Patient demographics and comorbidities, initial indication for surgery, number of total surgeries, timeline of fracture occurrence, risk factors for fracture, as well as sagittal imbalance were recorded.

Results

All 7 patients underwent hardware removal in conjunction with an extension of fusion for adjacent segment disease across multiple levels. All had CT-proven solid fusion of their previously fused segments, which was confirmed intraoperatively. All patients had multiple previous operations for a variety of indications. Four patients were smokers. Three patients had osteoporosis. Spontaneous fracture of the fusion mass occurred without history of trauma in all patients. These occurred 4 months to 4 years after hardware removal. All patients had significant sagittal imbalance of 13-15 cm. The most common fracture level was L5 in six of the patients, which was the first uninstrumented level caudal to the newly placed hardware in all cases.

Conclusions

The sequelae of hardware removal are largely unknown, but have been best studied in the scoliosis literature. Previous reports of spontaneous fractures through fusion mass have been reported by Ha, Ito, and Wealchi, consisting of single case reports or two patient series (1,2,3,4).

All of the patients in the present series had hardware removed during surgery for adjacent level disease, often due to proximal junctional kyphosis and high sagittal imbalance. Although in the current study we cannot establish a causative relationship, all patients in our series had hardware removed from a previously solid fusion in the setting of high sagittal imbalance which was not corrected, and suffered a fracture through the previous fusion mass even in the face of few other risk factors for poor bone quality. This may relate to a stress shielding phenomenon.

Based upon our case series, the development of a spontaneous fracture of the fusion mass may be related to sagittal imbalance and consideration should be given to re-implanting hardware for these patients, even across good fusions, to prevent spontaneous fracture of these areas if the sagittal imbalance is not corrected.

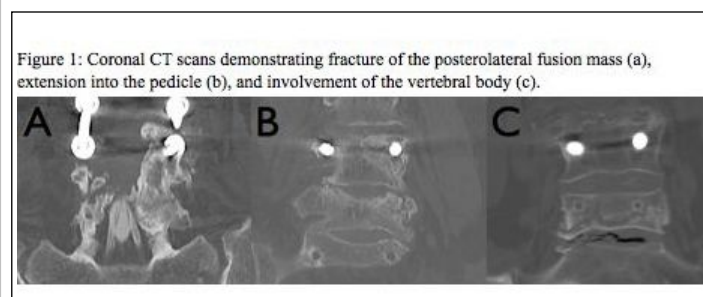


Figure 1: Coronal CT scans demonstrating fracture of the posterolateral fusion mass (a), extension into the pedicle (b), and involvement of the vertebral body (c).

Learning Objectives

By the conclusion of this session, participants should be able to 1) discuss a possible implication of hardware removal in the face of large sagittal imbalance.

References

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3. Ito T, Endo N, Honma T, Hirano T. Late stress fracture of a well-consolidated strut graft after total spondylectomy in the thoracolumbar spine. *Spine* 2011;36;E551-555
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Table 1: Patient Characteristics

Patient	Age	Initial Pathology	Fracture Level	SI	Potential Risk Factors
1	52	Scoliosis	L3	13 cm	M
2	60	Spinal Stenosis	L5	15 cm	S, M
3	63	DDD	L5	13 cm	S, M
4	68	DDD	L5	13 cm	M
5	68	Spondylolisthesis	L5	*	S, O, M
6	71	Unknown	L5	13 cm	S, O, M
7	74	Diskitis	L5	*	O, M

DDD: Degenerative Disc Disease. SI: Sagittal Imbalance. S: Smoker. O: Osteoporosis. M: Multiple previous surgeries. *: standing films not available