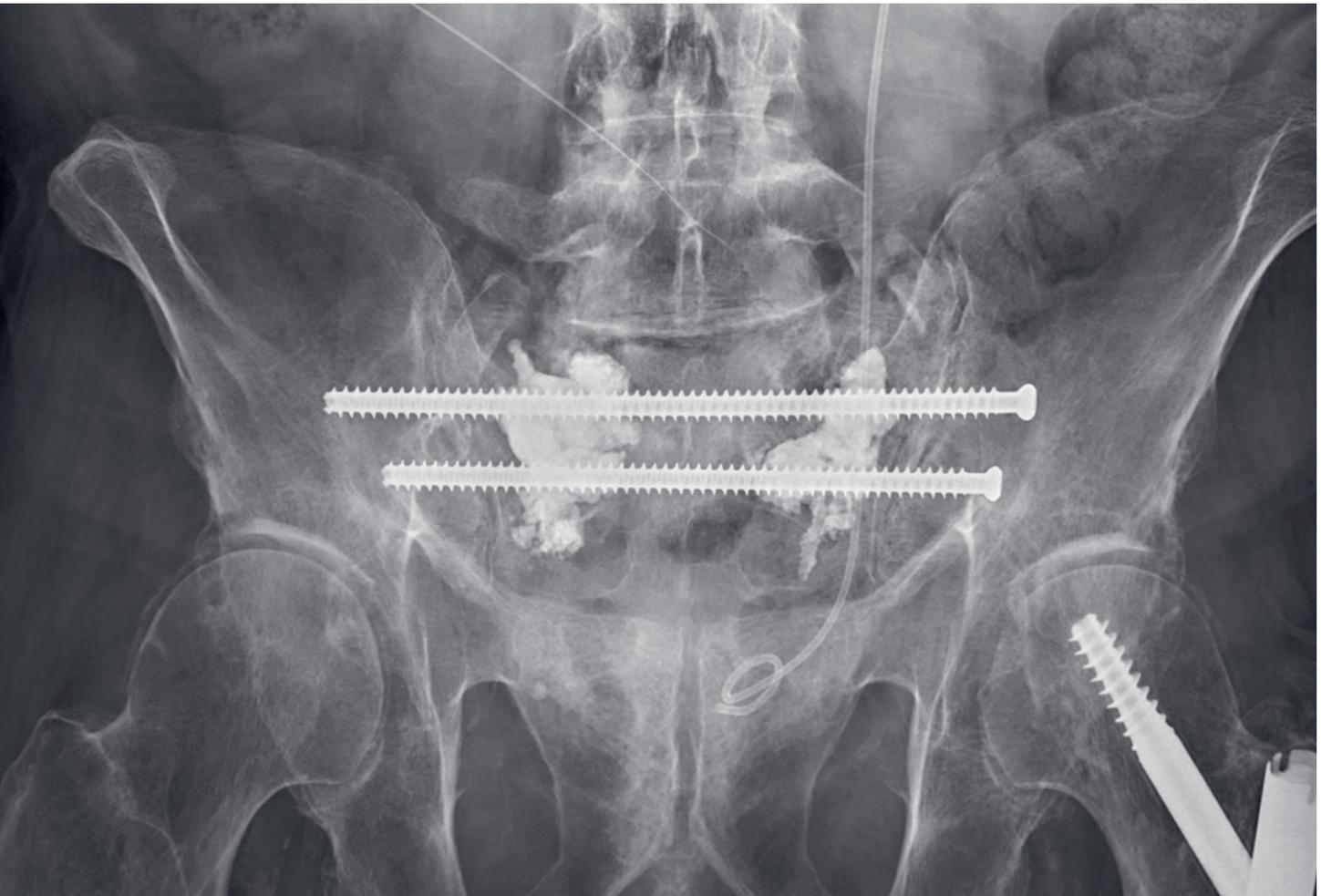


Fluoro Guided Percutaneous Trans-sacral Screw Fixation and CT Guided Sacroplasty

Courtesy: William B. Lea, MD, Department of Radiology, Froedtert Memorial Lutheran Hospital, Milwaukee, Wisconsin, USA



Introduction

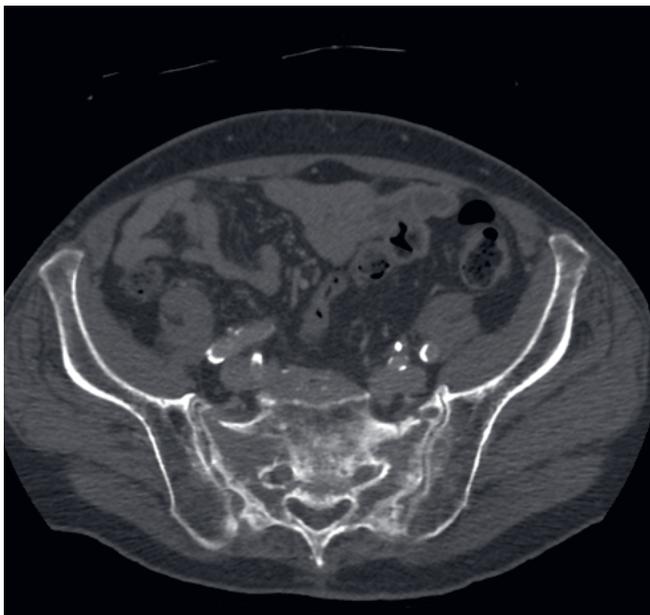
Skeletal complications related to a metastatic disease are an increasing clinical problem. Improved efficacy of new systemic therapies has improved overall survival from many cancer types but led to more patients living with disease and specifically complications related to skeletal involvement. Many treatment options such as high-dose radiation therapy or surgical resection have significant morbidity in bones.

Targeted therapies to control local disease and reinforce osseous structures through minimally invasive techniques such as ablation, embolization, and percutaneous stabilization have emerged as an attractive alternative to more traditional therapies in many cases, often performed as an outpatient procedure with reduced risks and quick recovery.

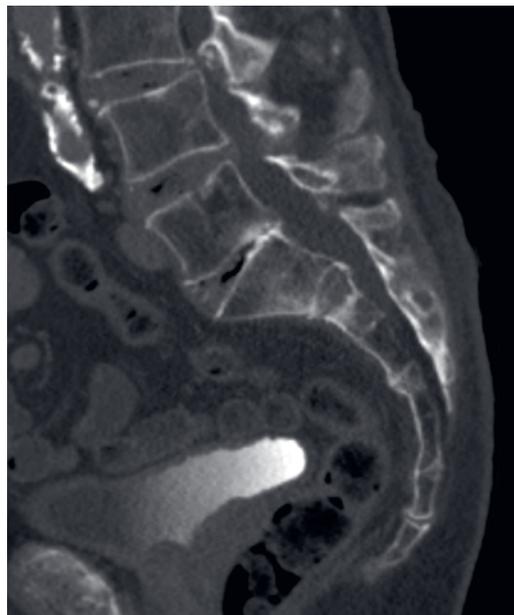
The following case describes a minimally invasive treatment of skeletal complications of malignancy. It was performed by an interventional radiologist in collaboration with our orthopedic oncology service after a multidisciplinary review in a combined Angio-CT room (nexaris Angio-CT) and utilized advanced imaging guidance within both modalities, facilitating single session treatment.

- 1** Axial and sagittal pre-operative CT imaging demonstrating radiation-induced insufficiency fracture of the sacrum bilaterally with extensive bony demineralization.

1a



1b



Patient history

86-year-old male with a past medical history significant for prostate cancer treated with pelvic radiation presented with bilateral sacral insufficiency fractures and moderate low back pain and functional limitation over the previous 3 months which was persistent despite conservative therapy.

Diagnosis

Sacral insufficiency fractures

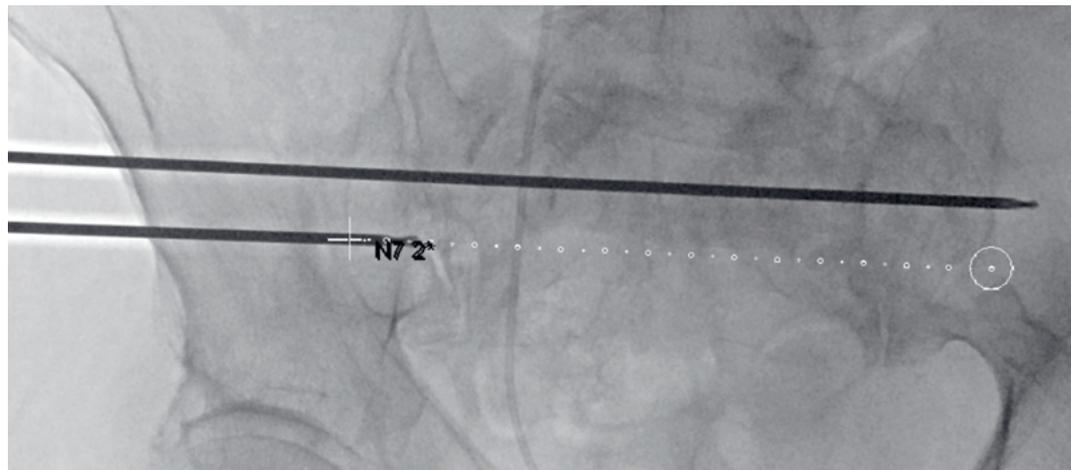
Treatment

Given the size of the fracture cleft in both alae, it was felt that sacroplasty alone would be unlikely to adequately stabilize the sacrum and allow for long term healing. Therefore, a combination of percutaneous trans-sacral screw fixation and sacroplasty was chosen for this patient.

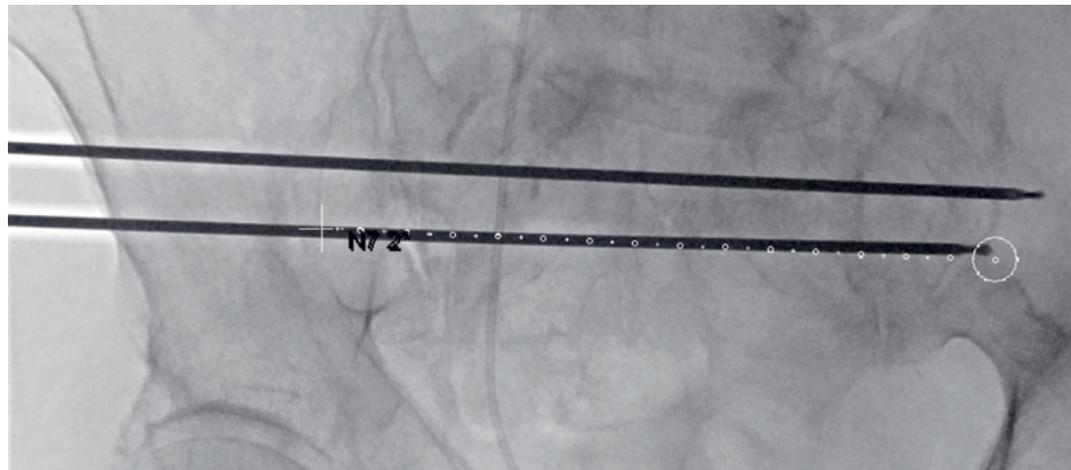
An initial DynaCT run was obtained using an Artis Q C-arm system. After assessing the fracture for interval changes, two linear paths were drawn on the 3D data set through the S1 and S2 trans-sacral corridors using the *syngo* Needle Guidance application. Two additional pathways were also drawn along the long axis of the left and right sacrum, lateral to the neuroforamina.

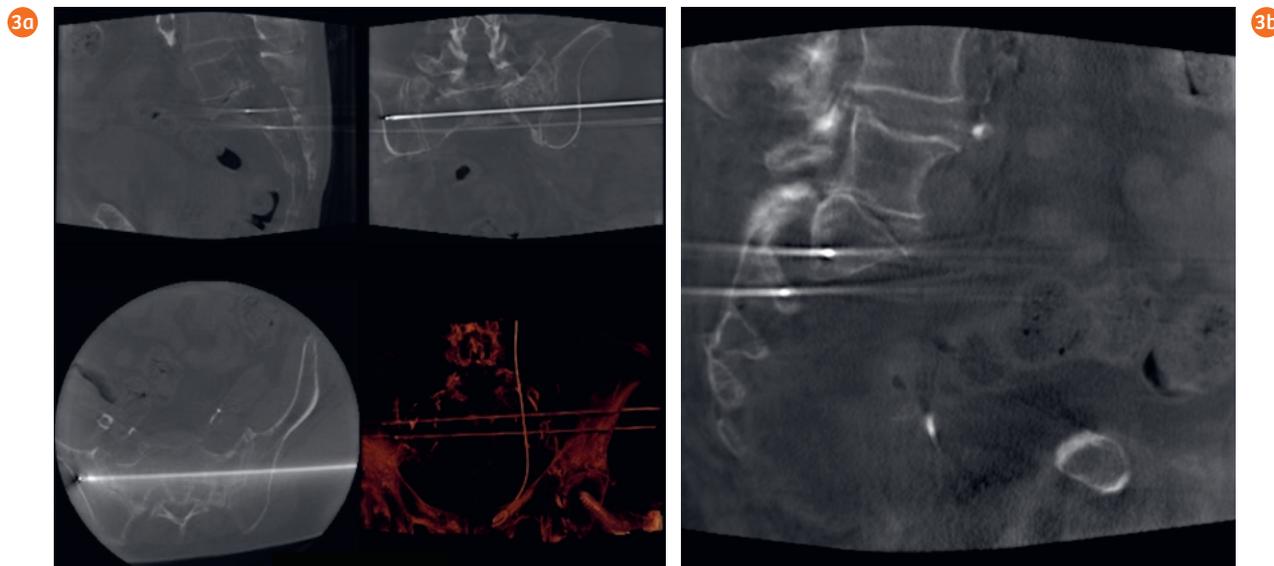
- 2 Intraoperative fluoroscopic needle guidance facilitate placement of a transverse guidepin through the S2 trans-sacral corridor.

2a

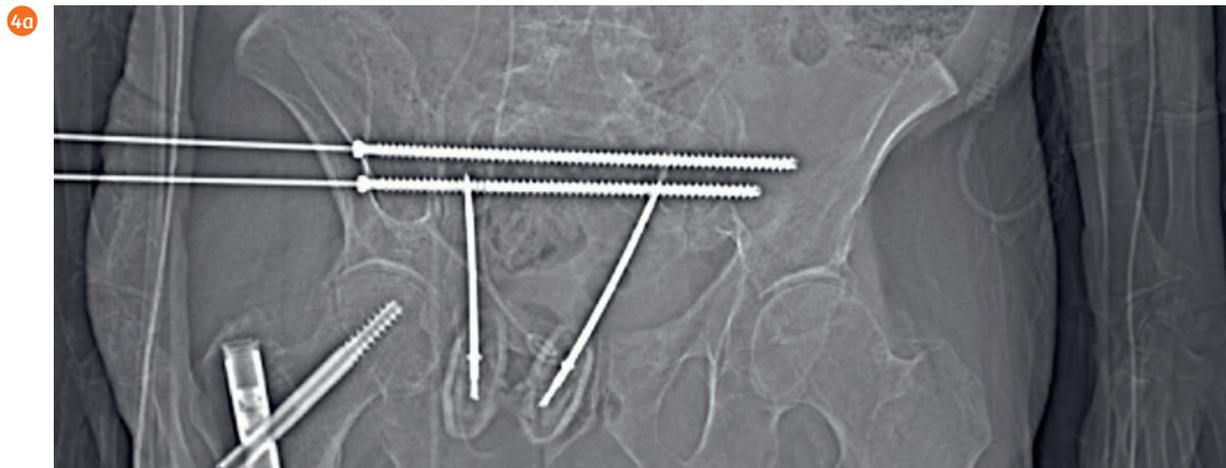


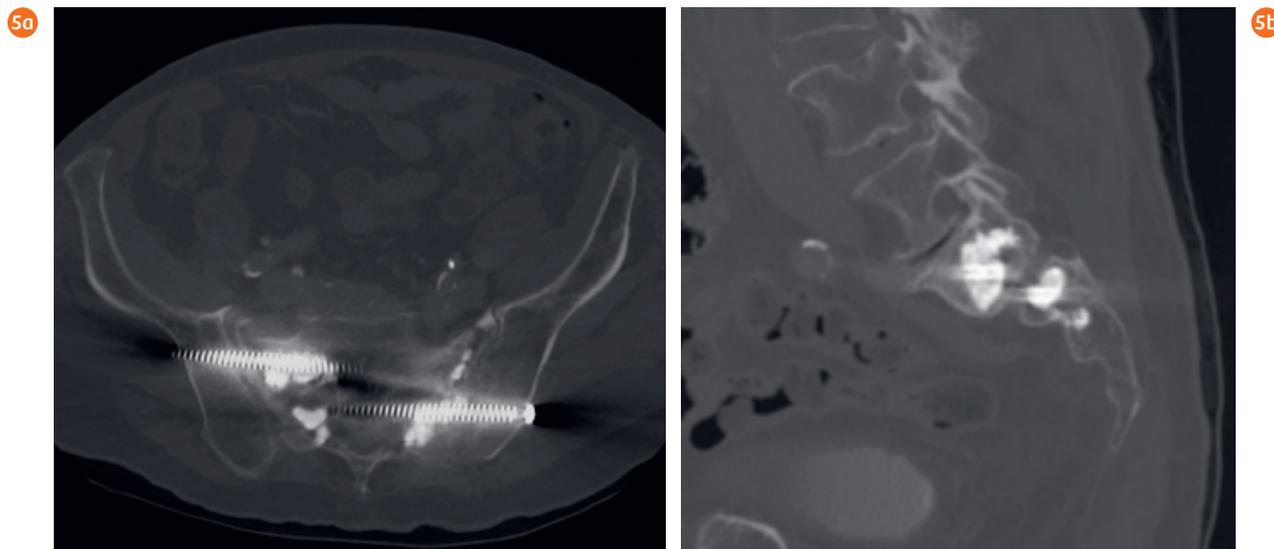
2b





- 3 Intraoperative DynaCT data confirm accurate placement of S1 and S2 trans-sacral guidepins prior to screw placement.
- 4 CT topogram in axial and sagittal planes shows placement of S1 and S2 trans-sacral screws and access trocars in the bilateral sacral alae at time of transition from fluoroscopy to CT imaging.





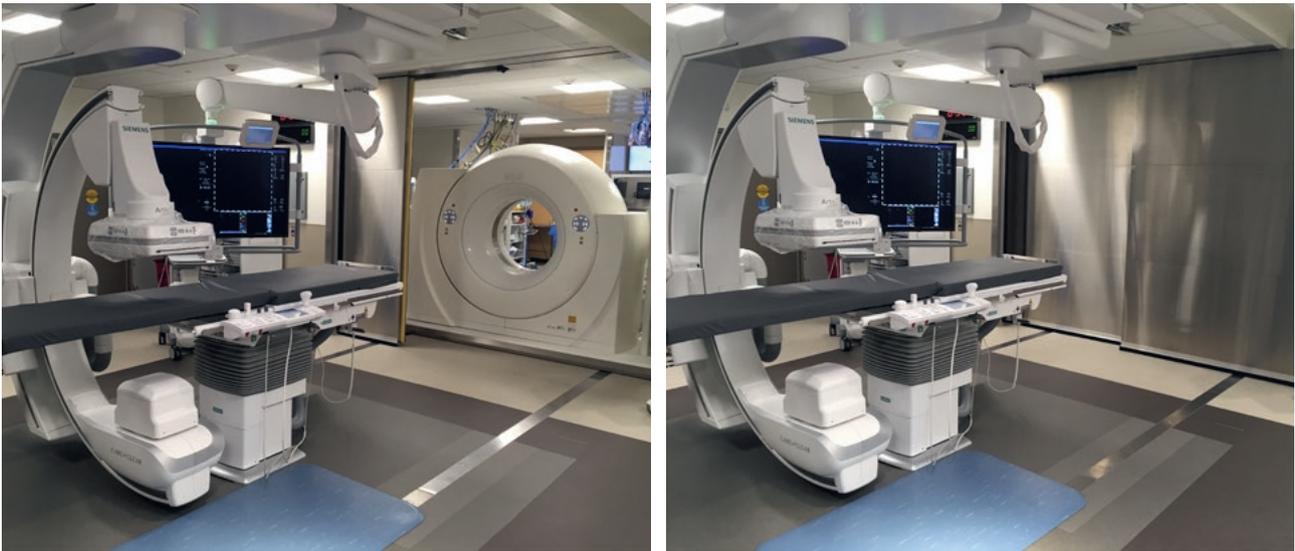
5 Final CT images in axial and sagittal planes show augmented screw placement in S1 and S2 corridors.

Guidepins for cannulated screws were then placed through the trans-sacral corridors utilizing fluoroscopy and the real-time fluoroscopic overlay of the needle guidance paths. Two 11 gauge bone trocars were also placed in the left and right hemisacrum, again utilizing the previously drawn needle guidance pathways. Following placement, a second DynaCT run was performed verifying correct placement of the guidepins and trocars. Two cannulated fully threaded screws were then advanced over the guidepins to their final position.

At this point, the patient was transferred to the CT scanner for sacroplasty. Polymethylmethacrylate (PMMA) was then injected through each sacral trocar under intermittent CT imaging ensuring good deposition within the sacral alae and around the screw threads without extravasation into a neuroforamina.

Comments

For this patient, augmented screw fixation allowed for adequate stabilization through a minimally invasive approach. Orthopedic screw placement can safely and accurately be performed in even very narrow corridors utilizing fluoroscopy in conjunction with *syngo* Needle Guidance software. Moreover, this can be performed with a relatively low radiation dose. However, adequate sacroplasty can be quite difficult to achieve when using fluoroscopy alone, especially when there is severe demineralization, making visualization of the neuroforamina quite difficult. Because of this, cement injection may be terminated early out of concern for extravasation into the neuroforamina. CT imaging provides superior visualization of the neuroforamina and in this particular case facilitated injection of a maximal amount of cement, affording the best chance for adequate stabilization, while ensuring no neuroforaminal extravasation had occurred.



Fluoroscopy and CT imaging can be used in combination or independently from each other which is ideal for this complex treatment.

Conclusion

This case demonstrates the benefit of combining both fluoroscopic and CT imaging in the same procedure. By combining imaging modalities, we were able to achieve results that would not have been possible with the same efficiency or safety if either modality was used in isolation. With minimal interruption, such concurrent systemic therapy, such minimally invasive procedures are an attractive option for many patients and represent an exciting growth opportunity for interventional radiologists working in conjunction with their oncologic colleagues in a multi-disciplinary fashion. ●

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