Vertically Unstable Sacral Fracture Nonunion Revised with Iliac-Iliac Fixation

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- The views expressed are those of the authors and do not reflect the official views or policy of the Department of Defense or its Components.
- The voluntary, fully informed consent of the subjects used in this research was obtained as required by 32 CFR 219 and DODI 3216.02_AF 40-402
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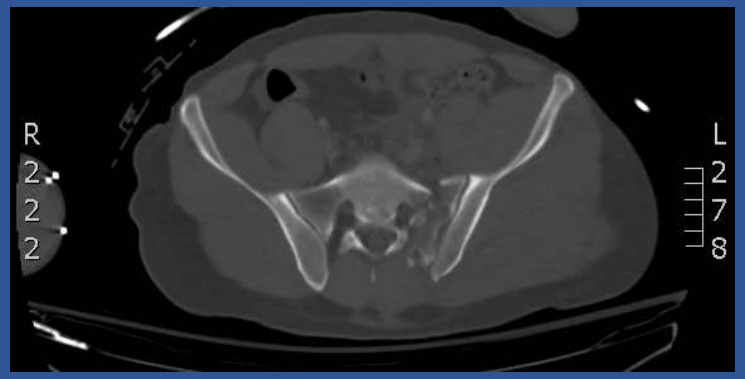
Introduction

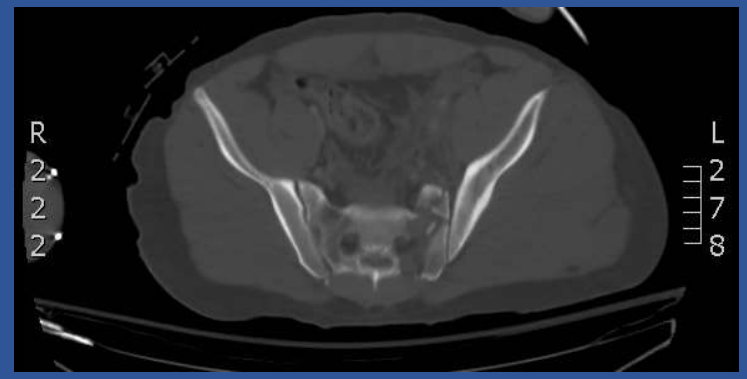
- Union rates of pelvic ring injuries typically high with reported rates ranging from 95-100% in Tile type B fractures and 93-100% in Tile C fractures for appropriately treated injuries.[1]
- Sacral nonunions rare but can cause significant morbidity
- Nearly 80% of nonunions are a result of inadequate treatment to include nonoperative treatment or external fixator alone[2]
- Standard treatment is ORIF with autologous bone graft and often anterior and posterior approaches
  - High blood Loss, significant risk for neurologic damage (5%), high overall complication rate (20%)[2,3]
- We describe a case of sacral nonunion after initial internal fixation revised using autologous bone grafting and a technique of iliac-iliac internal fixation

Case Presentation

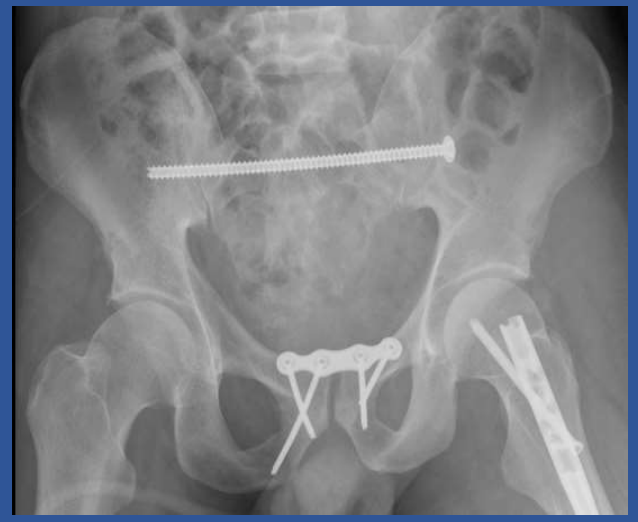
- 33M presented to our facility six weeks after undergoing ORIF pubic symphysis for Left transiliac transsacral screw placement for pelvic ring injury with complete left zone two sacral fracture
  - Neurologically intact, healed surgical incisions. Allowed to fully weight bear at three months after surgery
- Presented to clinic at six months post-operatively with persistent and worsening lower back pain. CT scan obtained which demonstrated no bony union about left sacral fracture. No vertical displacement or translation.
  - Vitamin D low at 28 ng/mL. Remainder of labs to include inflammatory labs and nutrition labs within normal limits.
- Indicated for revision sacral fixation with autograft

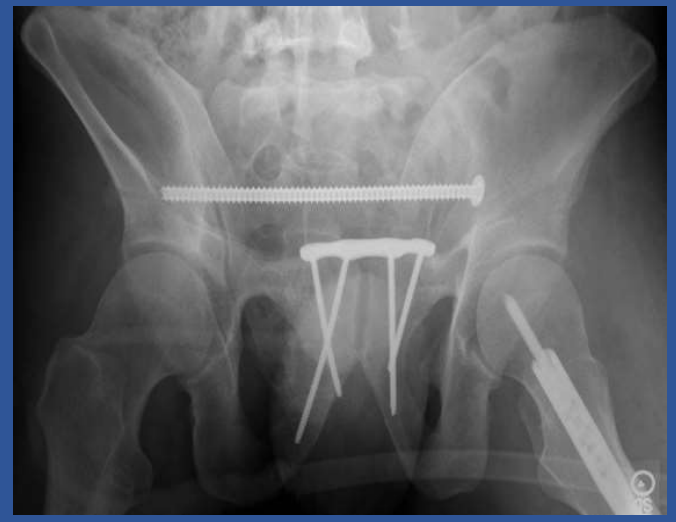
Injury Images from OSH





Post-operative Imaging





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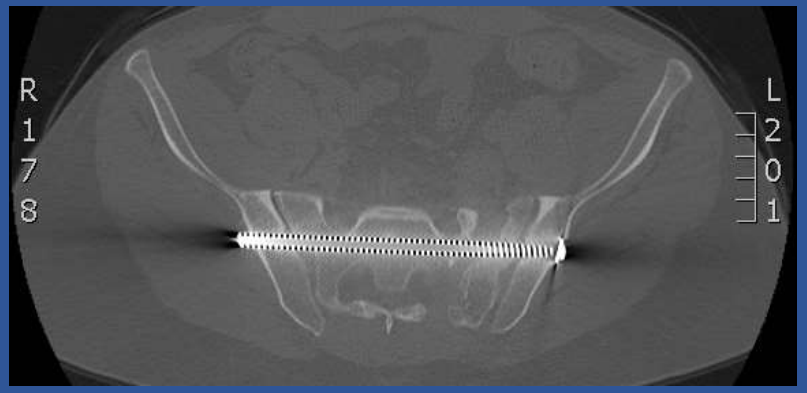
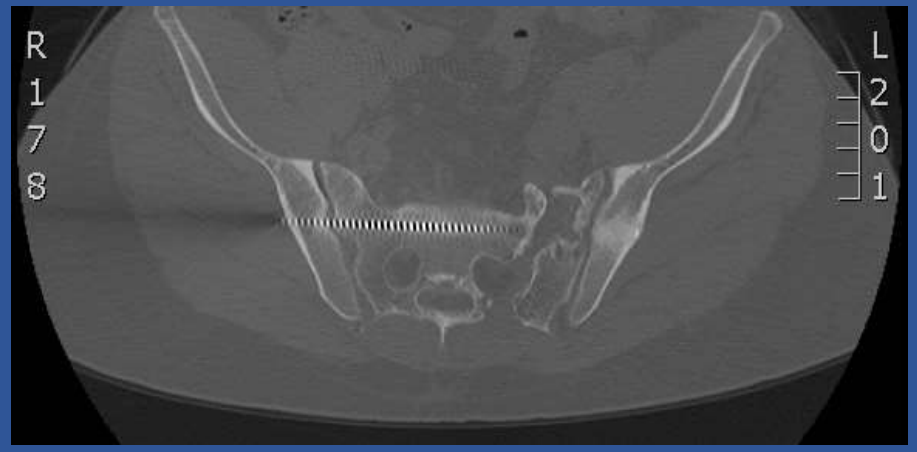
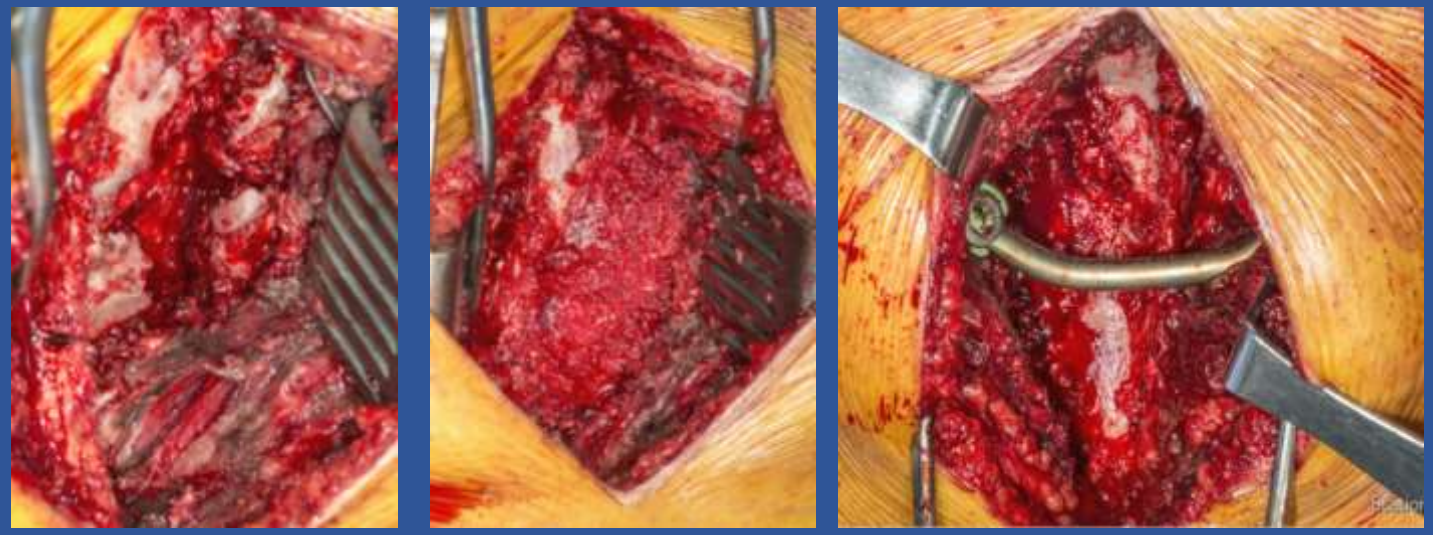




Case Presentation-Surgical Procedure

- Reamer Irrigator Aspirator (RIA) system used to harvest bone graft from Right femur
- Then prone, posterior approach to sacrum
- Used Stryker navigation to guide the debridement from sacral ala to level of S3, and anteriorly to anterior sacral cortex
  - Lateral aspect of S1 and S2 neuroforamen debrided. Triggered EMG used to confirm locations of nerve roots.
  - Duragen placed over lateral aspect of neuroforamen prior to placement of bone graft
- Defect grafted with BMP, NanOss, graft collected from RIA
- Stryker navigation used to place two 7.5mmx80mm bolts, connected with 6mm titanium rod. 5mm of compression applied across rod before locking.
- BMP infused sponges placed anterior to rod over top of graft

Intraoperative Clinical Images



Clinical photos demonstrated nonunion after debridement, placement of bone graft, and placement of hardware

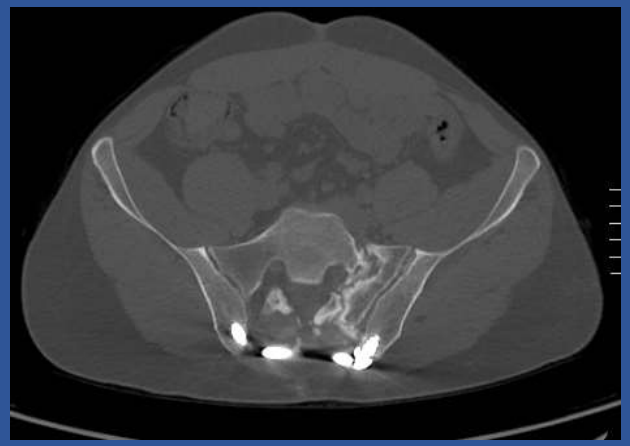
Intraoperative navigation software to guide debridement

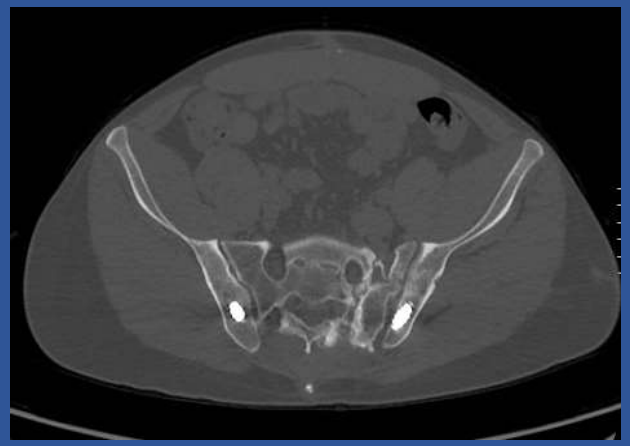
Post-operative Imaging

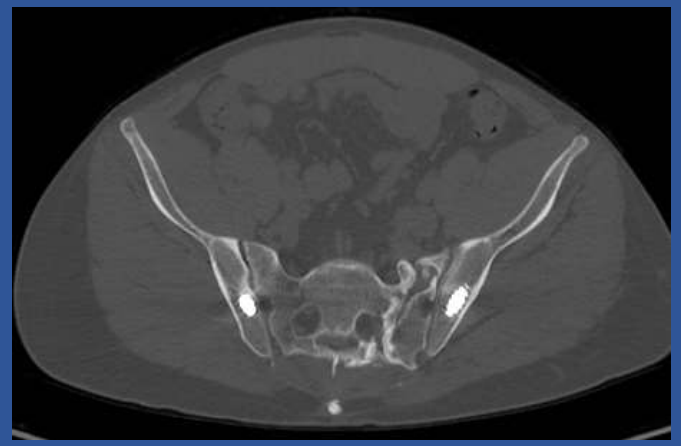
Case Presentation

- Patient recovered without complication. Remained neurologically intact.
- Non weight bearing to Left lower extremity until 12 weeks post-operatively
- Completed intensive physical therapy and gradual return to running.
- By 8 months post-operatively, he returned to full running
- By 10 months post-operatively, he passed to APFT with evidence of union on CT scan at 11 months post-operatively
- Cleared for full return to duty to USA

Post-operative Imaging







Discussion

- Sacral nonunions very uncommon for those fractures initially treated with operative fixation to include percutaneous sacral screw fixation[4,5]
  - Fully threaded transiliac transsacral screw not allowing for compression may have contributed to it
- All nonunions should undergo infectious and metabolic workup with correction of deficiencies
- Sacral nonunion revision procedures historically with high complication rate and morbidity
- We present a novel technique with a single-stage posterior approach using navigation and iliac-iliac fixation that resulted in bony union with good functional outcome

Sources

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- 2. Kanakaris NK, Angoules AG, Nikolaou VS, Kontakis G, Giannoudis PV. Treatment and Outcomes of Pelvic Malunions and Nonunions: A Systematic Review. Clin Orthop Relat Res (2009) 467: 2112-2124.
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Questions?