

Case Series Describing the Use of SPECT/CT for Diagnosis of Delayed Union / Pseudoarthrosis After Midfoot Arthrodesis

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INTRODUCTION

- In this case series, we show the use of SPECT-CT in the evaluation of symptomatic delayed union and pseudoarthrosis after midfoot arthrodesis of adjacent joints and its application for surgical planning.

LITERATURE REVIEW

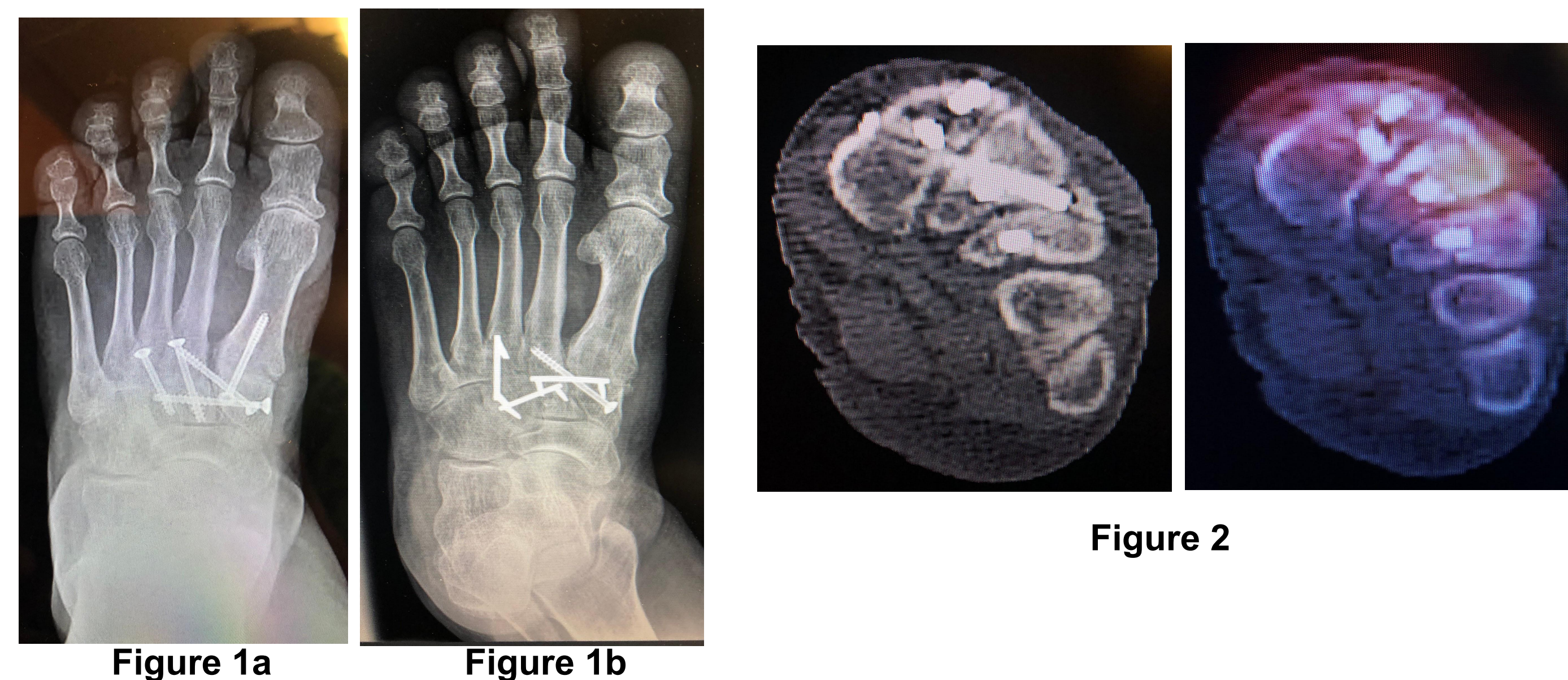
- Single photon-emission computed tomography (SPECT-CT scan) has proven to be useful in diagnosing degenerative joint disease of the foot and ankle by measuring the rate of bone turnover at the site of interest.
- SPECT/CT scan has been shown to low sensitivity and high specificity in excluding infection and confirming non-viability at a nonunion site (Liodakis et al. 2011).
- SPECT/CT can also be used to evaluate post-arthrodesis surgical sites by evaluation of metabolic activity
- Evaluation of pseudoarthrosis, delayed union, or non-union of foot and ankle joints in close proximity may be difficult, particularly with *in situ* hardware.
- We present a series of cases in which SPECT/CT scan was useful in delineating joints of interest in the midfoot following arthrodesis.

METHODS

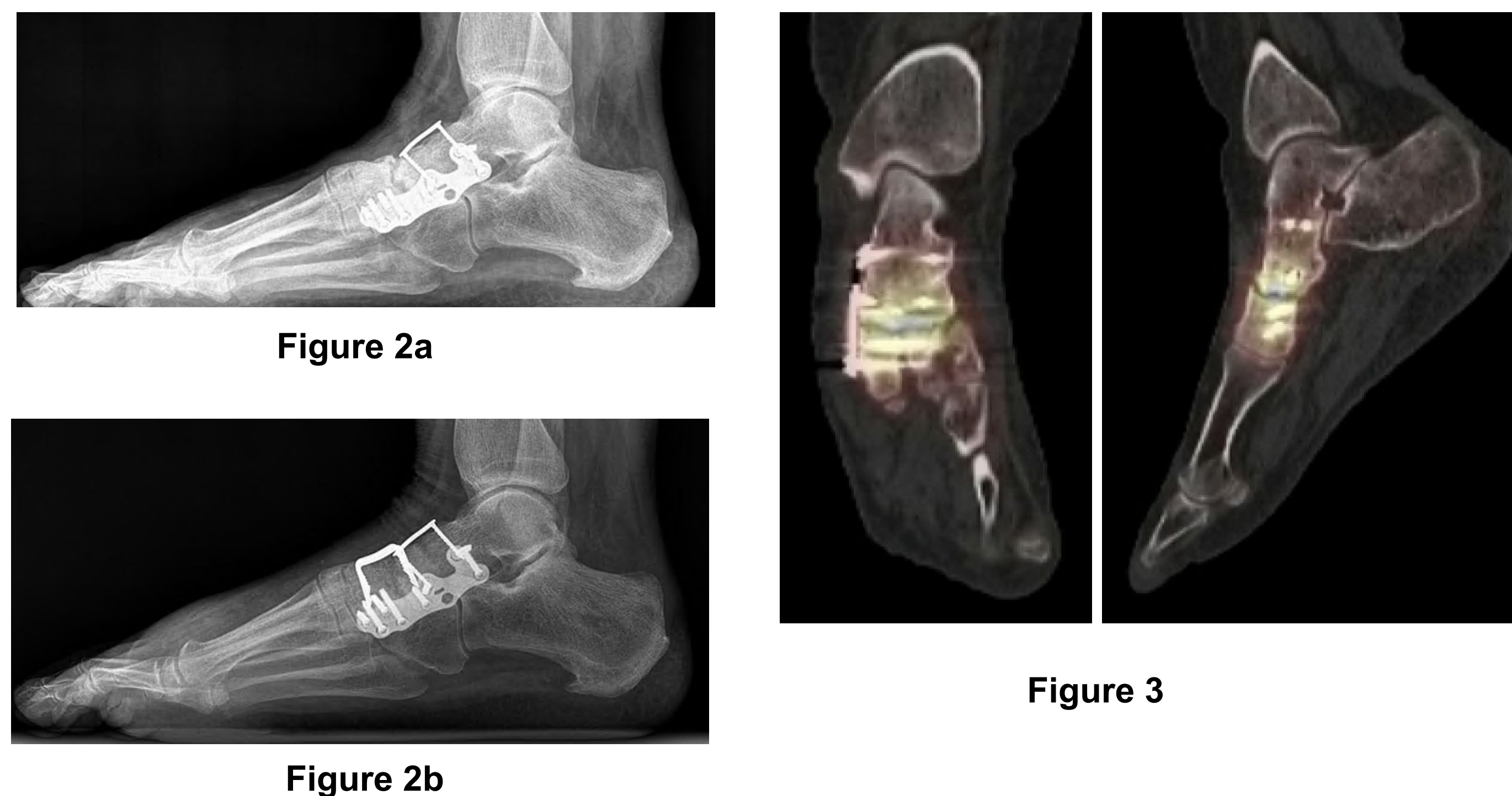
- 3 female patients who developed symptomatic delayed union after undergoing midfoot arthrodesis of multiple joints were included in this case series.
- Delayed union was diagnosed by lack of visualized bony consolidation by radiographs at a minimum of 3 months post-operatively.
- SPECT/CT scan was performed to evaluate each joint fusion site for altered metabolic turnover.
- This information was used for surgical planning for revision surgery in these 3 patients who had clinical symptoms of pain.

CASE SERIES

- All 3 patients underwent arthrodesis of the TMTJ, NCJ, TNJ, or multiple midfoot joints.
- Patient 1: 54 year old Female
 - Initial surgery:** Right TMT 1-3 fusion, NC 1-2 fusion, peroneal tendon repair
 - SPECT/CT:** 17 months post-op - pseudoarthrosis NC joint
 - Revision surgery:** Right HWR, NC and TMT arthrodesis
- Initial surgery:** Left TMT arthrodesis, peroneal tendon repair (**Figure 1a**)
 - SPECT/CT:** 29 months post-op- pseudoarthrosis lateral intercuneiform joint and 3rd TMT joint (**Figure 2**)
 - Revision surgery:** Left HWR, 3rd TMT arthrodesis, intercuneiform arthrodesis (**Figure 1b**)



- Patient 2: 41 year old Female
 - Initial surgery:** 4/20/2018 L gastroc recession, TN fusion, NC fusion
 - SPECT/CT:** 8/16/2019 : 4 months post op - nonunion medial & middle naviculocuneiform joint
 - Revision surgery:** 9/20/2019 L HWR, medial and middle NC joint arthrodesis



- Patient 3: 45 year old Female
 - Initial surgery:** Right TMT 2-3 arthrodesis, NC arthrodesis
 - SPECT/CT** 7 months post-op - pseudoarthrosis NC joint
 - Revision surgery:** Right HWR, NC joint arthrodesis

DISCUSSION

- Pseudoarthrosis and delayed union can be difficult to evaluate in adjacent joints following arthrodesis of the midfoot
- The increased specificity of SPECT/CT compared to MRI or CT in diagnosing non-union makes it a useful modality in the foot and ankle
- SPECT/CT accurately delineated the symptomatic joint from the adjacent midfoot joints at the site of attempted fusion in all 3 patients.
- The results of this case study suggest that SPECT/CT may be useful to evaluate sites of attempted fusion in adjacent joints in the midfoot with retained hardware for pseudoarthrosis, delayed union, or non-union
- This information can be used to guide surgical planning for revision surgery.
- Future studies should include a larger cohort of patients with histopathological analysis of pseudoarthrosis, delayed union, or non-union sites to evaluate the sensitivity and specificity of this modality as it pertains to the midfoot.

CONCLUSION

- SPECT/CT scan may be a useful modality in evaluating adjacent joints of the midfoot following arthrodesis for pseudoarthrosis, delayed union, and non-union despite the presence of retained hardware.
- This information can be useful for surgical planning for revision surgery, if necessary.

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