Does the Removal of Implants Improve Function Following Ankle Open Reduction and Internal Fixation?

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Background

- Removal of orthopaedic implants following fracture healing is one of the most common orthopaedic procedures
  - Rates of implant removal between 5% and 16%
  - Complications reported to be as high as 10%

- Despite the high rates of removal, there is no consensus or guideline for implant removal following uneventful fracture healing

- Several retrospective studies have shown improvement in pain and satisfaction following implant removal

- Prospective outcome studies assessing function following implant removal in the lower extremity are scarce
Purpose

- To evaluate the functional outcomes following the removal of symptomatic ankle implants after open reduction internal fixation of a healed ankle fracture

- **Primary outcome**: Short Musculoskeletal Function Assessment (SMFA) dysfunction index change from baseline to 6-month follow-up

- We hypothesize that removal of implants after a healed ankle fracture will result in improved functional outcomes
Methods

- A prospective implant removal registry between two hospital systems in Minneapolis and St. Paul
  - between May 2013 and August 2016

- Patients completed the SMFA at baseline and at 6 month f/u after implant removal

- Inclusion criteria:
  - skeletal maturity, closed ankle fracture, symptomatic ankle implants

- Exclusion criteria:
  - nonunion, infection or complex regional pain syndrome from initial surgery, other lower extremity surgery performed during the study period

- Regression analysis: evaluated the effects of age, sex, BMI, smoking status, number of comorbidities, and Lauge-Hansen and AO/OTA fracture classification on outcomes
Patient Demographics

- 43 patients (31 females, 12 males)
- Mean age 49.9 years (range, 19 to 83)
- Mean time from initial surgery to implant removal:
  - 37 ± 46 months (range, 2.2 to 209)
- Time from baseline to SMFA completed:
  - 5.7 ± 0.5 months (range, 5.1 to 7.4) following removal
- BMI 26.5 (range, 18.8 to 34.6)
- Workers Compensation 4/43 (9.3%)
- Current Smokers 5/43 (11.3%)
- Diabetes 3/43 (7.0%)
Results

- Lauge-Hansen fracture classification:
  - supination-external rotation: 23 (53%)
  - pronation-external rotation: 6 (14%)
  - pronation-abduction: 2 (4.7%)
  - supination-adduction: 1 (2.3%)

- AO/OTA
  - 44-A: 3 (6.9%)
  - 44-B: 18 (41.4%)
  - 44-C: 11 (25.3%)

- Pilons - 11 fractures (26%)
  - 43-B: 6 (13.8%)
  - 43-C: 5 (11.5%)
SMFA Results

- Significant improved in SMFA **dysfunction index** from baseline to follow-up ($p = 0.002$)
  - Pre-operative: $12.60 \pm 9.8$ (range, 0 to 41.4)
  - Follow-up: $9.0 \pm 9.3$ (range, 0 to 31.1)

- Significant improvement was seen in the secondary outcomes of **bother index** ($p = 0.003$)
  - Pre-operative: $16.0 \pm 12.7$ (range, 0 to 47.9)
  - Follow-up: $11.3 \pm 12.7$ (range, 0 to 45.8)

- And **daily activities** domain ($p = 0.006$)
  - Pre-operative: $12.0 \pm 10.8$ (range, 0 to 45.0)
  - Follow-up: $8.0 \pm 10.7$ (range, 0 to 37.5)
Results

- Regression analysis revealed a significant improvement in the bother index, post-implant removal, correlating with:
  - Female gender ($p = 0.01$)
  - Decreasing number of comorbidities ($p = 0.03$)

- Complications:
  - 1 intra-operative stripped screw requiring hollow over reaming
Conclusion

- Patients who have undergone ORIF of an ankle fracture have a significant improvement in function following the removal of symptomatic ankle implants.

- Appears to be value in removing ankle implants in patients who report discomfort during their daily functions.

- Low intra-operative complication rate.

- Further investigation into the specific indications for implant removal and the impact of injury and fracture pattern on outcomes is warranted.
Literature

- Williams et al, 2012: assessed a heterogeneous population of 69 foot and ankle implant removals at 6 weeks
  - Short-form McGill Pain Questionnaire
  - Showed a significant improvement in pain following implant removal

- Reith, et al., 2015: retrospectively surveyed 70 ankle implant removal patients
  - 332 patients upper and lower extremities
  - 53% reported less pain and 55% better function

- Low complication rate in other studies as well
  - Williams, et al., 2012, 2/69 superficial infections
  - Minkowitz, et al., 2007, 0/60
  - Boyle, et al., 2014, 0/51
  - Gyuricza, et al., 2011, 2/28, broken implants
Limitations

- Small sample size
- No long-term follow-up
- Did not capture all patients who presented for ankle implant removal
- Not compared to a control group
  - Those who did not have an implant removed likely did not have similar pain
- Selection criteria was a painful implant, did not select patients with other reasons for implant removal such as decreased range of motion
2. Grant WB. Variations in solar UVB doses and serum 25-hydroxyvitamin D concentrations may explain the worldwide variation in hip fracture incidence. *Osteoporos Int.* 2012;23(9):2399-2400.
References


