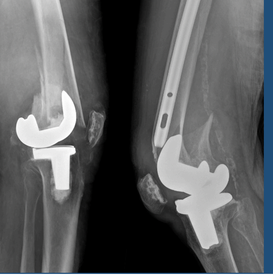

Cable Augmentation for Periprosthetic Distal Femur Fractures

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Research Goal

To relay outcomes comparing cable augmented with non-cable augmented constructs for operative management of periprosthetic distal femur fractures.

Hypothesis

Patients who had cables augmenting their fixation construct will have equivalent outcomes to cableless constructs.

Relevance

- Periprosthetic distal femur fractures are a known complication of total knee replacement
- This classification of fracture has a high degree of associated morbidity and mortality.[1,2] Similar to hip fracture population.[3]
- While **locked plating** and **retrograde intramedullary nailing (RIMN)** are superior to non-operative management and non-locked plating, there have been high rates of early failure requiring revisions.[4,5]

Importance of Cable Fixation

- In **proximal** femoral periprosthetic fractures, cable fixation has been shown to provide immediate fracture stability, early ambulation, and decreased complication rates.[6,7]
- Cable fixation has also been shown to provide provisional fixation intraoperatively, without risking fracture propagation in the manner of lag screw fixation.[7]
- Cables can be placed without affecting final locked plate or intramedullary nail placement

Benefits of this Study

- Significant geriatric population at this institution, providing increased exposure to periprosthetic fractures
- Good adherence to follow up, given relative paucity of trauma centers in the surrounding area

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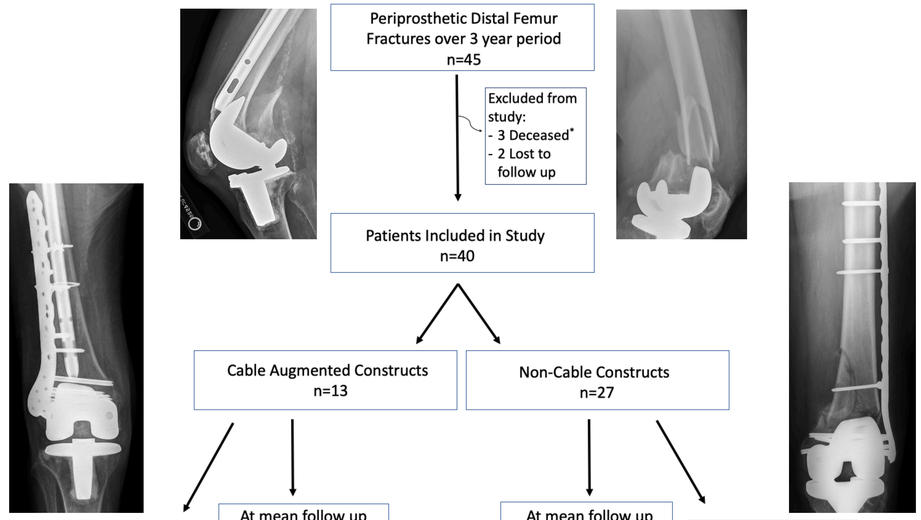
Methods

- **Retrospective study** abstracted from patients age 65 or older that presented to the Reading Hospital Emergency Department with a diagnosis of a periprosthetic femur fracture, from Oct 2015 to Oct 2018.
- Out of 45 patients identified, 40 patients were used after exclusions (figure 1).
- Chart review was performed by three investigators. Independent sampling was performed on the same twenty randomly selected patients, upon which the results were reviewed and compared for accuracy. Discrepancies were reviewed among investigators for a consensus decision.
- **Primary outcome** examined whether there was a change in ambulatory status, defined as a loss of level of independence (LOI) postoperatively, compared to preoperative ambulatory status.
  - Ambulatory LOIs were defined as below:
    - Unassisted (Full), Assisted (Cane/Walker), Non-Ambulatory (Wheelchair).
  - Preoperative and postoperative ambulatory status were compared .
  - Post-operative ambulatory status was assessed by examining physical therapy and orthopedic office notes approximately 9 months after initial operation.
- **Secondary outcomes** included length of stay, operative complications, revisions, and radiologic outcomes.
  - Complications assessed included infection with or without return to OR, DVT, PE, mortality, major medical event, stiffness requiring operative manipulation.
  - Radiologic outcomes were assessed at a goal post-operative time of 6 months. Radiologic films were interpreted as either non-union, partial healing, or healed.
- Continuous data was analyzed using the t test and categorical data using chi-square or Fisher's exact tests, where appropriate. A p value of ≤ 0.05 indicated significance.

Results

	Total (n=40)	Cable Augmented Constructs (n=13)	Non-cable constructs (n=27)	P-value
Age (years)	76.2 ± 9.7	81.9 ± 7.0	73.5 ± 9.7	0.009
LOS (days)	6.6 ± 3.4	7.5 ± 3.9	6.1 ± 3.1	0.2
Revisions	3	0 (0.0%)	3 (11.5%)	0.5
Op. Complications	3	2 (15.4%)‡	1 (3.7%)‡	0.2
Radiologic union	31	8 (61.5%)	23 (85.2%)	0.1
Loss of LOI	**24 (60%)**	**5 (38.5%)**	**19 (70.4%)**	**0.09**



Δ Ambulation	Frequency	Percent
No change	8	61.5
-1 LOI	4	30.8
-2 LOI	1	7.7

Δ Ambulation	Frequency	Percent
No change	8	29.6
-1 LOI	17	63.0
-2 LOI	2	7.4

Healing	Frequency	Percent
Non Union	1**	7.7
Partial Healing	4	30.8
Healed	8	61.5

Healing	Frequency	Percent
Non Union	2	7.4
Partial Healing	2	7.4
Healed	23	85.2

Figure 1 (above): Detailed results demonstrating how change in ambulatory status and radiologic healing status related to operative technique used.
Abbreviations: LOI, level of independence.
*Three patients deceased without follow up, of which 2 died during the same admission and 1 died outpatient. No deaths attributed to orthopedic operation. Two patients did not have any follow up records and were thus denoted as "lost to follow up."
**Radiologic non-union noted after 3 days from injury. Patient did not have follow up imaging.

Table 1 (left): Primary and secondary outcomes.
Abbreviations: LOI, Level of independence. Op., operative.
‡Operative complications included DVT and non-healing wound of thigh in the cable group and a post-operative hematoma in the non-cable group.

Discussion

- As total knee replacements increase, so will the incidence of periprosthetic distal femur fractures. Given their high degree of morbidity, it is essential to further examine operative approaches to improve outcomes. In this retrospective analysis, we were able to determine that when cables were used for fixation, postoperative outcomes were non inferior to cableless fixation.
- Despite a significantly older average age in the cable augmentation group, only 38.5% of patients lost a level of ambulatory independence, compared to 70.4% with non-cable constructs. Additionally, there were no revisions required in the 13 patients who had cable augmentation. These results mirror those of the proximal femoral periprosthetic fracture data and indicate that cable fixation may provide clinically significant benefits to long term ambulatory and operative outcomes in distal periprosthetic femur fractures.
- Moving forward, a more significantly powered prospective study will be considered to further examine cable augmentation for periprosthetic distal femur fractures.

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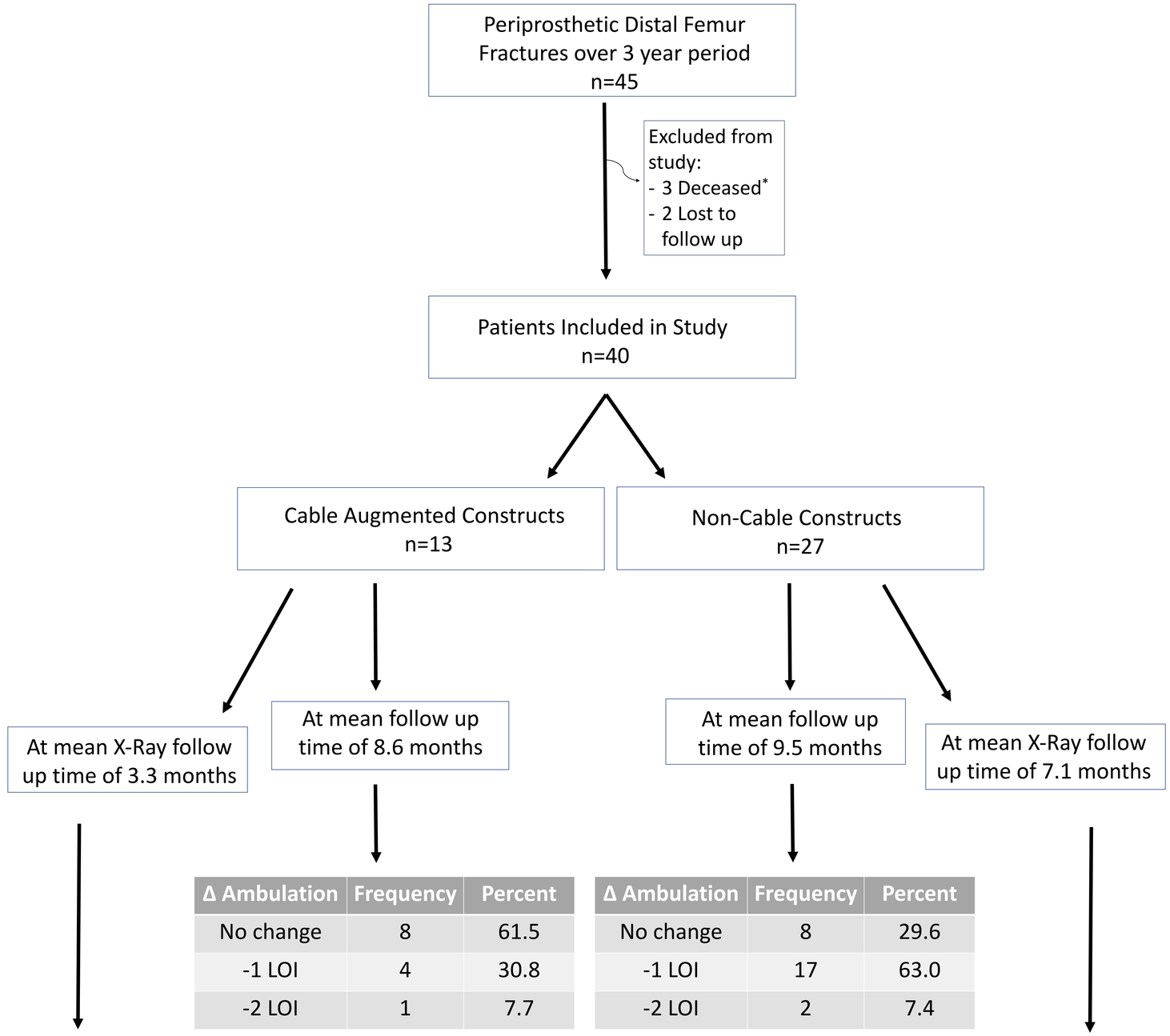

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