

UC Davis
Orthopaedic Surgery

Title

Is Fixation of Butterfly Fragments Necessary for Femoral Shaft Fractures?

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Introduction

- Femoral shaft fractures are relatively common orthopedic injuries typically associated with high-energy trauma in the young population and low-energy trauma in the elderly population
- Surgical management of femoral shaft fractures typically involves fixation with intramedullary nail and/or open reduction and fixation
- Diaphyseal triangular “butterfly” fragments frequently occur in comminuted femoral shaft fractures
- The management of these fragments, including the need for independent reduction or fixation, is unclear in literature

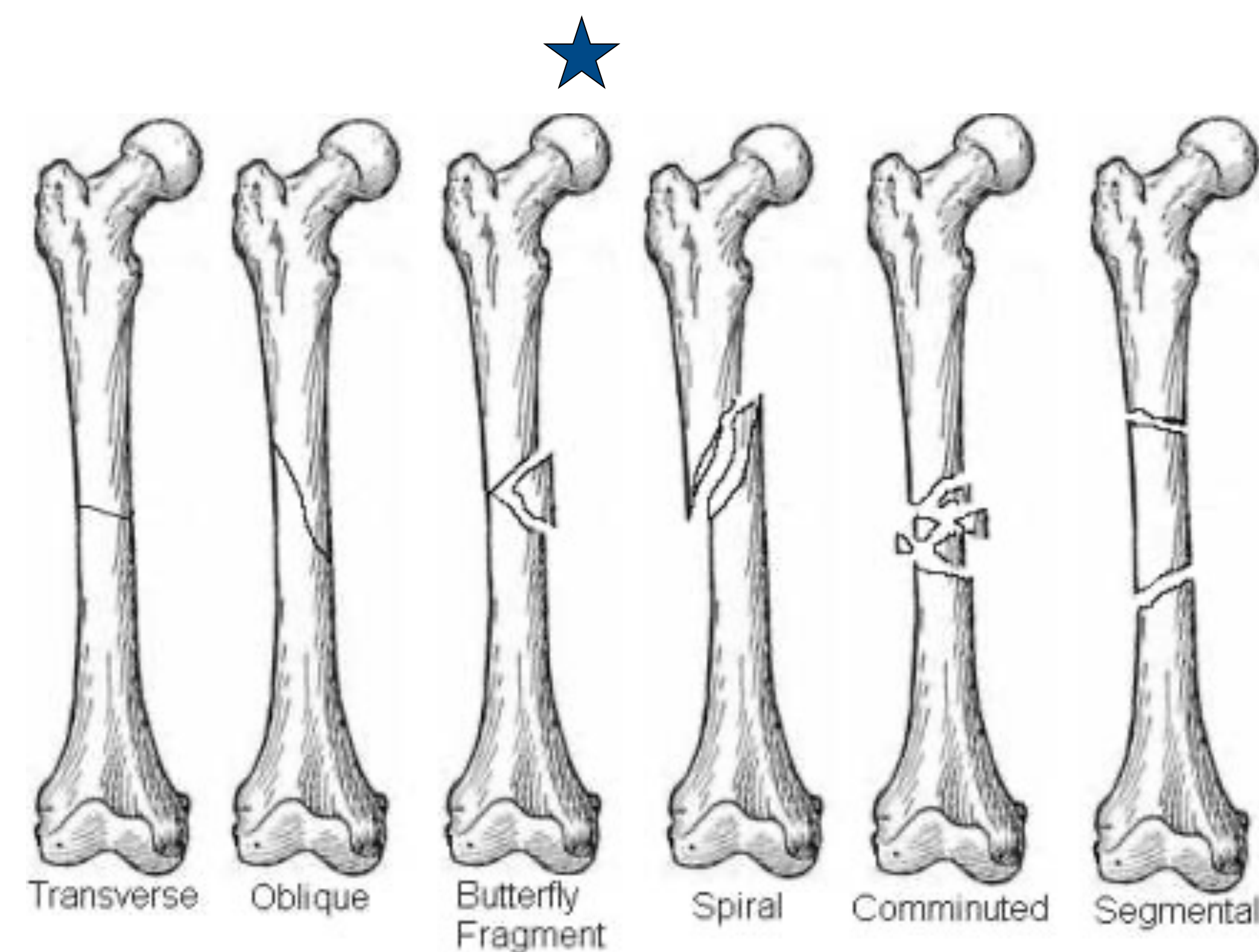


Figure 1: Various types of diaphyseal femoral shaft fractures

Objective

- This study aimed to compare revision rates and associated complications in femoral shaft fractures, with and without reduction of these butterfly fragments

Methods

- A retrospective review was conducted on patients undergoing intramedullary nailing for femoral shaft fractures with butterfly fragments (AO/OTA: 32B) at a Level-1 trauma center between 2014-2022
- Intraoperative fluoroscopy images and operative notes were reviewed to identify whether fragments were percutaneously/open reduced and/or fixed with adjunct implants, “reduced”; or left as is, “not reduced”
- Demographics, injury, and surgical details were collected, along with postoperative complication rates of revision and nonunion unless patient patients were lost to follow up (n=9)

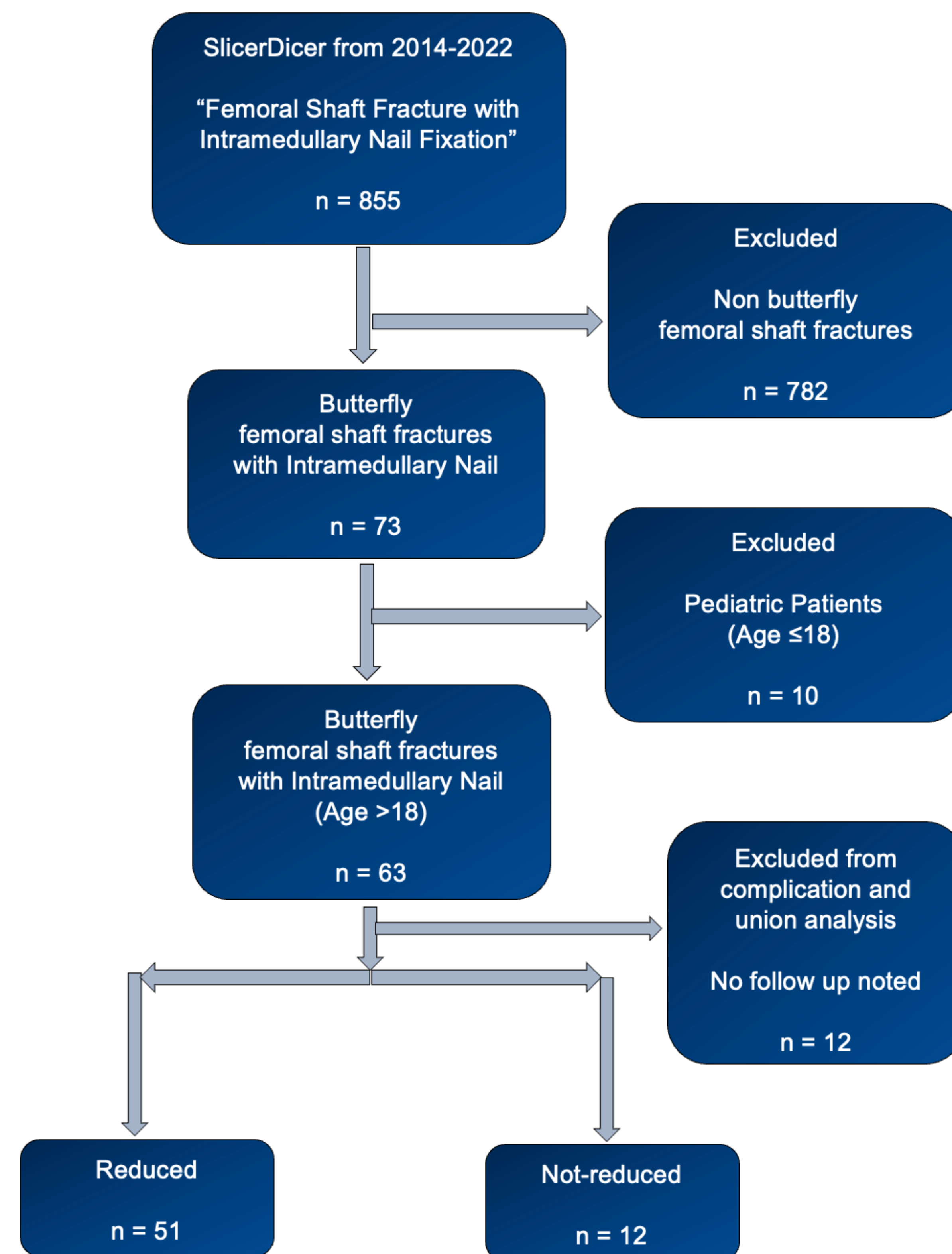


Figure 2: Inclusion and exclusion criterion for this study

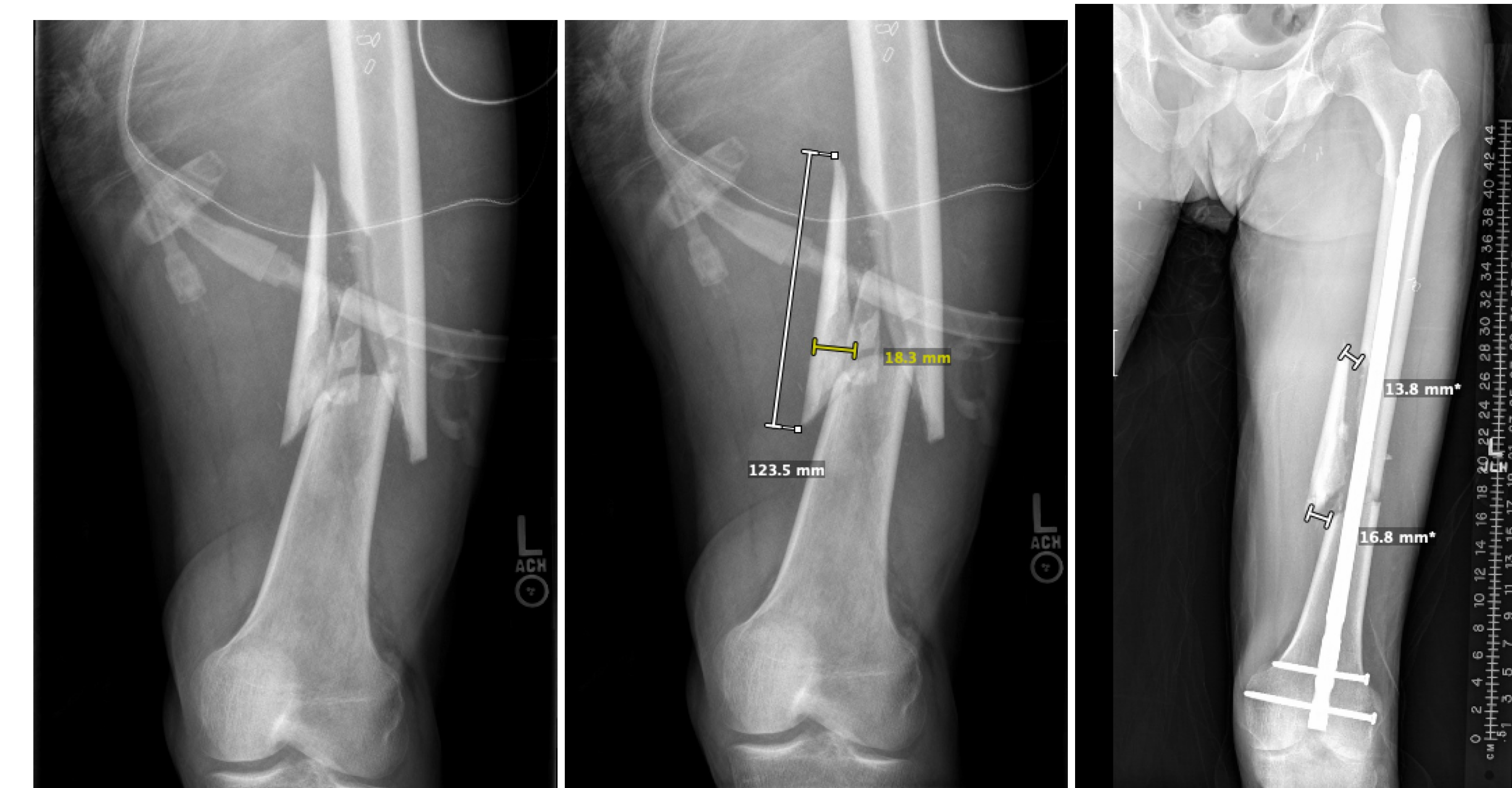


Figure 3: Case example of pre-operation butterfly fragment size (area = 0.5 x H x W) and post-operation distance from original site

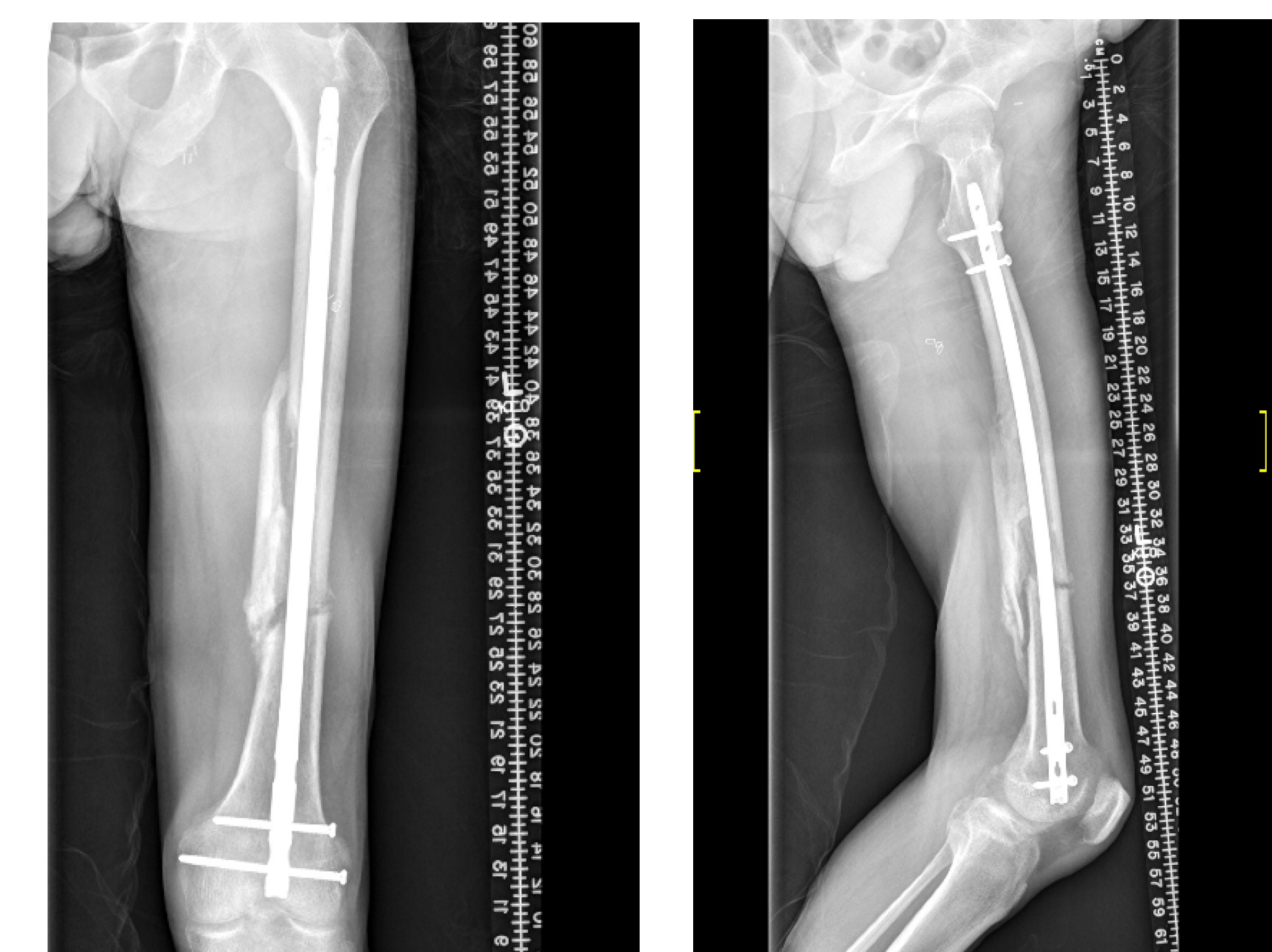


Figure 4: Case example of Lateral and AP radiographs following healing after a femoral shaft fracture with butterfly fragment fixation. mRUST score used to calculate 12 weeks post-operation

Results

	Reduced (n=39)	Not-reduced (n=12)	t-test
Age (years)	34.5	30.8	
BMI	26.5	26.4	
Male	26	10	
Follow up (days)	174	162	
Area of Butterfly (mm ²)	844.44	995.75	0.39
Proximal Displacement (mm)	9.6	23.5	5.2 x 10 ⁻⁵
Distal Displacement (mm)	11.6	26.4	6.6 x 10 ⁻⁵
Total Displacement (mm)	21.3	49.9	1.9 x 10 ⁻⁵
mRust Score at 12 weeks	9.8	8.14	0.07
mRust Score at latest	13.5	13.1	0.72

Table 1: Various averages and p-values between Reduced and Not-reduced groups

- Revision (p=0.33) and nonunion (p=0.51) rates were 11.8% and 5.9% in the reduced, and 25% and 12.5% in the not reduced groups, respectively
- Patients with nonunion or requiring revision surgery showed no significant differences in fragment size or postoperative displacement compared to those without

Conclusions

- Despite observing a lower revision and nonunion rate in the cohort where butterfly fragments were reduced, the lack of statistical significance suggests that the decision to reduce or not reduce may not substantially influence clinical outcomes
- Size and displacement of the butterfly fragment also did not significantly impact nonunion rates in our cohort
- Patients with nonunion or requiring revision surgery showed no significant differences in fragment size or postoperative displacement
- Future studies with larger cohort sizes will provide a more comprehensive understanding of these findings