Optimizing Fixation of Extra-Articular Distal Tibia Fractures: Does the fibula matter?

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Conflict of Interest

- None

Objective

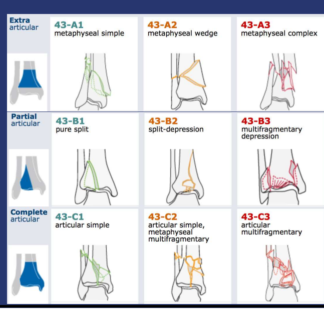
- Evaluate whether lateral column support either through fibular fixation or an intact fibula helped maintain axial alignment in operatively treated distal metaphyseal fractures of the tibia

Introduction

- Extra-articular distal metaphyseal tibia fractures are a relatively rare
  - only 15% of fractures of the distal third tibia
- 80% of these fractures are associated with a fibula fracture.

Introduction

- OTA Classification of Distal Tibia Fractures



Introduction

- OTA Classification of Distal Tibia Fractures

Current Treatment Options

- Functional bracing
- Intramedullary Nail ± fibular fixation
- Plate fixation alone ± fibular fixation
- External Fixation ± fibular fixation

Current Treatment Options

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- Plate fixation alone ± fibular fixation
- External Fixation ± fibular fixation

No Consensus

Purpose

- The purpose of this study was to evaluate whether fibular fixation was associated with lower incidence of post-operative changes in axial malalignment after surgical treatment of distal metaphyseal tibia fractures.

Materials and Methods

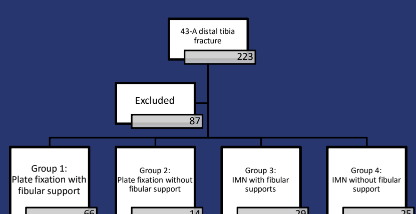
- Retrospective chart and radiographic review of prospectively collected data from July 2005 to June 2015
- 223 fractures identified in 219 patients
- All fractures treated at a level-1 trauma center by one of 5 fellowship trained orthopaedic traumatologists

Exclusion Criteria

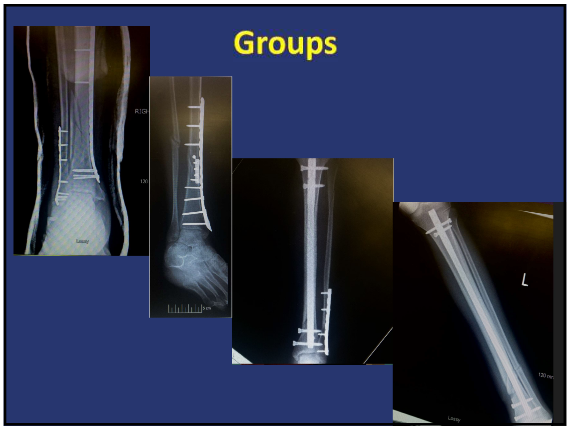
- Less than 12 months follow up (44)
- Skeletally immature (38)
- Treated with external fixation (5)

Included Patients

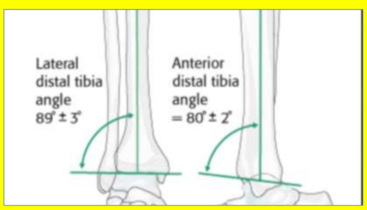
- 132 patients with 134 OTA 43-A metaphyseal tibia fractures were included



Groups



Radiographic Analysis



Results

Patient Demographics

Demographics for Comparison Groups

	Group 1 n=66	Group 2 n= 14	Group 3 n=29	Group 4 n=25
Age (range)	49.7 (18-91y)	50.6 (15-97y)	50.8 (17-73y)	43.7 (17-85)
Sex (%male)	50%	50%	44.8%	43.7%
AO1 Classification				
1	28.8%	28.6%	34.5%	32.0%
2	24.2%	42.9%	34.5%	40.0%
3	47.0%	28.6%	31.0%	28.0%
AO2 Classification				
1	28.8%	21.4%	31.0%	20.0%
2	33.3%	35.7%	20.7%	48.0%
3	37.9%	42.9%	48.3%	32.0%
Comorbidity index average	1.27	1.36	0.93	0.76

Group 1= plate fixation with fibular support. Group 2= plate fixation without fibular support.
Group 3= nail fixation with fibular support. Group 4 = nail fixation without fibular support.

Fracture Alignment

Initial and Final lDTA and aDTA for All Groups

Group	Initial lDTA	Final lDTA	Initial aDTA	Final aDTA
1	88.7 ± 2.2	88.4 ± 3.1	84.3 ± 2.7	83.7 ± 3.2
2	90.5 ± 2.5	89.1 ± 2.3	82.2 ± 2.8	82.1 ± 1.9
3	88.9 ± 1.9	88.4 ± 2.3	85.1 ± 3.6	84.1 ±4.6
4	88.6 ± 3.5	88.0 ± 4.1	84.2 ± 3.5	84.3 ± 5.2

Group 1

- 66 fractures total
  - 12 underwent > 3° angular change
    - 6 were initially fixed outside normal parameters

Angular Changes when Treated with Plate Fixation with Fibular Support

	aDTA vs lDTA	Initial angle	Final angle	OTA Classification	Open vs Closed	Comorbidity index
1	lDTA	*88	81	43-A3.1	open	2
2	lDTA aDTA	*87 *81	82 86	43-A2.2	closed	3
3	lDTA	*90	86	43-A3.2	open	1
4	aDTA	86	82	43-A3.3	closed	0
5	aDTA	86	80	43-A3.2	closed	1
6	aDTA	85	90	43-A2.2	open	7
7	aDTA	85	78	43-A1.2	closed	0
8	lDTA aDTA	85 83	92 72	43-A3.1	open	1
6	aDTA	85	90	43-A2.2	open	7
7	aDTA	85	78	43-A1.2	closed	0
8	lDTA aDTA	85 83	92 72	43-A3.1	open	1
9	lDTA	*89	93	43-A1.2	closed	0
10	lDTA	*86	82	43-A2.2	closed	2
11	lDTA	94	98	43-A3.1	open	0
12	lDTA	*90	85	43-A2.1	open	4

* indicates initial alignments within the normal parameters described for lDTA and aDTA

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Angular Changes when Treated with Plate Fixation with Fibular Support

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1	lDTA	*88	81	43-A3.1	open	2
2	lDTA	*87	82	43-A2.2	closed	3
	aDTA	*81	86			
3	lDTA	*90	86	43-A3.2	open	1
4	aDTA	86	82	43-A3.3	closed	0
5	aDTA	86	80	43-A3.2	closed	1
6	aDTA	85	90	43-A2.2	open	7
7	aDTA	85	78	43-A1.2	closed	0
8	lDTA	85	92	43-A3.1	open	1
	aDTA	83	72			
9	lDTA	*89	93	43-A1.2	closed	0
10	lDTA	*86	82	43-A2.2	closed	2
11	lDTA	94	98	43-A3.1	open	0
12	lDTA	*90	85	43-A2.1	open	4

* indicates initial alignments within the normal parameters described for lDTA and aDTA

Group 2

- 14 fractures total
  - 3 underwent > 3° angular change
    - 1 was initially fixed outside normal parameters

Angular Changes when Treated with Plate Fixation without Fibular Support

	aDTA vs lDTA	Initial angle	Final angle	OTA Classification	Open vs Closed	Comorbidity Index
1	lDTA	95	87	43-A3.1	open	1
2	lDTA	*91	87	43-A3.3	open	3
3	lDTA	*92	87	43-A1.2	open	2

* indicates initial alignments within the normal parameters described for lDTA and aDTA

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  - 3 underwent > 3° angular change
    - 1 was initially fixed outside normal parameters

Angular Changes when Treated with Plate Fixation without Fibular Support

	aDTA vs lDTA	Initial angle	Final angle	OTA Classification	Open vs Closed	Comorbidity Index
1	lDTA	95	87	43-A3.1	open	1
2	lDTA	*91	87	43-A3.3	open	3
3	lDTA	*92	87	43-A1.2	open	2

* indicates initial alignments within the normal parameters described for lDTA and aDTA

Group 3

- 29 fractures total
  - 4 underwent > 3° angular change
    - 3 were initially fixed outside normal parameters

Angular Changes when Treated with IM nail with Fibular Support

	aDTA vs lDTA	Initial Angle	Final angle	OTA Classification	Open vs Closed	Comorbidity Index
1	aDTA	*78	70	43-A1.3	open	0
2	aDTA	89	94	43-A1.2	closed	2
3	aDTA	90	79	43-A2.2	closed	1
4	aDTA	85	78	43-A3.1	closed	1

* indicates initial alignments within the normal parameters described for lDTA and aDTA

Group 3

- 29 fractures total
  - 4 underwent > 3° angular change
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Angular Changes when Treated with IM nail with Fibular Support

	aDTA vs lDTA	Initial Angle	Final angle	OTA Classification	Open vs Closed	Comorbidity Index
1	aDTA	*78	70	43-A1.3	open	0
2	aDTA	89	94	43-A1.2	closed	2
3	aDTA	90	79	43-A2.2	closed	1
4	aDTA	85	78	43-A3.1	closed	1

* indicates initial alignments within the normal parameters described for lDTA and aDTA

Group 4

- 25 fractures total
  - 6 underwent > 3° angular change
    - 1 initially fixed outside normal parameters

Angular Changes when Treated with IM nail without Fibular Support

	aDTA vs lDTA	Initial angle	Final angle	OTA classification	Open vs closed	Comorbidity index
1	aDTA	*79	75	43-A1.2	open	1
2	aDTA	*81	88	43-A2.2	closed	0
3	aDTA	88	97	43-A2.3	closed	1
4	lDTA	*92	88	43-A1.2	closed	0
5	lDTA	*90	85	43-A3.1	closed	0
6	aDTA	*81	76	43-A1.3	open	1

* indicates initial alignments within the normal parameters described for lDTA and aDTA

Group 4

- 25 fractures total
  - 6 underwent > 3° angular change
    - 1 initially fixed outside normal parameters

Angular Changes when Treated with IM nail without Fibular Support

	aDTA vs lDTA	Initial angle	Final angle	OTA classification	Open vs closed	Comorbidity index
1	aDTA	*79	75	43-A1.2	open	1
2	aDTA	*81	88	43-A2.2	closed	0
3	aDTA	88	97	43-A2.3	closed	1
4	lDTA	*92	88	43-A1.2	closed	0
5	lDTA	*90	85	43-A3.1	closed	0
6	aDTA	*81	76	43-A1.3	open	1

* indicates initial alignments within the normal parameters described for lDTA and aDTA

Findings

- No statistical difference between the initial and final alignment when comparing these two groups as a whole.
- 50% of those fractures in which alignment changed by more than 3° were initially fixed outside what is considered normal alignment.
  - 7 of the 13 fractures that were initially fixed within normal parameters but then went onto more than 3° of alignment change, were open fractures.

Findings

- We feel that more important than the fixation method chosen, is the reduction and care with which the implant is placed.

Limitations

- Retrospective study
- Attrition bias
- Treatment bias based on surgeon preference
- Standardization of radiographs

Conclusion

- One of the largest clinical trials to date looking specifically at the importance of fibular fixation in the setting of OTA 43-A fractures.
- Findings: Both locking plate fixation and IM nail fixation, if done properly, offer excellent initial alignment and lasting stability with minimal angular change over time, regardless of fibular support.

Thank you

Any questions?