

Radial Nerve Transection after Ballistic Humeral Shaft Fractures: A Retrospective Cohort Study

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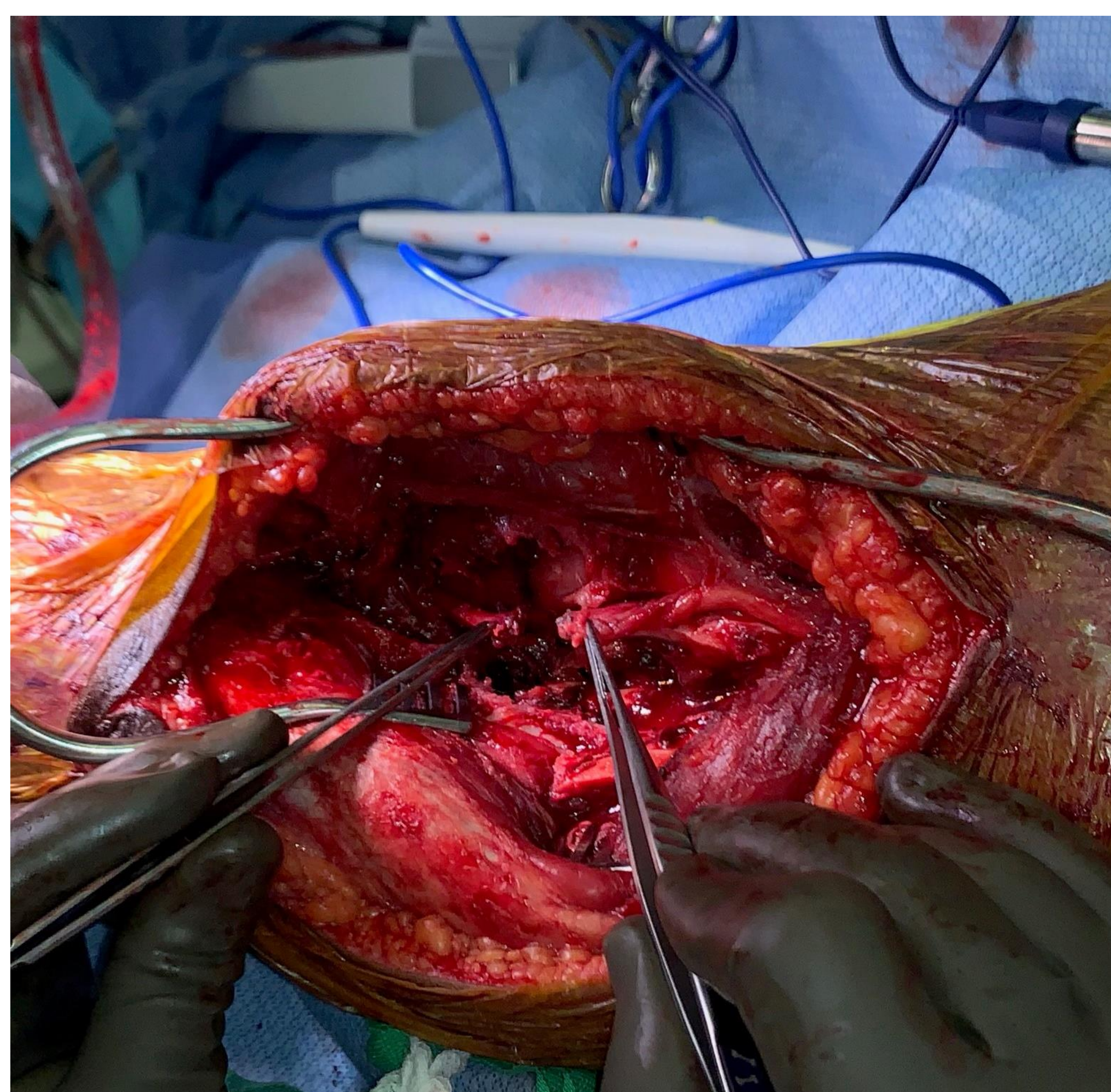
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Introduction

- Radial nerve palsy following fracture of the humerus is common.
- Many studies have concluded nonoperative management is appropriate in the setting of humerus fractures with radial nerve palsy.
- The purpose of this study was to determine the incidence of radial nerve transection after ballistic fracture of the humerus.

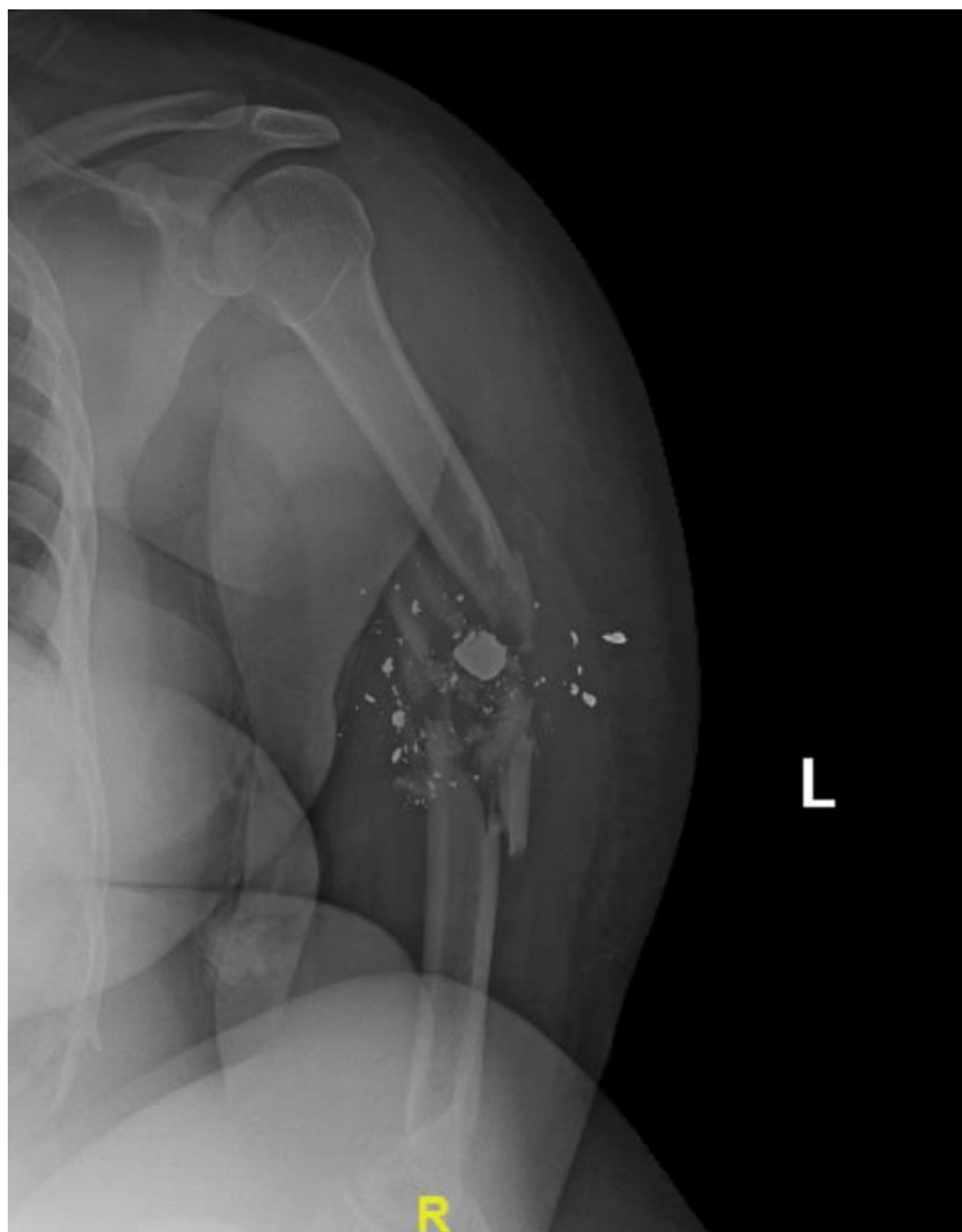


Methods

- Patients who had sustained a ballistic humeral fracture were identified through International Classification of Disease and Current Procedural Terminology codes from January 1, 2014 to December 31, 2021
- Nerve palsy was defined as complete absence of both sensory and motor functions of the radial nerve on initial presentation.
- Nerve transection was identified based on review of the operative report
- Univariate analysis was conducted using a student's t-test for continuous variables and a chi-square test or Fisher-exact test (for expected values of less than five) for categorical variables. Statistical significance was defined as a p-value of less than 0.05.

Results

- Thirty of 184 (26.5%) patients reviewed had a complete radial nerve palsy on exam
- Twenty (66.7%) patients were taken to the operating room. The nerve was visualized in 17 of these cases.
- Fourteen nerve injuries were identified (2 partial laceration, 12 transections).
- In patients with a complete nerve deficit on examination who underwent operative treatment with nerve exploration, the rate of nerve transection was 70.6%.
- The lower bound rate of nerve transection for all patients with radial nerve palsy (assuming all unexplored nerves were intact) was 40.0%.
- Radial nerve deficit on presentation, other nerve deficit, and anatomic location of ballistic fracture to the middle 1/3 of the humerus were associated with radial nerve transection.



Conclusions

- The rate of nerve transection in patients with humerus shaft fractures with associated radial nerve palsies is likely higher than the rate of nerve transection in similar injuries caused by blunt mechanisms.
- Further study on the topic of ballistic humerus shaft fractures, particularly those with radial nerve palsies, is warranted, and current treatment algorithms may need to be updated for these injuries.

Table 1: Comparison of Patients with and without Nerve Transection

Age	Sex	Missile Characteristics	OTA Classification	Anatomic Location	Vascular Injury
25	Male	Fragmentation	12B	Middle 1/3	No
21	Male	Fragmentation	12C	Distal 1/3	No
25	Male	Fragmentation	12C	Distal 1/3	Yes - Brachial artery, brachial vein, ulnar artery
25	Male	Missile without Fragmentation	12C	Middle 1/3	No
26	Male	Missile without Fragmentation	12C	Middle 1/3	No
19	Male	Fragmentation	12B	Distal 1/3	No
25	Male	No missile fragments	12B	Middle 1/3	No
21	Female	Fragmentation	12C	Distal 1/3	No
27	Female	Fragmentation	12C	Middle 1/3	No
29	Male	Fragmentation	12C	Middle 1/3	No
21	Male	Fragmentation	12B	Distal 1/3	No
33	Male	Missile without Fragmentation	12B	Middle 1/3	No

Table 2: Characteristics of Patients with Nerve Transection

Univariate Analysis	Nerve Transected N=12	Nerve Intact N=101	P-Value
Age (Mean Years ± Standard Deviation)	24.8 ± 3.9 years	28.2 ± 10.4 years	0.26
Sex (% Male)	10 (83.3%)	90 (89.1%)	0.63
Diabetes	0 (0.0%)	1 (1.0%)	1.00
Tobacco Use	1 (8.3%)	27 (26.7%)	0.29
Drug Use	0 (0.0%)	31 (30.7%)	0.52
Radial Nerve Deficit on Presentation	12 (100%)	42 (41.6%)	<0.01
Sensory	11 (91.7%)	27 (26.7%)	<0.01
Motor	12 (100%)	35 (34.7%)	<0.01
Both	11 (91.7%)	19 (18.8%)	<0.01
Other nerve Deficit	5 (41.7%)	12 (11.9)	0.02
Vascular Injury	1 (8.3%)	4 (4.0%)	0.44
Bullet Characteristics			0.26
No bullet	1 (8.3%)	31 (30.7%)	
Bullet without fragmentation	3 (25.0%)	17 (16.8%)	
Bullet with fragmentation	8 (66.7%)	53 (52.5%)	
OTA Classification			0.12
12A	0 (0.0%)	18 (17.8%)	
12B	5 (41.7%)	21 (20.8%)	
12C	7 (58.3%)	62 (61.4%)	
Location			0.10
Proximal 1/3	0 (0.0%)	26 (25.7%)	
Middle 1/3	7 (58.3%)	51 (50.5%)	
Distal 1/3	5 (41.6%)	24 (23.8%)	