The Impact of Obesity on Neurovascular Injuries in Supracondylar Fracture Patients

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INTRODUCTION

- Obesity is reaching epidemic levels in the United States within both general and pediatric populations.
- Obese individuals are increased risk of adverse psychological and health consequences, including increased fracture risk.
- Supracondylar humerus fractures are among the most common fractures within pediatric patients and pose a significant risk of neurovascular complications.

Study Goals

- This study aimed to determine whether **obesity** was a significant predictor of ***neurovascular complications*** following **supracondylar humerus fracture**.

METHODS

- Retrospective review using the National (Nationwide) Inpatient Sample (NIS) from 2005-2012.
- Patients with open and closed supracondylar humerus fractures were identified by ICD-9 codes and stratified using the NIS obesity assignment (present vs. not).
- ICD-9 codes were utilized to identify axillary, median, ulnar, radial, musculocutaneous, cutaneous sensory, and digital nerve injuries.
- Vascular injuries such as brachial laceration, radial vessel damage, upper extremity thrombosis, compartment syndrome, and osteonecrosis were also identified.
- Univariate analysis compared rates of neurological and vascular complications between obese and non-obese patients.
- Multivariate binary stepwise logistic regression models identified independent predictors of neurovascular complications (covariates: age, gender, Deyo Index score, and fracture pattern [open vs. closed]).

RESULTS

- 23,319 patients were identified with supracondylar humeral fractures (Obese: n=629, mean age: 54.9 years; Non-Obese: n=22,500, mean age: 26.48 years).
- From 2005-2012, the proportion of obese patients with supracondylar fractures significantly **increased from 1.79% to 3.5% (p<0.001)**. A **larger proportion of obese patients had open fracture patterns** when compared to non-obese (14.9% vs. 8.1%, **p<0.001**).
- Obese patients experienced significantly greater rates of neurological injury: **ulnar nerve injury** (**2.1%** vs. 1.0%), **ulnar nerve lesion** (**2.70%** vs. 0.70%), **radial nerve lesion** (**2.20%** vs. 0.71%), and **total neurological complications** (**7.8%** vs. 3.6%) (all p<0.011) **(Table 1).**
- Obesity was a significant independent predictor of neurological damage in patients with supracondylar fractures (OR: 1.804 [95% CI: 1.265-2.574].
- Fracture type (open vs. closed) was the strongest predictor of neurological complications (OR: 2.895 [2.378-3.524]) (all p<0.001). Rates of vascular injuries did not differ significantly between groups.

Neurological Complication	Non-Obese	Obese	p-value
Axillary Nerve Injury	0%	0%	0.813
Median Nerve Injury	0.50%	0%	0.071
Ulnar Nerve Injury	1.00%	2.10%	**0.011**
Radial Nerve Injury	0.70%	0.80%	0.65
Cutaneous Sensory Nerve Injury	0%	0%	0.813
Digital Nerve Injury	0%	0%	1.000
Ulnar Nerve Lesion	0.70%	2.70%	**p<0.001**
Radial Nerve Lesion	0.70%	2.20%	**p<0.001**
Carpal Tunnel Syndrome	0.20%	0.20%	1.000
Median Nerve Lesion NEC	0.20%	0.20%	1.000
Total Neurological Complications	3.60%	7.80%	**p<0.001**
Vascular Complication	**Non-Obese**	**Obese**	**p-value**
Compartment Syndrome	0.20%	0%	0.302
Upper Extremity Thrombosis	0.10%	0.20%	0.631
Radial Vessel Damage	0%	0%	0.597
Upper Extremity Vascular Injury	0%	0%	0.772
Brachial Laceration	0.30%	0.50%	0.447
Total Vascular Complications	0.30%	0.20%	0.506
Total Neurovascular Complications	3.90%	7.90%	**p<0.001**

Table 1. Comparison rates of neurological and vascular complications between obese and non-obese patients following supracondylar fracture of the humerus.

CONCLUSIONS

- To date, few studies have reported on the association between obesity and the incidence of neurovascular injury following supracondylar humerus fracture.
- This investigation identified a significant increase in incidence of neurological complications among obese patients and highlights obesity as a strong independent predictor of neurological complications in the setting of supracondylar fracture.
- These findings have important implications for the management of supracondylar fractures within the obese population and underscore the importance of current efforts to curb obesity.

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