

## Pediatric Cervical Spine Injury Treatment: Surgical Fusion versus Halo Vest Immobilization

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### Introduction

- Pediatric cervical spine injuries without spinal cord injury can be treated using either surgical fusion or halo vest immobilization.
- Despite widespread use of these two treatment options, no studies within the pediatric population have compared complication rates and cost for surgical fusion vs. halo vest immobilization.
- Differences in the operative vs. non-operative treatment outcomes of different cervical fracture locations—that is, atlantoaxial (C1-2) vs. subaxial (C3-7) fractures—have not been adequately addressed in the pediatric population.
- We used the Nationwide Inpatient Sample (NIS) to compare in-hospital complication rates following either surgical fusion or external fixation in pediatric patients with atlantoaxial and subaxial injuries.

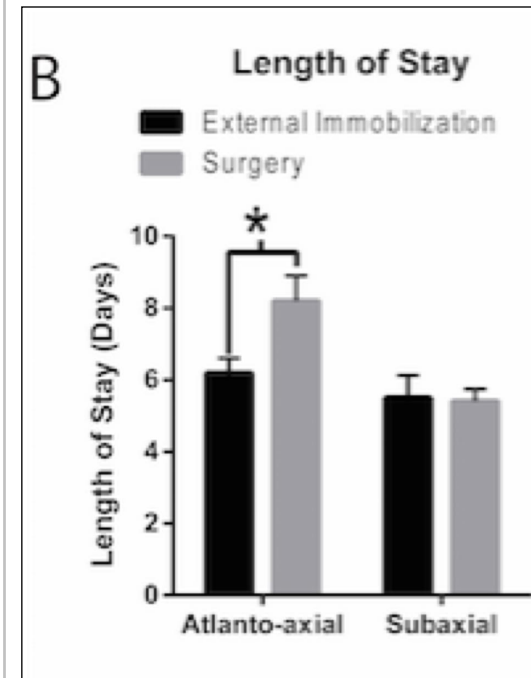
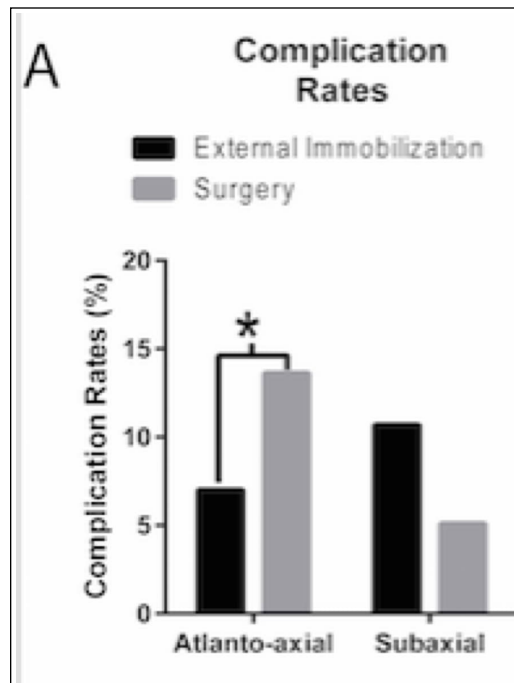
### Study Objective

- To determine whether in-hospital complications and mortality, length of stay, and total hospital charges for cervical injuries are significantly different after external fixation or spinal fusion among pediatric patients.
- *Atlantoaxial Fractures:* Atlantoaxial fracture patients who underwent surgery were significantly older when compared to patients treated with external immobilization ( $14.3 \pm 4.8$  years vs.  $12.5 \pm 6.0$ ,  $p=0.006$ ).
- Significant differences between treatment groups included length of stay (6.2 days for immobilization and 8.2 days for surgery,  $p=0.017$ ), total charges (\$30,312 for immobilization and \$56,897 for surgery,  $p=0.020$ ), and development of at least one complication (7.0% for immobilization and 13.6% for surgery,  $p=0.047$ ), even after controlling for age.
- *Subaxial Fractures:* When comparing external immobilization to surgery for subaxial fractures, there were no significant differences in length of stay ( $5.5 \pm 6.4$  days vs.  $5.4 \pm 5.1$ ,  $p=0.802$ ) or complication occurrence ( $p=0.597$ ). However, total charges were significantly higher in patients who underwent surgery (\$64,361 vs. \$29,332,  $p<0.001$ ).

### Methods

- The 2002-2011 NIS database was queried for patients under 18 with a diagnosis of atlantoaxial cervical spine fracture without cord injury.
- Patients who underwent halo immobilization or internal fixation were included for analysis. Variables analyzed included in-hospital mortality, development of at least one in-hospital complication, discharge disposition, length of stay, and total hospital charges.
- Two separate analyses were conducted: external immobilization versus surgery for atlantoaxial (C1-2) fractures and external immobilization versus surgery for subaxial (C3-7) fractures.

Complication rates (Fig. A) and length of stay (Fig. B) were significantly higher in the atlantoaxial group that underwent surgery. No differences were observed in the subaxial treatment groups.



### Conclusions

Pediatric patients with atlantoaxial injury may warrant initial consideration of external fixation as treatment due to lower overall complication rates and decreased cost.

### Results

A total of 659 pediatric patients with cervical spine fracture were identified; 339 (51.4%) patients with atlantoaxial (C1-2) fractures and 320 (48.6%) with subaxial (C3-7) fractures.