Closed skeletal traction for unilateral locked facet can expedite realignment but does not affect time to decompression or AIS grade conversion at long-term follow-up

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Introduction

Closed skeletal traction (CST) success rates are variable

- Literature success rates range significantly
- Lack of known predictors for success to guide patient selection
- Unknown how attempting CST affects the timing of surgery

The effect of early CST on neurologic outcome is unclear

- Early surgical decompression has been associated with improved recovery following spinal cord injury, likely through alleviating secondary injury
- Reducing a subluxed facet relieves lithesis, thus decreasing local ischemia and ongoing insult
- Limited evidence to suggest that early reduction improves outcome

We sought to answer:

1. **What structural or patient factors predict successful CST?**
2. **Does performing CST lead to faster realignment, and if so, does this improve long-term neurologic outcome?**

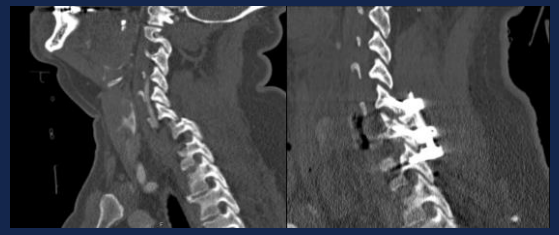

Figure 1. Computed tomography images of a 63-year-old man who presented with unilateral locked C6-7 facet. He underwent successful CST followed by C6-7 ACDF and PSF

Methods

Study population

- A total of 112 patients with facet injuries were identified through a retrospective database at a single level I trauma center
- Cases were confined to injuries in the sub-axial cervical spine. Patients with bilateral locked facet, perched but not locked facets, or isolated displaced facet fractures were excluded, yielding a population of 46 patients
- Clinical, demographic, and treatment data were extracted from the electronic medical record

Clinical management

- Patients underwent CST using Gardner Wells tongs with rapid incremental weight
  - Patients with reliable neurologic exam, who were behaviorally cooperative and able to tolerate moderate sedation, underwent CST at the bedside
  - Patients not meeting these criteria but still able to undergo CST (i.e. no structural contraindication on imaging) had CST performed under general anesthesia

Statistical Analysis

- Data were analyzed in R. Univariate analysis was conducted to determine potential variables of interest before performing multivariate analysis with linear and logistic regression after stepwise variable selection

Results

Study demographics

- Forty-six patients with ULCF had attempted CST before surgery
- Mean age was 45.6±17.7 and 34 patients (72.3%) were male
- C6-7 was the most common level of injury
- Median admission ASIA motor score was 39
- Twenty-six patients (55.3%) had a successful CST (mean weight 59.8±33.5lbs)
- Forty-three patients (91.5%) had fractures and 15 had epidural hematoma (31.9%)
- Seven cases (14.9%) had diffuse idiopathic skeletal hyperostosis (DISH)

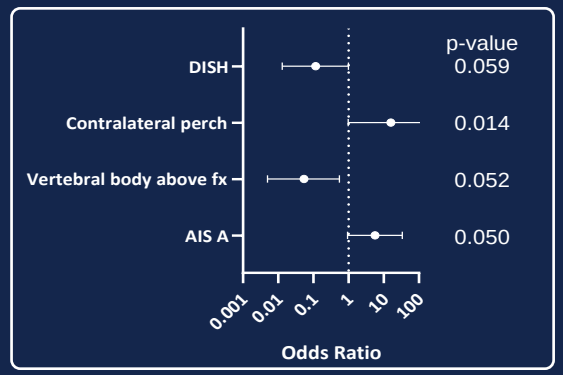

Figure 2. Fractures involving the superior vertebral body of the locked level (OR=0.054, p=0.014) and DISH (OR=0.116, p=0.050) reduced the odds of successful CST. AIS grade A (OR=5.630, p=0.059) and contralateral perched facet (OR=15.967, p=0.052) trended towards increased odds of successful CST

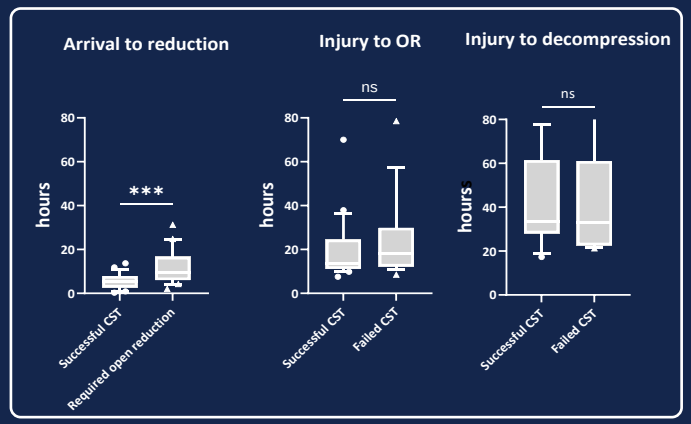

Figure 3. Patients who were successfully reduced with CST achieved realignment sooner (5.5±3.5 hours after arrival vs. 13.3±8.0 hours for unsuccessful CST requiring open reduction, p = 0.0023). There was no association between CST outcome and time interval from injury to surgery (p = 0.752) or time interval from injury to verification of spinal cord decompression with postoperative MRI (p=0.303).

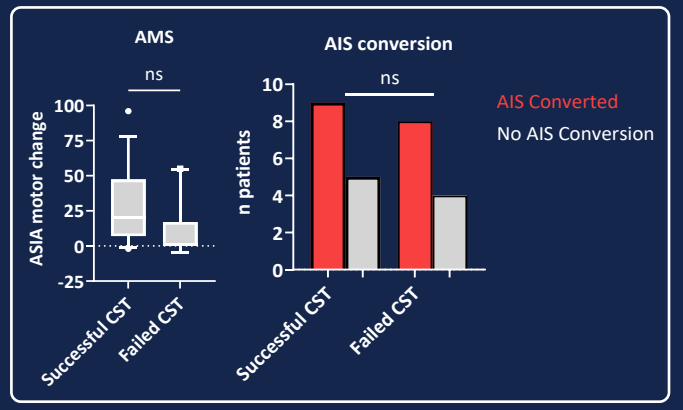

Figure 4. In patients with minimum three months follow-up there was no significant difference in AIS grade improvement with successful CST (AIS Grade E was excluded from this analysis). Successful CST trended towards improved ASIA motor score (27.43 vs 11.82, p=0.067).

Discussion

Poor neurologic status (AIS grade A) and contralateral perched facet predict successful CST. DISH and fracture to the superior vertebral body were negatively associated with successful CST representing features that may impair the ability to reduce via poor spinal mobility or force transduction, respectively.

While patients with successful CST were reduced earlier than their counterparts with failed CST, this did not alter the time interval to surgery or confirmation of decompression on MRI. Likewise, no differences were seen in neurologic outcome with a minimum of 3-month follow-up between the two groups.

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SPINE SUMMIT 2024