Spinal Immobilization Adverse Effects vs. Benefits in the Trauma Patient

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Scenario

You are a EMT-P arriving on the scene of a rollover that occurred less than 10 minutes ago. No witnesses are present. It appears that the vehicle was going in excess of 45 mph around a turn, then rolled. You notice skid markings leading up to the vehicle. No other vehicles were involved. An 18 y/o female is found unconscious restrained in the drivers seat with air bags deployed. Police were first on scene, and the fire department is still another 20 minutes away. The nearest hospital is roughly a 20 minute drive.

On first look you see the patient is not pinned within the vehicle. She spontaneously becomes responsive to verbal cues but is mumbling and she is incoherent. She is pale, diaphoretic, tachypneic, and her stomach is distended and rigid. Only minor bleeding is noted on the patients head from small glass fragments.

Three options:

1. Await Fire for extrication and assistance.
2. Attempt the extraction with your partner and two by standing policemen with short spine board and c-collar. Then transition to long board once out of the vehicle. Package the patient then head to the Hospital.
3. Attempt the extraction with your partner and two by standing policemen as fast as possible. Start I.V.s and obtain vitals on the way.

Scenario with additional info

1. Journal of Neurotrauma conducted a study in 2014 on Prehospital Use of Cervical Collars in Trauma Patients that concluded: "The existing evidence for using collars is weak, and our practice is mainly a result of the historical influence of poor evidence. More significant and concerning, there is a well of less-appreciated documentation of harmful effects from collars."[17]
2. Recent Report from the National Academies of Science, Engineering, and Medicine concluded that 20 percent of people who die from traumatic injuries could have been saved if they got treatment at a trauma center quicker.[18]

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Background

The origin of spinal immobilization for severe spinal trauma is unclear, but the first patent for such a device was shortly after the Vietnam war by inventor Glen Hare, the founder of *Dyna-Med* in 1974. The initial use of spinal immobilization devices was based off of **anecdotal evidence** that their use reduced the likeliness of further neurological injury post trauma. Since then, the use of spinal immobilization devices has become a standard practice in the Western world.

The use of spinal immobilization devices is not benign and can cause adverse complications for the patient to include:

- **Restricted breathing**
- **Airway obstructions**[1,3]
- **Increased transport time to medical treatment facility from scene of injury**
- **Increased medical cost**
- **Abnormal Sensations of the Vertebrae**

This review assesses the current evidence of adverse effects from spinal immobilization in trauma patients.

Methods

An exhaustive search of available literature was conducted using the *MEDLINE-Ovid*, *Web of Science*, *CINAHL*, and *Google Scholar* using the keywords: **spinal immobilization**, **adverse**, and **trauma**. References cited in the included articles were examined for additional relevant sources. Articles that assessed the effects of spinal immobilization on trauma patients were included. The quality of relevant articles was evaluated using GRADE Working Group guidelines.[11]

Characteristics of Reviewed Studies, GRADE Profile

Authors	Study Design	Limitations	Indirectness	Inconsistency	Imprecision	Publication bias	Quality
Leonard et al[13]	Prospective Cohort study	Not Serious	Not Serious	Not Serious	Not Serious	Unlikely	Moderate[a]
Hauswald et al[12]	Retrospective Cohort study	Not Serious	Not Serious	Serious[b]	Not Serious	Unlikely	Very Low
Mobbs et al[14]	Prospective Cohort study	Serious[c]	Serious[d]	Not Serious	Serious[e]	Unlikely	Very Low

[a] Upgraded due to a large treatment effect
[b] Large uncontrollable differences in sample populations (Malaysian vs. U.S.)
[c] Lacked a control group
[d] Single person for application and data collection
[e] Limited sample n=10

Results

Three studies met eligibility criteria and were included in this systematic review. The studies consisted of a retrospective study and two prospective cohort studies. One study[13] of 329 children found a statistically significant increase in **pain score**, **rate of admission**, and **rate of radiological examination**.

The second study[12] of 454 trauma patients reported little to **no neurological effect** of spinal immobilization on patients with spinal injuries. In the third study of 10 consecutive head-injured patients, **90%** had a rise in ICP following the application of a rigid cervical collar. All studies had a very low to moderate quality of evidence based on GRADE guidelines.[11]

Effect of Spinal Immobilization	Odds Ratio
Pain Score	2.2(1.4–3.4)
Rate of admission to ICU or OR	5.3(1.5–19.0)
Rate of radiological exam	8.2(4.5–15.4)

Discussion

- Multitude of cohorts since the early 1990s have come to a similar conclusion.
- **No randomized controlled trials to substantiate continuing the practice** of spinal immobilization in out-of-hospital trauma victims.[9]
- The results of the studies reviewed[12-14] were consistent across different populations and different regions of the world.
- Direct comparison complications: different populations, measuring different adverse effects.
- Consistent statistically significant **OR's**.
- The variability across the studies[13,14] does not provide adequate evidence to change practice, but further investigation is required.
- The average low level quality of the studies is also low because of **logical fallacies** associated with the standard of practice.
- The result is that spinal immobilization **most likely has no benefit**, and may possibly incur **adverse side effects**, which the patient is alarming.
- Enough data to substantiate temporary change in practice for a more thorough direct comparison such as a randomized control trial.

Conclusion

The studies evaluated[13,14] and prior data clearly illustrate the increased risk of adverse effects when utilizing spinal immobilization with trauma patients that include:

- **Increased pain**
- **Increased likeliness of radiographic imaging**
- **Increased likelihood of admission**
- **Increased ICP**

The use of spinal immobilization devices appears to have **little to no beneficial effect.**[12] Providers need to assess the legitimacy of this practice with the potential adverse side effects demonstrated in these studies. Further research must be performed to ensure the safety of patients.

Questions?

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