Title

Why we need to rethink C-spine immobilization: we need to reevaluate current practices and develop a saner cervical policy.

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Why We Need to Rethink C-Spine Immobilization

We need to reevaluate current practices and develop a saner cervical policy

The spinal immobilization of trauma patients suspected of having spinal injury has been a cornerstone of prehospital care for decades. Current practices are based on the belief that a patient with an injured spinal column can deteriorate neurologically without immobilization. This concern has ballooned to include large numbers of patients with little or no chance of such an injury and caregivers with little appreciation for the complications caused by use of the cervical collar and spinal board. Somewhere between 1 million and 5 million patients receive spinal immobilization each year in the United States.[1,2]

The injury of concern is not the cervical spine fracture but the unstable cervical fracture with the potential for further neurological deficits.[3] It is clear that among severely traumatized patients admitted to hospitals, the rate of cervical spine fractures is 2%–5% and the rate of unstable cervical fractures is 1%–2%.[4–6] For patients with head injuries, the rate of cervical spine injuries increases substantially.[7] Among patients with known unstable cervical spine fractures, half in one study demonstrated neurological deficits upon hospital arrival.[8] Most clinicians would agree that this high-risk group would benefit from spinal immobilization, and we are truly concerned about that 0.5%–1% with unstable cervical spine fractures and intact spinal cords.

It is logical that among patients with lesser mechanisms of injury, the

Trauma Types and Cervical Injury Rates

Clinical Group	Cervical Fractures	Cervical Cord Injuries
Polytrauma	2%–5%	1%–2%
All blunt trauma	1.2%–3.3%	0.4%–0.7%
Blunt assault	0.4%	0.14%
Penetrating trauma	1.43%	0.38%

Photos by Dan Limmer

Main Points to Remember

- 1 million to 5 million patients receive spinal immobilization each year in the U.S.
- Of severely traumatized patients, 1%–3% have cervical spine fractures.
- In severely traumatized patients, we are concerned about the 0.4%–0.7% with unstable cervical spine fractures and intact spinal cords.
- 50%–70% of patients with unstable cervical spine fractures present with a completed spinal injury.
- Patients with a lesser mechanism of injury will have substantially lower rates of unstable cervical spine fracture.
- The rate of unstable cervical spine fracture varies predictably by the mechanism of injury.
- For patients with a lesser mechanism of injury, consider less-restrictive methods of immobilization.
- Clinical clearance for awake patients without distracting injury should be applied when appropriate.
- For patients with penetrating trauma, cervical spine immobilization is not helpful and likely harmful.

potential for unstable cervical spine fractures is much smaller. It is with this group that we must consider the trade-offs with the complications of cervical spine immobilization. Several studies have examined the rate of cervical fracture among generic blunt-trauma patients, whose mechanisms included MVCs, falls from standing, falls from heights and assaults. In these commonly encountered patients, the rate of cervical fracture is 1.2%–3.3%,[1,9–12] and the rate of cervical spinal cord injury is 0.4%–0.7%.[13,14]

One of the larger studies of blunt-trauma patients with high-energy mechanisms had clear inclusion criteria and used a well-defined endpoint of clinically important cervical spine injury (essentially an unstable cervical spine fracture). In this Canadian system, patients with blunt assaults and falls from standing are generally not assessed for cervical spine injury. Among this cohort of patients with high-energy mechanisms, the rate of clinically important cervical spine injury was 0.6%.[1,15] This study outlined a clear method (the Canadian C-Spine Rule) for evaluating patients with normal GCS and determining by exam those who do not have clinically important cervical spine injuries. This method has been validated in the field.[15] Other criteria have also been well studied to safely discriminate a subgroup without risk of cervical spine fracture.[10] Many EMS systems have incorporated these methods of clinical clearance.

Trauma expert Peter Rhee, MD, and colleagues did a retrospective study of 4,390 blunt-assault patients and noted a cervical spine fracture rate of 0.4% and cervical spinal cord injury rate of 0.14%.[6] Only 4 (0.03%) of 51 patients with fractures were considered to be unstable. There has been no study that specifically examines patients who fall from standing.

The subgroup that has been most studied is those who have penetrating trauma. One recent study led by Johns Hopkins' Elliot Haut, MD, examined the national trauma registry for such patients.[16] The authors demonstrated a doubling of mortality among patients who received cervical spine immobilization. It is unclear whether this implies causality or is a proxy for more severe injury. From more than 30,000 patients with penetrating trauma, 443 (1.43%) had spine fractures, and 116 (0.38%) had unstable spine fractures. Of those with unstable spine fractures, 86 (74%) had completed spinal injuries prior to immobilization. The authors concluded that in order to potentially benefit one person with spinal immobilization, 1,032 people would have to be immobilized. But in order potentially harm/contribute to one death, just 66 would have to be.

Many other case-control studies have also examined this issue.[6,17–22] A recent systematic review of the literature pointed out the low rate of unstable fractures and the relatively rare appearance of patients with unstable spine fractures and no neurologic deficits.[23] The authors, led by LSU's Lance Stuke, MD, concluded there is no data to support routine spine immobilization in patients with penetrating injury to the neck, head or torso. They recommended the use of spinal immobilization only in the setting of obvious focal neurologic deficits. Following this logic, we could reach the same conclusion for patients who have suffered blunt assault and less-than-high-energy blunt trauma.

Complications

There are clearly clinical complications with cervical spinal immobilization as it is currently practiced. Pain is almost universal with the use of a hard board,[24–26] as well as the radiation and expense of x-rays and CTs. One recent study concluded that exposure to ionizing radiation (mostly from iatrogenic causes) is the leading environmental factor associated with breast cancer.[27] There are other potential problems with unclear clinical significance, such as mild respiratory compromise,[28] increased intracranial pressure[29,30] and

Clinical Examples

• A 39-year-old male in a high-speed MVC; GCS of 9, multiple extremity fractures.

This patient's high-speed mechanism puts him at risk for cervical spine injury. His head injury increases this risk eightfold. Use appropriate cervical spine immobilization, preferably a collar and board or vacuum splint.

• A 67-year-old female who was a restrained driver rear-ended at 20 mph.

This patient does not have a high-energy mechanism of injury per the Canadian C-Spine Rule, but her age could be of concern. In the absence of significant cervical pain, distracting injury or paresthesias, appropriate care could range from no immobilization to some less-restrictive methods of spinal motion restriction.

• A 37-year-old male who was a restrained driver rear-ended at 40 mph.

This patient has a more significant mechanism of injury. If he is awake and without a distracting injury, some method of clinical clearance could be applied. With some cervical spine pain in this cooperative patient, a less-restrictive method of spinal motion restriction could be considered.

• A 45-year-old male found intoxicated at a bus stop with an eyebrow laceration; his GCS is 12, and he moves all extremities.

He does not meet criteria for a severe mechanism of injury and is at very low risk for cervical spine fracture and even lower risk for cord injury. But since he is not at zero risk for cord injury and he is unable to cooperate with a physical exam, we could consider a less-restrictive method of spinal motion restriction and observation in an emergency department. A later evaluation, when his mental state has improved, can guide further care.

the rare cases of distracting an unstable fracture.[31]

For such a commonly performed procedure, there has been a remarkable lack of progress in recent years on alternative methods of immobilization. The vacuum splint has some promise and should be further evaluated, especially for severely injured patients.[32] It poses significant logistical issues to work out, such as decontamination and acceptance by trauma centers.

For patients with a much lower likelihood of cervical spinal cord injury, such as victims of blunt assaults and falls from standing or alcohol-intoxicated patients with minor scalp or facial injuries, we can consider other, much less restrictive methods of immobilization. These could range from using the hard collar without a board to using a soft roll with tape. We should be asking the inventive among us or our more creative prehospital supply companies to develop new and novel methods to accomplish less-restrictive immobilization. Alameda County is embarking on such a protocol. Those with severe trauma will be immobilized with a hard collar and backboard or a vacuum splint. Those with less-severe trauma will have spinal restriction with a hard collar alone or some other combination of soft restrictive devices.

Hopefully we can move away from the forest of used hard boards in the ambulance bays of our community hospitals and at the same time develop a saner policy for our patients with lower-energy injuries.

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