Spinal Immobilisation in Pre-hospital and Emergency Care: A Systemic Review of the Literature

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Why the Interest?

• 25+ years of spinal immobilisation is under question
  • by first aid providers
  • by EMS state ambulance services
  • by hospital ED’s

• ARC guideline review committee
  • lack of evidence stated in our guideline

• ILCOR First Aid Taskforce
  • draft CoSTR statement recommending “no immobilisation”
Introduction to Spinal Immobilisation (SI)

- Mainstay of trauma care for decades
  - Based on the premise that immobilisation reduces further neurological compromise
- Data from 2007-8 reported 285 trauma related spinal cord injuries in Australia
  - 46% transport accidents, 29% falls, 9% aquatic
  - 53% cervical injuries
Aim

• To examine the evidence related to spinal immobilisation in pre-hospital and emergency care
**PICO**

“In victims with suspected spinal injury, does the use of spinal immobilisation during pre-hospital or emergency care (in-line manual immobilisation, head blocks, spinal boards, cervical collars), compared with no immobilisation, effect neurological outcome or other outcomes (prevention of movement, spinal positioning / alignment, comfort or pain, and complications)?”
Methods

- Systemic literature review of Medline, Cochrane library and EMBASE
  - Scopus, Google Scholar, reference checks
- 2470 studies assessed for inclusion/exclusion
- Included studies assessed for
  - LOE (Australian NHMRC)
  - Quality: Good, Fair, Poor
Included

• Studies looking at effectiveness of SI in emergency care of patients with suspected traumatic spinal injuries
• Studies of patients with suspected spinal injuries
• Studies of healthy human volunteers
• Cadaver studies
Excluded

- Non-systematic reviews
- Opinion papers
- Abstracts
- Animal studies
- Advanced or surgical stabilisation techniques
- Helmet removal
- Intubation studies
- Spinal clearance protocols
Outcomes

- Neurological outcome
- Prevention of movement
- Spinal positioning/alignment
- Comfort/pain
- Complications
Results

- 47 studies met criteria for further review
  - 10 case series (LOE IV)
  - 37 extrapolated data (no LOE)
- 15 studies supportive of SI
- 13 studies neutral
- 19 studies opposing SI
Effects of SI on neurological outcome

- 8 studies (LOE IV, 7 fair, 1 poor)
  - 1 study of patients with penetrating trauma opposed SI reporting in-hospital mortality doubled with SI
  - 7 studies neutral. Features of these studies were
    - the “all or none effect”,
    - risks to the rescuer in a combat environment
      - 10% penetrating neck injuries were in “rescuers”
    - pre-hospital care interfering with emergent care
    - questionable risk:benefit ratio
Effect of SI on preventing movement

- 16 studies, all extrapolated data
  - 10 studies supportive of SI preventing movement
  - 4 studies neutral
  - 1 conflicting
  - 1 opposing SI reporting increased separation between C1 and C2 with SI
Effects of SI on optimal positioning/alignment

- 5 studies
  - 1 study in children needing c-spine xray (LOE IV)
  - 4 studies in healthy adult volunteers
- All methodologically poor
- All supportive of SI to optimise alignment
  - 2 recommend occipital support in adults
  - 1 recommends under-shoulder support in children
Effects of SI on pain and comfort

• 5 studies, extrapolated data, 4 fair, 1 poor
  • All opposed SI
  • 3 studies showed that padding a backboard improved comfort
  • 1 study (backboard vs vacuum mattress) reported less pain with vacuum-mattress
  • 2 studies showed unpadded spine boards increased board-tissue interface pressure
Complications caused by SI

- 13 studies, all extrapolated data
  - 7 healthy adults
  - 1 healthy children
  - 2 in head-injured patients
  - 2 in patients having lumbar puncture/spinal anaesthesia
  - 1 in patients having general anaesthesia
- 4 studies fair quality, 9 poor
Complications caused by SI

- 12 of the 13 studies opposed SI
  - 5 studies found that cervical collars raised intracranial pressure (ICP)
  - 1 study extrapolated an ICP rise
  - 2 studies reported respiratory complications
  - 2 studies showed increased tissue interface pressure
  - 1 study reported case studies of tissue ulceration
  - 1 study reported dysphagia
  - 1 study of tidal volumes was neutral for SI
Discussion

- No published high level studies, no RCT’s
- SI may cause complications and protocols need to consider the risk:benefit
- All studies assessing neurological outcome were retrospective, with risk of bias
- No studies of movement prevention were in injured patients and application to trauma patients is questionable
- Alignment studies only examined the c-spine
Discussion

• All 7 studies on pain/comfort reported negative effects of SI
• In trauma patients, discomfort may lead to increased movement
• Patients with actual spinal cord injury and decreased sensation may be at higher risk of skin ulceration
• Padding of boards should be considered
Discussion

• Toscano (1988)
  • 123 trauma patients, 32 experienced major neurological deterioration during their initial hospital care.
  • 28 of the 32 patients were not suspected of having a spinal injury, raising the possibility of poor attention to spinal alignment and spinal care during patient handling
  • Highlights the importance of suspecting a spinal injury
Conclusion

- No high level studies assessing SI in pre-hospital and emergency care
- No studies showing SI improves neurological outcome
- SI does prevent neck movement but clinical significance is unknown
- SI has complications, can mask injuries, delay care, lead to unnecessary interventions and cost
The Future

- Protocols on SI need to consider the risk:benefit to the patient
- The door is open for further research
  - In the first aid setting
  - In the pre-hospital and ambulance setting
  - In the emergency department
- ILCOR CoSTR SI recommendation
Follow-on & Consequences

- Queensland Ambulance introducing soft collars
- Hospital ED’s not routinely collaring patients
- Guidelines will be reviewed
- Risk lowering our level of “spinal injury awareness”
- High risk patient protocols
  - Management of high risk/+ve neurology patients
  - Collaboration with definitive care teams
  - Proven fracture/spinal cord injury
Questions??