

ABSTRACT

Pain and tissue-interface pressures during spine-board immobilization.

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STUDY OBJECTIVES: Although spine boards are one of the main EMS means of immobilization and transportation, few studies have addressed the discomfort and potential harmful consequences of using this common EMS tool. We compared the levels of pain and tissue-interface (contact) pressures in volunteers immobilized on spine boards with and without interposed air mattresses.

DESIGN: Prospective crossover study.

SETTING: Emergency department of Methodist Hospital of Indiana, Indianapolis, Indiana.

PARTICIPANTS: Twenty healthy volunteers who had not taken any analgesic drugs in the preceding 24 hours, were not experiencing any pain at the time of the study, and did not have history of chronic back pain.

INTERVENTIONS: To simulate prehospital transport conditions, we immobilized volunteers with hard cervical collars and single-buckle chest straps on wooden spine boards with or without commercially available medical air mattresses. The crossover order was randomized. After 80 minutes, immobilization measure were discontinued and the subjects were allowed to get off the boards for a recovery period of 60 minutes. Subjects were then studied for a second 80-minute period with the opposite intervention. At baseline and at 20-minute intervals, the level of pain was rated with a 100-mm visual analog scale. Tissue-interface pressures were measured at the occiput, sacrum, and left heel.

RESULTS: Mean pain on the visual analog scale was 9.7 mm at the end of the mattress period and 37.5 mm at the end of the non-mattress period ($P = .0001$). Although there were no significant differences in pain between the two groups at time 0, volunteers reported significantly more pain during the non-mattress period at 20 ($P = .003$), 40 ($P = .0001$), and 60 minutes ($P = .0001$). All 20 subjects reported that immobilization on the spine board with the mattress was "much better" (five-point scale) than that without the mattress. Interface pressure levels were significantly less in the mattress period than in the non-mattress period measured at occiput ($P = .0001$), sacrum ($P = .0001$), and heel ($P = .0001$).

CONCLUSION: In a simulated immobilization experiment, healthy volunteers reported significantly less pain during immobilization on a spine board with an interposed air mattress than during that on a spine board without a mattress. Tissue-interface pressures were significantly higher on spine boards without air mattresses. This and previous studies suggest that immobilization on rigid spine boards is painful and may produce tissue-interface pressure high enough to result in the development of pressure necrosis ("bedsores"). Emergency care providers should consider the use of interposed air mattresses to reduce the pain and potential tissue injury associated with immobilization on rigid spine boards.

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