

# A new low-cost method for difficult airway management in non-missile-penetrating cervical spine injury

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## ABSTRACT

Accessing and maintaining the airway in penetrating cervical spine injury is a challenge for anaesthetists globally. This is more so in resource-poor settings, where advanced techniques for intubation in difficult airway situations are unavailable. We describe a new, low-cost, easily adaptable method of managing the airway used in a middle-aged man who sustained screw driver injury to the cervical spine with C4 Brown-Séquard syndrome. The deployment of readily available and cheap materials led to successful anaesthesia management of the patient.

**Key words:** Developing countries, difficult airway, low-cost method, penetrating cervical spine injury

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## INTRODUCTION

Direct stab injuries to the spine are uncommon. These non-missile-penetrating spinal injuries (NMPSI) are often inflicted by assailants from the back. The object may be withdrawn by the assailant but is sometimes left behind. Patients with NMPSI present unique challenges related to their transportation and intubation. In cervical NMPSI with retained foreign bodies, manipulation of the neck during intubation is likely to result in precipitation or worsening of neurological deficits. In addition, intubation can certainly not be accomplished in the conventional supine position if the stab is from the back. To successfully anaesthetize these patients, several techniques including the use of fiberoptic intubation, intubation in the lateral and prone positions and intubating laryngeal mask airway (ILMA) have been deployed in advanced centres.<sup>[1-3]</sup> These are not available in our centre and other resource-poor centres like ours. We report our method of successful management of the airway in a patient with cervical NMPSI caused by a screw driver stab injury from the back that resulted in C4 Brown-Séquard syndrome.

## CASE REPORT

A 52-year-old commercial motorcyclist was referred to us with a retained screw driver in the neck following a stab injury from the back. He reported immediate inability to move the right limbs. On our advice, his initial care and eventual transportation from the referring centre was accomplished in the lateral position in order to prevent further inward movement of the instrument and any consequent worsening of his neurological status. His last meal was 15 h previously (3 h before the incident). He was of average built and had right-sided C4 Brown-Sequard Syndrome with normal vital signs. A screw driver was impacted in his cervical spine along the midline between the spinous processes of C4 and C5. His Mallampati score was II. It was assessed later when it was possible to lay the patient in the supine position.

Fiberoptic intubation and ILMA are not available at our centre. To compound our dilemma, we did not have experience with intubation in the lateral or prone position. In addition, we lack electrocardiogram (ECG)

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and capnography, which are routine in advanced centres and are essential for monitoring in emergency and difficult situations like this. Awake tracheal intubation using topical airway anaesthesia and an angiocatheter to place a wire or an epidural catheter in the trachea, which would have helped to guide an endotracheal tube, was considered. This would have allowed re-assessment of his neurological status prior to induction of anaesthesia. However, we did not have experience with its use and also lack the equipment for it. We decided to intubate him in the supine but “suspended” position.

We procured two foam mattresses at the equivalence of 5 United States dollars each from the local furniture market. Each mattress measured 60 cm×60 cm×15 cm. Each of them was cut longitudinally. He was transported to the operating room in lateral position on the only available trolley and placed on the operating Table in the lateral position. The four pieces of foam mattress were laid on the trolley in addition to other smaller ones and a pillow in four places corresponding to the position of his head, chest, buttocks and legs ([Figure 1a]: Foam mattresses cut and positioned). He was then positioned supine on the trolley suspended by the foam mattresses ([Figure 1b]: Patient “suspended” on the mattresses). The transfer to and from the operating Table was done by four people who carried him in the lateral position (log of wood fashion). We took care to avoid contact of the screw driver with any object in the process. When fully “suspended”, the screw driver lay free between the mattresses supporting the head and the chest ([Figure 1c]: Close view of the screw driver lying free between the head and chest sets of mattresses). Thereafter, intubation using pre-

oxygenation, atropine administration, induction with thiopentone, muscle relaxation with suxamethonium and size 7.5 disposable endotracheal tube was accomplished in the supine position ([Figure 1d]: Intubation achieved in the “suspended” supine position). A rapid-sequence induction was ensured and manual in-line immobilization was done to aid intubation, which was achieved at the first attempt. The balloon of the endotracheal tube was inflated and gauze packs placed in the pharynx to prevent bronchoaspiration. Anaesthesia was maintained with oxygen, halothane and pancuronium. He was then positioned prone on the operating Table for the planned C4 and 5 laminectomies, foreign body removal and spinal exploration. Intraoperative analgesia was maintained with intravenous pentazocine. There were no adverse events during intubation or surgery. He had delayed recovery from anaesthesia of 1 h (possibly due to the effect of pancuronium, which was re-administered to maintain paralysis to the end of surgery and allow for proper wound closure). A nerve stimulator, which we lacked, would have aided the assessment of muscle paralysis during this period. We extubated him after ascertaining that he had recovered fully from anaesthesia. The early post-operative period was uneventful.

## DISCUSSION

Stab wounds to the spine are rare occurrences.<sup>[4]</sup> A widely cited South African report of 450 cases out of the 1600 with spinal cord injury managed over a —13-year period is, perhaps, the largest series in the global literature.<sup>[5]</sup> Anaesthesia training is often devoid of the care of airway in patients with NMPSI. This category



**Figure 1:** (a) Foam mattresses cut and positioned (b) patient ‘suspended’ on the mattresses (c) close view of the screw driver lying free between the head and chest sets of mattresses (d) intubation achieved in the ‘suspended’ supine position

of patients, especially the subset with retained foreign bodies, poses significant challenges to the anaesthetists. Intubation in these patients is a difficult task.<sup>[6]</sup> With the impaling object in the back of the neck, as in our patient, intubation cannot be achieved in the conventional supine position. In difficult situations like this, airway access has been achieved with the use of fiberoptic intubation and ILMA.<sup>[1-3]</sup> Intubation in the lateral position using malleable stylet has been described in a patient in whom the aforementioned techniques could not be used.<sup>[6]</sup> As noted, however, experience with this technique is rare. It is also fraught with dangers.

In a recent Indian report of two cases of NMPSI involving the thoracic spine, the patients were positioned between two trolleys such that the impaling objects were between the trolleys and anaesthetized.<sup>[7]</sup> Being a small resource-poor centre in a developing economy, we did not have access to materials for fiberoptic intubation or ILMA. We are also not experienced in the techniques of intubation in the lateral or prone position. Only one trolley was available for use, and this was not up to the height of the operating table. As such, the consideration of using the two-trolley technique for intubation was discarded. Our last resort was the “suspended supine technique” described above. We found it to be very simple and surprisingly effective and without any hazard. We had to augment the procured foam mattresses with smaller ones and pillows that were available. We believe that four sets of two 60 cm×30 cm×15 cm foam mattresses positioned as detailed earlier would achieve better “suspension” of the patient. Transporting him in lateral position,

later intubating him “supine” and then positioning him prone have their inherent dangers of increasing the cord injury, but had to be carefully carried out in our patient given all the limitations stated.

As the materials were cheap and sourced locally, we believe this method could be successfully adapted by anaesthesia teams in resource-poor centres in developing countries if faced with similar scenarios. This simple, cheap, locally available method of “suspended supine technique” for intubation may be very useful in resource-poor settings for the management of difficult airway in patients with NMPSI with retained foreign bodies at the back.

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## Announcement

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