

Title

Intraoperative Foot Dorsiflexion Technique to Visualise the Lower Cervical Spine: A series of 25 cases

Background

Anterior cervical approaches are extremely common practice and intraoperative localisation using the image intensifier can be a daunting task, especially at the C7/T1 junction. The technique of dorsiflexion of the ankles appears to increase cervical exposure. The study aims to demonstrate this principle in a larger series, measuring the change in vertebral level exposure. To our knowledge, this is the largest study of its kind.

Research question

Does patient demographics such as age, gender and BMI affect the level of exposure achieved with the foot dorsiflexion technique and is exposure achieved to the level of C7/ T1?

Design and Methods

A 2-centre prospective study was conducted in 25 patients undergoing anterior cervical discectomy and fusion or anterior cervical corpectomy. The patients were anaesthetised and positioned supine on a shoulder roll with the upper limbs placed to the side of the patient. The neck was slightly extended and gentle caudal traction on the shoulders was achieved using tape. After surgical exposure, 12mm or 14mm Caspar pins were placed into the vertebral body. Standard cross-table lateral radiographs using the image intensifier were performed before and

after the manoeuvre, pushing the feet cranially at the level of the metatarsals. The manoeuvre was performed by the circulating nurse or anaesthetist. The images were evaluated by a fellowship-trained spine surgeon. The number of the vertebral levels achieved was documented. Using the length of the Caspar pins as the scale, the increased length of exposure was also measured.

Results

The study included 25 patients, 48% (n = 12) of which were male. The average age was 52.9 years (SD 13.2) and average BMI was 27 (SD 3.8). The average number of vertebral levels gained after the manoeuvre was 0.91 (SD 0.29, $p < 0.00001$), including seeing the C7/T1 junction in 28% (n = 7) of the cases.

The younger the patient, the more vertebral levels were visible after the maneuver ($R^2 = 0.22$, $p = 0.01$). This significance was also reflected when compared to the increased length of exposure achieved (in millimetres) after performing the technique ($R^2 = 0.17$, $p = 0.04$).

When correlation was made by gender, the males were more likely to gain a vertebral level, where average number acquired was 1.06 versus 0.77 in the female group ($p = 0.01$).

Discussion/ Conclusion

Cervical level check using the image intensifier is theoretically not a difficult task to perform. Despite this, it can be a challenge due to the anatomical relationship between the lower cervical

spine, and the shoulder and upper thorax. Adequate visualization also plays a significant role in avoiding wrong level surgery and reduction of intraoperative time.

The underlying mechanism of the foot dorsiflexion technique is believed to be multifactorial, including countertraction against the fixed shoulders and increased cervical lordosis due to the friction between the head and the table.

The manoeuvre added almost one vertebral body length. The C7/T1 junction is a relatively difficult area to visualise and this was achieved in just under one third of the cases.

This is a safe, simple and reproducible method to increase the number of cervical vertebral levels visualised on intraoperative cross-table lateral radiography using the image intensifier.