Eur Spine J (2009) 18:1986–1988
DOI 10.1007/s00586-009-1075-9

IDEAS AND TECHNICAL INNOVATIONS

Percutaneous approach to the upper thoracic spine: optimal patient positioning

Edward Bayley · Jonathan Clamp · Bronek M. Boszczyk

Received: 15 January 2009 / Accepted: 3 June 2009 / Published online: 3 July 2009

Abstract Percutaneous access to the upper thoracic vertebrae under fluoroscopic guidance is challenging. We describe our positioning technique facilitating optimal visualisation of the high thoracic vertebrae in the prone position. This allows safe practice of kyphoplasty, vertebroplasty and biopsy throughout the upper thoracic spine.

Keywords Percutaneous · Thoracic spine · Costovertebral

Introduction

Boszczyk et al. [2] have advocated fluoroscopically guided kyphoplasty cranial to T5. They have shown the transcostovertebral approach to the high thoracic spine can be successfully used for kyphoplasty, vertebroplasty and biopsy.

Optimal visualisation is paramount for safe placement of instruments due to the close proximity of the spinal canal, the pleural cavity and major vascular structures. With conventional prone positioning, the scapula and humeral head are superimposed on the spine in the lateral image.

We describe a simple patient positioning modification that significantly improves the lateral visualisation of the upper thoracic spine during percutaneous procedures.

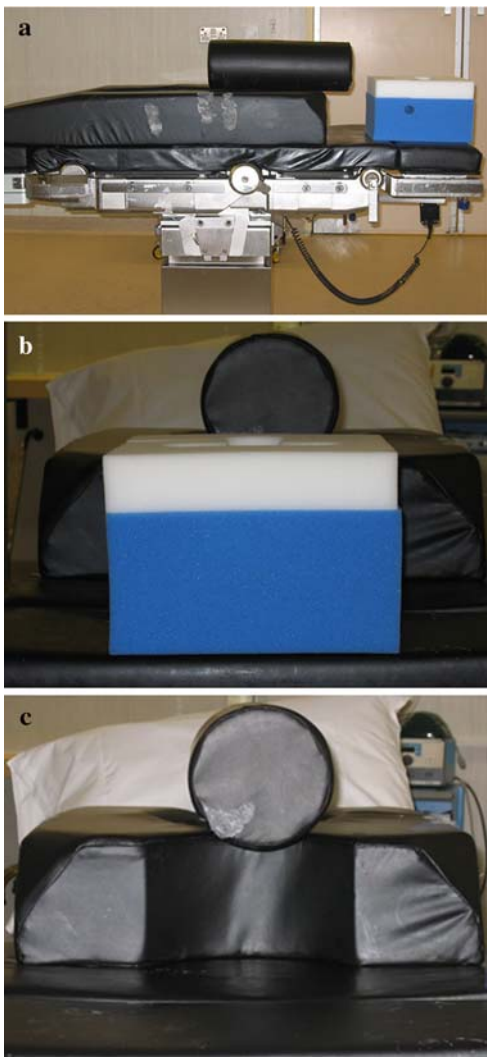

Fig. 1 Patient positioning for percutaneous access to upper thoracic spine. **a**, **b**, **c** Bolster placement: **a** lateral, **b** head end, **c** head end with head cushion removed

E. Bayley · J. Clamp · B. M. Boszczyk (✉)
Centre for Spinal Studies and Surgery,
Queen's Medical Centre, Nottingham NG7 2UH, UK
e-mail: bronek.boszczyk@nuh.nhs.uk

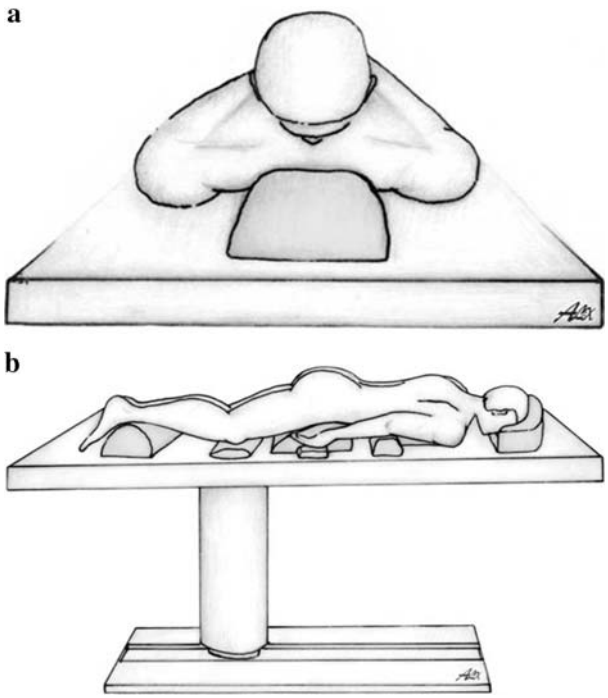

Fig. 2 Patient positioning for percutaneous access to upper thoracic spine. Schematic views of shoulders displacing anteriorly. **a** from head end, **b** lateral (Illustrations courtesy of spinegraphics@gmx.net)

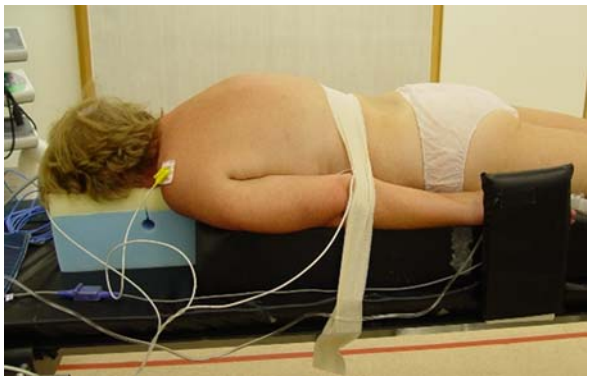

Fig. 3 Patient positioning for percutaneous access to upper thoracic spine. Patient positioned with sternal bolster during general anaesthetic (lateral view)

Technique

The patient is positioned prone on conventional bolsters. The arms remain adducted. A midline longitudinal bolster is placed under the sternum allowing the scapulae to fall anteriorly avoiding overlay of the shoulder girdle on the lateral fluoroscopic image (Figs. 1, 2, 3).

Fig. 4 Patient positioning for percutaneous access to upper thoracic spine. Patient positioned for procedures under sedation **a** from head end, **b** lateral view

For those procedures performed under sedation rather than general anaesthetic, a midline longitudinal sternal bolster is still positioned, but the arms can be placed with the shoulders abducted and elbows flexed as shown. This is more comfortable for the patient and still allows good visualisation up to T2 (Fig. 4).

In our experience, this has allowed clear fluoroscopic visualisation of the upper thoracic spine (Fig. 5).

Discussion

Ottolenghi [8] was the first to advocate thoracic vertebral biopsy above T9 and described the intercostal approach. More recently, trans-pedicular and trans-costovertebral approaches have been described [1, 3–6, 9]. CT guidance has been described as safer than fluoroscopic guidance [10]; however, a recent meta-analysis has suggested no

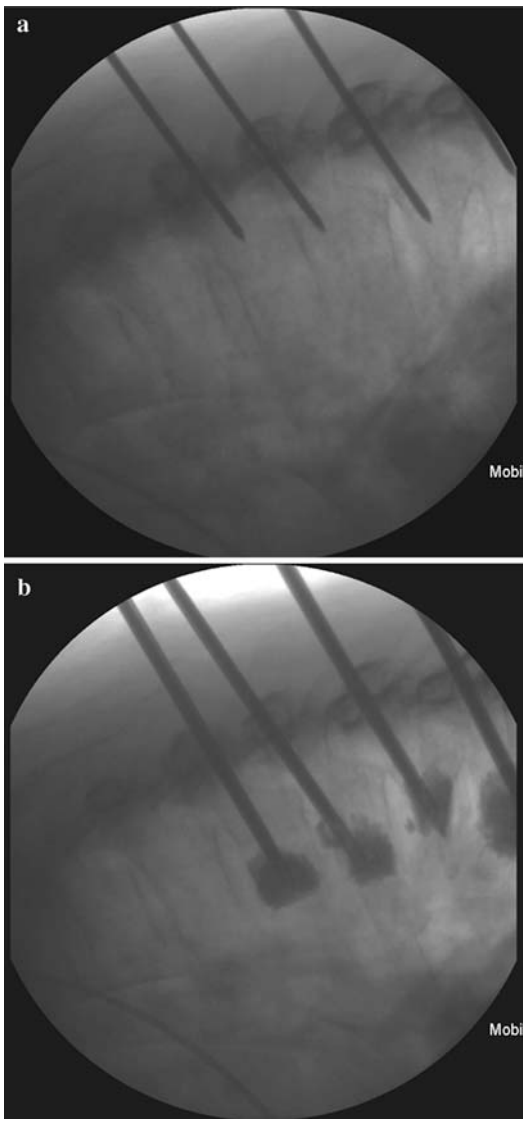

Fig. 5 **a**, **b** Lateral fluoroscopic image obtained with this technique: **a** During placement of K-wires, **b** during injection of PMMA cement (images show T2–T7 with T4–T7 injected with PMMA cement)

significant difference in complication rates (3.3–5.3%) [7].

We favour the trans-costovertebral approach using fluoroscopic guidance, as described by Boszczyk et al. [2]. This allows safe use of large cannulas or biopsy needles with a potentially larger diameter than the upper thoracic pedicles, thus avoiding spinal canal intrusion.

The described modified position allows clear fluoroscopic lateral imaging of the upper thoracic spine. The image is not obscured by the shoulder girdle. This facilitates safe cannula or needle placement in the upper thoracic spine. We have accessed 23 vertebrae between T1 and T5 successfully with this technique.

Acknowledgments Illustrations are courtesy of spinegraphics@gmx.net.

References

1. Babu NV, Titus VT, Chittaranjan S, Abraham G, Prem H, Korula RJ (1994) Computed tomographically guided biopsy of the spine. Spine 19(21):2436–2442. doi:10.1097/00007632-199411000-00013
2. Boszczyk BM, Bierschneider M, Hauck S, Beisse R, Potulski M, Jaksche H (2005) Transcostovertebral kyphoplasty of the mid and high thoracic spine. Eur Spine J 14(10):992–999. doi:10.1007/s00586-005-0943-1
3. Brugieres P, Gaston A, Heran F, Voisin MC, Marsault C (1990) Percutaneous biopsies of the thoracic spine under CT guidance: transcostovertebral approach. J Comput Assist Tomogr 14(3):446–448. doi:10.1097/00004728-199005000-00023
4. Donaldson WF 3rd, Johnson DW (1996) Percutaneous biopsy of the thoracic spine. Neurosurg Clin N Am 7(1):135–144
5. Ghelman B, Lospinuso MF, Levine DB, O'Leary PF, Burke SW (1991) Percutaneous computed-tomography-guided biopsy of the thoracic and lumbar spine. Spine 16(7):736–739. doi:10.1097/00007632-199107000-00008
6. Mick CA, Zinreich J (1985) Percutaneous trephine bone biopsy of the thoracic spine. Spine 10(8):737–740. doi:10.1097/00007632-198510000-00008
7. Nourbakhsh A, Grady JJ, Garges KJ (2008) Percutaneous spine biopsy: a meta-analysis. J Bone Jt Surg Am 90(8):1722–1725. doi:10.2106/JBJS.G.00646
8. Ottolenghi CE (1969) Aspiration biopsy of the spine. Technique for the thoracic spine and results of twenty-eight biopsies in this region and overall results of 1050 biopsies of other spinal segments. J Bone Jt Surg Am 51(8):1531–1544
9. Pierot L, Boulin A (1999) Percutaneous biopsy of the thoracic and lumbar spine: transpedicular approach under fluoroscopic guidance. AJNR Am J Neuroradiol 20(1):23–25
10. Rimondi E, Staals EL, Errani C, Bianchi G, Casadei R, Alberghini M, Malaguti MC, Rossi G, Durante S, Mercuri M (2008) Percutaneous CT-guided biopsy of the spine: results of 430 biopsies. Eur Spine J 17(7):975–981. doi:10.1007/s00586-008-0678-x