been premedicated heavily and had received remifentanil 1 µg kg⁻¹ followed by an infusion of 0.1 µg kg⁻¹ min⁻¹ for 2–3 min. Concomitant administration of a neuromuscular blocking agent such as vecuronium with an opioid can lead to bradycardia. However, bradycardia occurred in our patient before administration of the blocker, and in any case rocuronium has a slight vagolytic action. Opioid-induced bradycardia is generally accepted to be vagally mediated. This effect seems to be exacerbated in the presence of beta-receptor blocking agents, and in this patient it appears that we may have unmasked a tendency to a bradyarrhythmia. This may have been the cause of the fall, which led to the initial injury to the eye.

We suggest that even a slow bolus of remifentanil may result in severe bradycardia in elderly patients receiving beta-receptor blocking drugs or with pre-existing bradycardia. A slow infusion may be preferable and result in less haemodynamic disturbances.

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5 Desouza G, Lewis MC, TerRiet MF. Severe bradycardia after remifentanil. Anesthesiology 1997; 87: 1019–20

Pulmonary haemorrhage after percutaneous paravertebral block

Editor,—With reference to the case report by Thomas, Sanders and Berrisford,¹ which described pulmonary haemorrhage as a complication of percutaneous paravertebral block when a 16-gauge Tuohy needle was inserted to a depth of 6 cm in the mid-thoracic region, I would like to make the following comments.

The Tuohy needle was inserted inappropriately deep for a mid-thoracic paravertebral block; identification of the paravertebral space with the loss of resistance technique may give a false negative result; and a 22-gauge Tuohy needle is the needle of choice for single-shot percutaneous paravertebral blocks.

A full understanding of the anatomy is essential for safe use of any regional technique. When performing a paravertebral block, it is imperative to locate the transverse process of the vertebra, before advancing the needle into the paravertebral space. In the thoracic region, the spinous process of a vertebra lies in the same horizontal level as the transverse process of the vertebra below, because of the extreme angulation of the spinous processes. In adults, the transverse processes are located 2.5 cm lateral to the midpoint of the spinous processes. The skin to transverse process distance varies from 2–3 cm in the T5–6 region to 5 cm in the T1–2 region. However, there may be a small variation depending on the size of the patient. The paravertebral space lies anterior to the transverse processes and superior to the costotransverse ligaments, at a depth of 1 cm from the posterior surface of the transverse processes.

Loss of resistance with saline or air can be used to locate the space as the needle passes through the superior costotransverse ligament but may result in false negatives. Scar tissue in the paravertebral space, or a previous thoracotomy, may interfere with the loss of resistance technique.

A 22-gauge Tuohy needle (B. Braun Medical Inc, Product code E2230T) is the needle of choice for single-shot percutaneous paravertebral blocks. It has the advantage of a small diameter, 1-cm markings to a depth of 8 cm so that the precise depth of the tip of the needle is always known and a blunt tip so that a ‘pop’ may be experienced as it passes through the costotransverse ligament. Unfortunately, this needle is not available in the UK, but can be imported by special arrangement by B. Braun Medical Inc.

At Duke University Medical Center, all breast surgery is performed using percutaneous paravertebral blocks with sedation. We have performed more than 1000 percutaneous blocks with no pneumothoraces and only two epidural spreads. We would like to describe our technique. First, choose which dermatomes will be involved in the operative field. For mastectomy with axillary dissection, we routinely block T1–T6. The patient is placed in the sitting position with their neck flexed, back arched and shoulders dropped forward. The spinous process of each level is identified and a mark is placed at its most superior aspect. From the midpoint of these marks a needle entry site is marked 2.5 cm lateral to each spinous process ipsilateral to the incision. These marks should overlie the transverse process of the immediately caudal vertebra. Using an aseptic technique, a 22-gauge 8-cm Tuohy needle attached via extension tubing to a syringe is inserted through the skin and advanced anteriorly in the parasagittal plane until it contacts the transverse process, which is 2–5 cm depending on the habitus of the patient. In the T6 region, the expected depth of the transverse process is 2–3 cm. Inserting the needle 1 cm past this predicted depth is allowed. If the transverse process is not identified at the appropriate depth, it is assumed that the needle tip lies between adjacent transverse processes, and the needle should not be advanced any deeper. If bone is contacted at a point that seems too deep, this is probably a rib lying anterior to the transverse process. In both these cases, return the needle to the skin point, and search in a cephalad and then a caudal direction until the transverse process is successfully contacted. This depth is noted as the estimated distance to subsequent transverse processes. The needle is then withdrawn to the subcutaneous tissue and angled to walk onto the caudal edge of the transverse process by 1 cm. At thoracic level, it is common to appreciate a loss of resistance or a subtle ‘pop’ as the needle passes through the superior costotransverse ligament. After aspiration, 3–5 ml of local anaesthetic (0.5% bupivacaine or 0.5% ropivacaine with epinephrine 1:400 000) are injected at each level.

Percutaneous paravertebral blocks can be safe and effective when performed in good hands. The complications of the block are minimized by a full understanding of the anatomy of the paravertebral space and identification of a safe pre-end-point (i.e. the transverse process).

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Editor,—Thank you for the opportunity to respond to the points raised by Drs Hill and Greengrass regarding our recent case report describing a case of pulmonary haemorrhage after a percutaneous paravertebral block. It was not the intention of this case report to give a detailed description of how a paravertebral block should be executed correctly. This has been eloquently described in several publications, two of which1 2 were referred to in our original article. It goes without saying, however, that a sound knowledge of the relevant anatomy is a prerequisite for this and indeed any other regional or local anaesthetic technique being performed.

We would take issue with the comment made that the Tuohy needle was inserted inappropriately deep for a mid-thoracic paravertebral block. In a recently published article,3 the depth from skin to paravertebral space in 86 female patients ranged from 3.1 to 6.0 cm. Similarly, Richardson and colleagues4 reported a mean depth of the paravertebral space of 5 cm with an SD of 0.7 cm. The female patient in our case report was a relatively thick set individual, and while 6 cm is quite deep, it could not be considered to be outside the normal range.

Drs Hill and Greengrass comment that scar tissue in the paravertebral space may give a false negative result when using a loss of resistance to air technique. We agree entirely—this was exactly the point we were illustrating in our case report. To our knowledge, this complication had not been documented before, which prompted us to report it.

As the smaller 22-gauge Tuohy needle is not available in the UK, we have no personal experience in its use, although it seems a sensible option. We would advise using the size of needle to which one is most accustomed. In common with the majority of anaesthetists in this country, we use the 16-gauge needle for all of our adult epidural work and feel more comfortable with the tactile feedback from these larger needles.

We read with interest the described technique for performing breast surgery using a paravertebral block with sedation. It would appear that up to six separate injections are being made in each patient to achieve an adequate surgical block from T1 to T6. We would question the wisdom of multiple injections given that even in expert hands there is a risk of complications with each pass of the needle. It is well documented that there is a good spread across several dermatomes after a single paravertebral injection. We are currently conducting a clinical study which involves injecting methylene blue-labelled bupivacaine paravertebrally before open thoracotomy. In our experience to date, it is not uncommon to see spread over 4–6 intercostal spaces after an injected volume of 0.5% bupivacaine 20–30 ml. These as yet unpublished findings concur with previously published data, both clinically1 and in radiological studies.6 It would seem unnecessarily risky to perform multiple injections when one or perhaps two would adequately suffice.

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1 Thomas PW, Sanders DJ, Berrisford RG. Pulmonary haemorrhage after percutaneous paravertebral block. Br J Anaesth 1999; 83: 668–9

Complications of paravertebral block

Editor,—We read with interest the case report of Thomas, Sanders and Berrisford on pulmonary haemorrhage after percutaneous paravertebral block.1 It is well recognized that in patients who have undergone previous thoracic surgery, the paravertebral space may be fibrosed and that this can interfere with the appreciation of loss of resistance.2 In such cases, it is important to locate the transverse process to prevent the Tuohy needle from penetrating too deeply.

The authors do not mention whether in this patient the transverse process was identified. It is imperative that this bony landmark be located without the needle penetrating any deeper than necessary. If the transverse process is not contacted initially at a depth of approximately 3 cm, the needle should be withdrawn and reinserted in either a caudal or cephalad direction.3 From the displayed CT scan, the approximate position of the transverse process can be measured at a depth of 3 cm. The Tuohy needle was noted to be at a depth of 6 cm when blood was aspirated, so we assume that the authors failed to identify the transverse process. The Tuohy needle must have breached the pleura and entered the lung tissue. The most likely source of the pulmonary haemorrhage seen on bronchoscopy would be from a traumatized pulmonary vessel.

Our second point relates to the single axial CT slice of the chest. The left paravertebral space may be 5–15 mm wide in the normal subject.4 Using the scale displayed on the CT image, the left paravertebral space is approximately 5 mm wide and within normal limits. Further interpretation of the paravertebral region to identify abnormal tissue attenuation material within the normal fatty space is prevented by the position of the author’s marker and the window settings chosen to display the image. A paravertebral haematoma may have been visible on other slices in the examination series but in our opinion the displayed image fails to show this condition.

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1 Richardson J, Cheema SPS, Hawkins J, Sabanathan S. Thoracic paravertebral space location. Anaesthesia 1996; 51: 137–9
