A SURGICAL APPROACH TO THE UPPER THORACIC SPINE

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We describe a surgical approach to the upper thoracic spine which allows an adequate exposure of the vertebral bodies from T1 to T3. The approach causes little functional disturbance and is especially useful in older patients with spinal tumours causing spinal cord compression.

Excision of the affected vertebral body, often combined with decompression of the spinal cord, is now widely used for the surgical management of infection, especially tuberculosis (Hodgson and Stock 1960), spinal tumours (Harrington 1981) and congenital spinal deformity (Leatherman and Dickson 1979). There has thus been an increasing interest in a direct surgical approach to vertebral bodies.

Surgical approaches which allow exposure of the anterior aspect of virtually the full length of the spine have been described. The upper thoracic spine (T1–T3), however, remains a problem. These vertebral bodies can be visualised through a standard thoracotomy which enters the chest through the bed of the third rib. Access is greatly restricted, however, by the scapula and the remaining ribs, making a vertebrectomy and spinal cord decompression very difficult. Reconstruction of the vertebral defect and instrumentation to give spinal stability are equally difficult. The anterolateral approach by a costotransversectomy (Capener 1954) is feasible at this level but, again, access is very limited and decompression of the spinal cord with spinal instrumentation over more than one level is difficult.

This paper describes a surgical approach which allows direct exposure of the first, second and third thoracic vertebral bodies, thus making operation on this portion of the spine easier and less hazardous.

Operation. The patient lies in the lateral position with the uppermost arm supported on an arm-rest in front of the chest and at shoulder level. The right-sided approach is preferred, as the straight course of the brachiocephalic artery into the base of the neck (rather than the curved course of the left subclavian artery) makes it less liable to injury during reflection of the pleura and superior mediastinal structures. The left-sided approach can, however, be used where investigation shows that the pathological lesion lies predominantly on the left side of the spine.

The incision begins below the inferior angle of the scapula and curves upwards and medially to finish opposite the spinous process of C7. It should lie midway between the medial border of the scapula and the spinous processes (Fig. 1).

At the lower end of the incision a small portion of the latissimus dorsi is divided, including those fibres that insert into the inferior angle of the scapula. The trapezius is divided in line with the skin incision, cutting as medial as possible to minimise the amount of the muscle that will be denervated (Fig. 2).

The trapezius is retracted laterally to expose the rhomboideus and levator scapulae muscles as they insert into the medial border of the scapula (Fig. 2). These muscles are divided, leaving a small portion of muscle attached to the scapula to permit subsequent re-attachment. The majority of these muscles can be retracted medially without interference with their nerve or blood supply.

The scapula can now be retracted laterally to expose the upper chest wall (Fig. 3). The posterior 7 to 10 cm of each of the second, third, fourth and fifth ribs is exposed by subperiosteal dissection and each rib is removed, leaving only the head and neck of the rib behind. If the vertebral body of T2 or T3 is involved, the first rib can usually be left intact; if, however, exposure of T1 is necessary, the first rib can also be divided with removal of a 2 to 3 cm segment.

An L-shaped incision is made in the pleura. The lower limb of this incision is made in the bed of the fifth rib and the vertical limb is made at the level of the medial cut end of the ribs. The intercostal muscles are divided and the segmental neurovascular bundle ligated at this.
Technique of operation. Figure 1 - Position of skin incision. Figure 2 - The trapezius and latissimus dorsi are divided to expose the rhomboids. Figure 3 - The rhomboids and levator scapulae are divided to allow the scapula to be retracted laterally; this exposes the chest wall. Figure 4 - An L-shaped incision is made in the pleura and intercostal muscles; the flap is retracted laterally to expose the pleural cavity. Figure 5 - The lung is deflated and retracted to expose the pleura over the vertebral bodies.

level. The pleura–muscle flap can now be reflected laterally (Fig. 4) to expose the pleural cavity. Retraction or deflation of the upper lobe of the lung reveals the upper thoracic spine (Fig. 5).

A combination of blunt and sharp dissection will allow reflection of the pleura and superior mediastinal structures to complete exposure of the vertebral bodies. Great care must be taken when dissecting around the neck of the first rib to avoid damage to the anterior root of T1 as it crosses the neck of the first rib to reach the brachial plexus.

Having completed the required surgery, each layer is closed in turn, with two underwater seal drains (apical and basal) in the pleural cavity. The arm is rested in a sling for two weeks, after which the shoulder is gradually and gently mobilised.

CASE REPORTS
Case 1. A 72-year-old woman presented with a six-week history of back pain, a two-week history of increasing weakness and numbness in the legs and a three-day history of difficult micturition. On examination there was marked weakness in all muscle groups in the lower limbs and a sensory level at T3. Perineal sensation was abnormal and reflexes were hyperactive. A plain radiograph showed collapse of the vertebral body at T2 with a complete extradural block at this level on the myelogram. An anterior decompression was performed using bone cement, supplemented by a Zielke rod, to reconstruct the vertebral defect (Fig. 6). Histological examination showed chronic osteomyelitis and the patient received a three-month course of antibiotics. There was a full neurological recovery and good relief of the back pain.
Case 2. A 69-year-old man presented with a nine-month history of back pain, 10 days of weakness in the legs and one week of numbness below the nipples. On examination there was marked weakness in the lower limbs and a sensory level at T3. Perineal sensation was altered and
reflexes were hyperactive. A plain radiograph showed collapse of the vertebral body at T3 and a CT-assisted myelogram showed compression of the spinal cord by an anterior tumour mass. An anterior decompression was performed using bone cement, supplemented with a Slott rod, to reconstruct the vertebral defect (Fig. 7). Histological examination revealed a myeloma and he received follow-up radiotherapy. There was an excellent neurological recovery with good relief of back pain.

Three further cases of spinal cord decompression have been performed using the same approach with no surgical complications.

DISCUSSION
This approach allows an excellent exposure of the anterior aspect of the upper thoracic spine. It provides adequate access to enable excision of the involved vertebral body, with decompression of the spinal cord and reconstruction of the defect produced. Spinal instrumentation, utilising the adjacent vertebral bodies, can be easily inserted where necessary.

The major criticism of the approach is its disregard for the nerve supply of certain structures within the operative field. A portion of the inferior part of the trapezius muscle is denervated and this, along with the formation of adhesions between the scapula and chest wall, may lead to some restriction of scapular movement. The division of three to four intercostal nerves will lead to paralysis of the relevant intercostal muscles and an area of numbness over the floor of the axilla and anterolateral chest wall.

In this small group of patients, however, only one experienced slight difficulty with shoulder and scapular movement and only one patient has been aware of chest wall numbness. Denervation of only three to four intercostal muscle groups is unlikely to cause any significant embarrassment to respiratory function, and our experience bears this out. Return of the scapula to its normal resting position covers the chest wall defect produced by the excision of the ribs, thus preventing the formation of a “flail” segment with its attendant paradoxical respiration.

The non-anatomical aspects of this approach should, perhaps, make one reluctant to use it for younger patients with non-fatal conditions. However, for the older patient, particularly with spinal tumours causing spinal cord compression, the approach described is well worth considering for procedures on the upper thoracic spine. It causes surprisingly little functional disturbance and offers an excellent exposure of a portion of the spine that is otherwise difficult to reach.

REFERENCES

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