ANTERIOR APPROACH TO THE UPPER THORACIC VERTEBRAE

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The anterior exposure of the upper thoracic spine using standard methods is often difficult and limited. We report our experience using a technique described by Sundaresan et al. (1984) in which the medial portion of one clavicle and part of the manubrium sterni are excised. In 10 cases we found this to be a useful and safe procedure.

Anterior approaches to the cervico-dorsal spine for purposes of decompression and stabilisation are well established, but the low anterior cervical and high transthoracic methods give limited exposure and present a problem, especially if bone grafting is to be done. A third route to this part of the spine is through a median sternotomy but this also gives limited exposure (Hodgson et al. 1960; Vanden Brink and Edmonson 1980). We describe our experience with the approach described by Sundaresan et al. (1984) when working at the Memorial Sloane Kettering Hospital in New York, and report on our results.

Sundaresan approached the front of T1 and T2 by partial resection of the manubrium sterni and part of the clavicle on one side. The vertebrae are revealed between the oesophagus and trachea medially and the carotid sheath laterally. The area may be approached either from the right or the left depending on the individual case. If no specific side is indicated it is safer to use the left side because the left recurrent laryngeal nerve is more constant in its location.

TECHNIQUE OF OPERATION

The patient is intubated under general anaesthesia and a nasogastric tube or an oesophageal stethoscope is used to help identify the oesophagus. A sandbag is placed between the scapulae and the head turned away from the side of the operation. The vocal cords are inspected by the anaesthetist at the start and at the end of the procedure to confirm that they are working.

A “T” shaped incision is made with the transverse limb 1 cm above and parallel to the clavicles, extending from the lateral border of one sternocleidomastoid muscle to the other. The vertical limb is in the midline extending to the middle of the sternum. On the side of the approach, the sternocleidomastoid and the strap muscles are released from the clavicle and manubrium. The manubrium and the medial half of one clavicle are exposed subperiosteally with care being taken not to damage the innominate vein. The medial third or half of the clavicle is resected using a Gigli saw and the bone retained so that it can be replaced as a graft at the end of the operation. Part of the manubrium is excised, preserving the opposite sternoclavicular joint. The anterior cortex of the manubrium is cut using a high

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Fig. 1

The operative field after part of the clavicle and of the manubrium have been excised. The strap muscles are turned upwards, the trachea and oesophagus are retracted to one side and the carotid sheath to the other. The innominate vein is retracted downwards.
speed burr; the posterior cortex is resected subperiosteally with a strong pair of scissors or bone nibblers.

The plane between the trachea and oesophagus medially, and the carotid sheath laterally, is developed; the recurrent laryngeal nerve is identified and protected; the innominate vein is retracted downwards. The prevertebral muscles are now exposed and stripped from the front of the vertebrae (Fig. 1). Using metal markers, a radiograph is taken to confirm the level of involvement. Exposure down to T3 is easily achieved and decompression and stabilisation may be performed. The excised clavicle is replaced as a bone graft, haemostasis is secured and the strap muscles are re-attached to the periosteum. The platysma and skin are closed over suction drains.

Postoperatively the patient is nursed with sandbags on either side of the head. Provided that radiographs then show the graft to be in good position, a firm cervical collar is applied and the patient is allowed up.

PATIENTS

Ten patients had this operation over a period of 18 months. Their clinical data and histological diagnoses are summarised in Table I. The Frankel classification was used to grade neurological involvement (Frankel et al. 1969). Before operation, five patients had complete and five incomplete paralysis. Plain radiographs of the involved area were often difficult to interpret, and tomograms were done in all patients (Fig. 2). Myelography and CT scans were useful when the tomograms were not sufficiently clear (Fig. 3).

RESULTS

Follow-up varied from three to 11 months with an average time of 5.9 months. One patient with poor respiratory function and complete paralysis died from respiratory failure three weeks after operation. Two patients showed no neurological recovery but the remaining seven were ambulant at the time of discharge.

No patient experienced any shoulder problem on the side from which part of the clavicle had been removed and replaced.

Bone grafting was performed in eight patients and
at final follow-up all grafts were incorporated (Fig. 4). One patient had only a partial vertebrectomy and therefore no graft was used, and another had very soft bone which would not accept a graft.

**Problems and complications.** The one death from respiratory failure was in a patient with chronic bronchiectasis and old pulmonary tuberculosis. The operation itself gave no problem and death was not attributed to it. In one of the early cases the graft displaced slightly. The patient was kept in bed for three months and finally the graft was well incorporated.

Hoarseness of voice occurred in one patient after surgery, though the vocal cords were recorded as functioning at the end of the procedure. The hoarseness seemed to be due to retraction on the larynx and it resolved within two weeks. In one patient, with a secondary deposit of thyroid carcinoma, the graft could not be inserted because of profound osteoporosis. This patient was subsequently stabilised posteriorly using a Luque rod and bone cement.

**DISCUSSION**

An anterior approach to the upper thoracic vertebrae presents technical difficulties. In a patient with a long slender neck and drooping shoulders an anterior cervical approach can sometimes give adequate exposure, but in

<table>
<thead>
<tr>
<th>Case</th>
<th>Age (years)</th>
<th>Sex</th>
<th>Site</th>
<th>Duration (months)</th>
<th>Pathology</th>
<th>Follow-up (months)</th>
<th>Frankel* grade (Pre-op</th>
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<td>69</td>
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<td>T2</td>
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<td>T1 and 2</td>
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<td>56</td>
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<td>T2</td>
<td>2</td>
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<td>4</td>
<td>45</td>
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<td>50</td>
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<td>Tuberculosis</td>
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* Frankel grades: A, complete paraplegia to E, free of neurological symptoms
patients with normal physique access tends to be limited especially for bone grafting. The high transthoracic and median sternotomy approaches to this area also give limited exposure.

We found that partial excision of the clavicle and manubrium was technically simple, and enabled decompression and grafting to be performed with ease. We were able to visualise the body of T3 in all cases. Because of the difference in the location of the recurrent laryngeal nerve on each side, it is less hazardous to approach the spine from the left side. Here the nerve reaches its position between the trachea and oesophagus in the chest and does not cross the operative field. On the right side the nerve does cross the operative field and is thus prone to injury.

We found this approach to be a safe and useful method for a difficult area in the spine; it should be known to all who perform anterior spinal surgery.

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REFERENCES


