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AN ANTERIOR, EXTRAPHARYNGEAL, SUPRAHYOID APPROACH TO THE FIRST, SECOND AND THIRD CERVICAL VERTEBRAE

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When faced with the problem of approaching the anterior aspect of the first, second and third cervical vertebrae, the surgical literature to date presents an array of formidable procedures. The approach of Fang & Ong (1962) and Hodgson & Stock (1956, 1960) through the pharyngeal cavity was felt to increase the risk of infection beyond reasonable limits in this case. The approach of Foille & Delmas, well described and illustrated by Kaplan (1966), approaching the first three cervical vertebrae, in effect laterally, requires an approach proceeding around a considerable number of vital structures, namely the seventh, tenth, eleventh and twelfth cranial nerves, and the second, third and fourth cervical nerves, the branches of the internal jugular vein and the external carotid artery. Similarly, the approach of DeAndrade & McNab (1967, 1969) also approaches the cervical vertebrae laterally. In their later series of five cases they indicated that tracheostomy was necessary in four out of five patients. They described encountering the accessory nerve, the hypoglossal nerve and dividing the superior thyroid, lingual and facial arteries and accompanying veins in order to obtain access to the retropharyngeal space. The traction effect on the pharyngeal and laryngeal branches of the vagus nerve were also described.

CASE REPORT

The procedure which we are about to describe was performed in the case of a 23-year-old graduate university student who presented with X-rays demonstrating a fracture dislocation of C-2 on C-3 with marked displacement of C-2 anteriorly. Fractures of the lamina and pedicles were present. The sole neurologic deficit present was transient paresthesias in one arm. The patient was placed in Vinke tongs, and a closed reduction of the fracture was performed under X-ray control with the patient awake. Fractures of the right second, third, fourth, fifth and eighth ribs and a pneumonic process in the right middle lobe and a pneumothorax necessitated

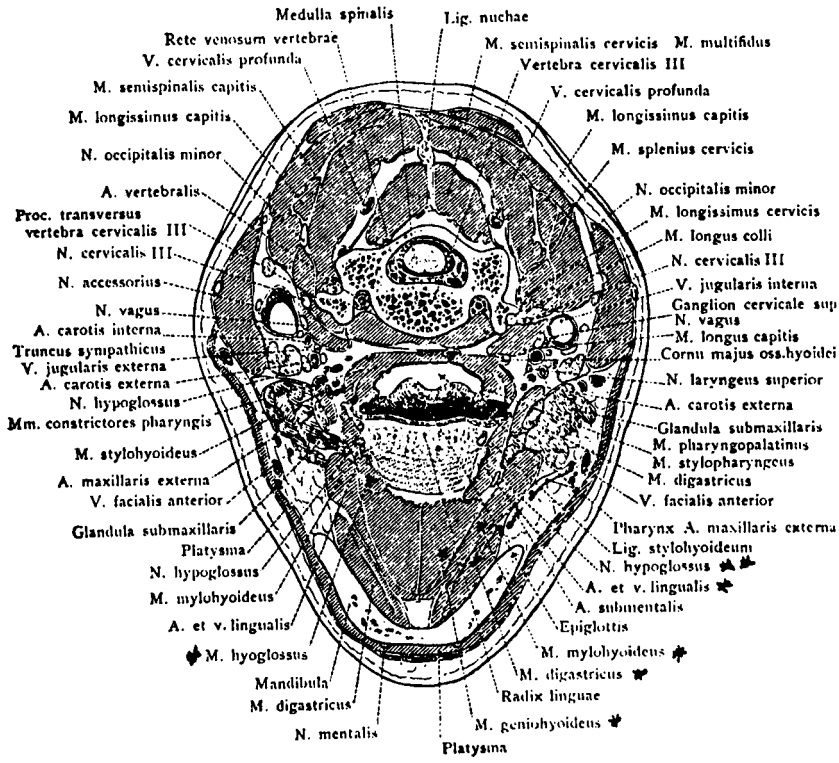

Figure 1. A cross-section of the neck through the point of the chin. Singly starred structures must be divided. The division of these structures and the rotation of the neck 45° opens the extrapharyngeal plane to the anterior aspect of the vertebral bodies.

continuation of a conservative course for a period of 3½ weeks. During this time the fracture dislocation was found to be extremely unstable, tending to displace anteriorly. In addition, the patient commenced to develop pressure sores over his occiput, which with the comminution of the posterior elements presented us with no choice but to fuse the second and third cervical vertebrae anteriorly.

At surgery the patient evidenced a tear of the anterior longitudinal ligament with displacement of the disc material beneath this, and destruction of the C-2–C-3 disc space. This was felt to contribute in part to the anterior displacement. However, it was felt that the site of the fracture, plus the absence of any posterior attachments, was responsible primarily for the instability. At surgery slight residual displacement of the second cervical vertebra was found with reference to the third.

Prior to performing the operative procedure, with the patient awake, and prior to being anesthetized, his neck was gently extended 20° and then rotated as far to the left as comfortably possible, approximately 45°. When no neurologic symptoms were produced, the patient was anesthetized and intubated. A transverse incision was made on the right along the upper border of the hyoid from just lateral to the

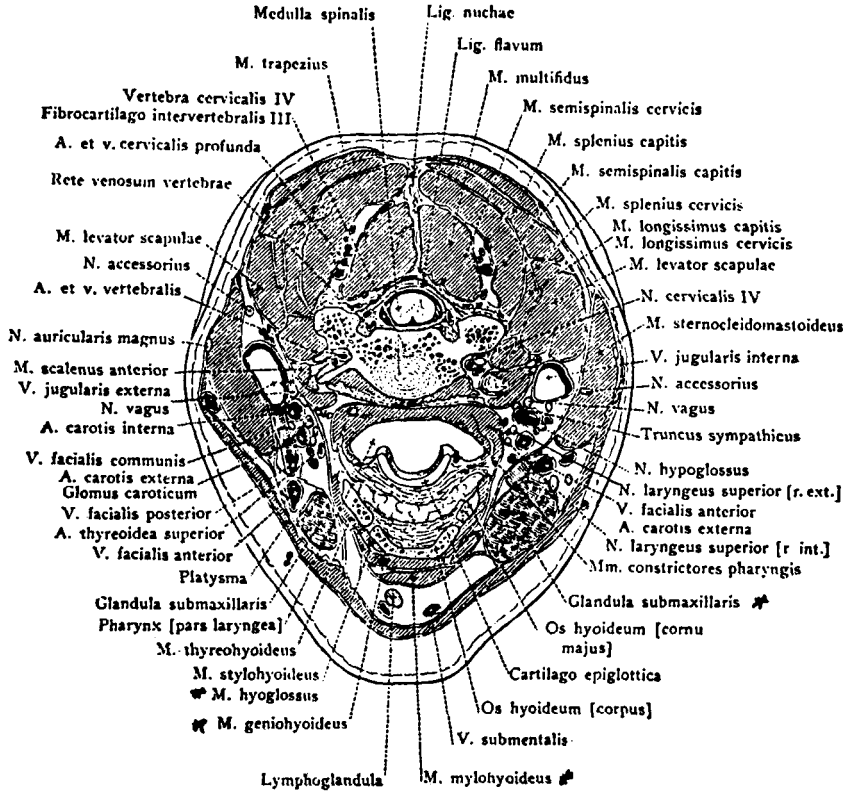

Figure 2. Cross-section of the neck passing through the hyoid bone. The singly starred structures were divided.

midline toward the sternocleidomastoid. The skin and platysma were incised. The external cervical fascia was divided parallel to the skin incision. The hyoid was exposed along its superior margin. The capsule about the submaxillary gland was divided and the gland retracted cephalad. Care must be taken to avoid perforating the gland. The anterior portion of the digastricus muscle was then divided, further facilitating exposure. The lingual artery was identified and divided and ligated. This step facilitates maintenance of a dry field. The hypoglossal nerve next comes into view in the layer beneath the digastricus muscle and deep to the mylohyoideus muscle. It is usually picked up between the mylohyoideus and the hyoglossus muscles. Once the hypoglossal nerve has been identified, care must be taken in its retraction in a cephalad direction. The patient experienced transitory ipsilateral tongue paresis postoperatively, in the absence of vigorous retraction in this case. Three muscles remaining in the way required incision, namely the mylohyoideus extending from the mandible to the anterior surface of the hyoid bone, the hyoglossus extending from the upper border of the greater cornu of the hyoid bone and adjacent body to the base of the tongue, and the genioglossus fanning from the

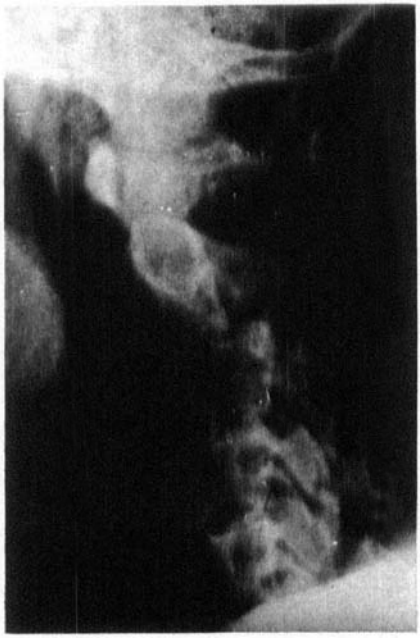

Figure 3. Initial lateral X-ray of the fracture dislocation of C-2 on C-3.

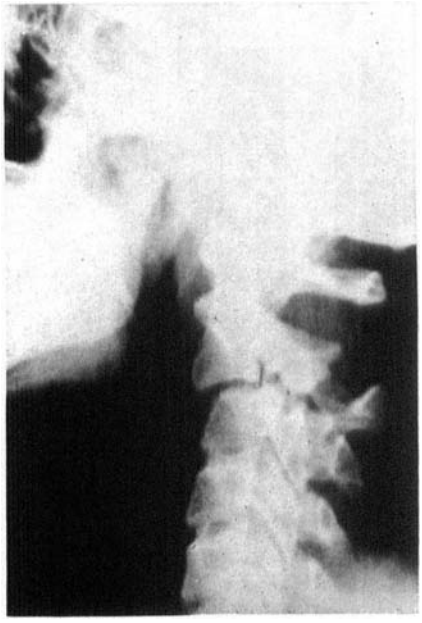

Figure 4. Lateral X-ray of the cervical spine at a later date, demonstrating the instability of the fracture at this level.

spine of the mandible toward the tongue and the medial part of the superior border of the hyoid bone. Once these three muscles were incised, the extrapharyngeal plane lying medial to all of the neurovascular structures heretofore encountered in other exposures, and extending extrapharyngeally to the ventral surface of the vertebral bodies of the upper three cervical vertebrae was opened.

This plane was dissected bluntly. The rotation of the neck tended to rotate the pharynx away from the neurovascular structures. The interval between the pharynx and the longus colli muscle was readily developed in the exact midline of the vertebra contributing to the avoidance of bleeding at this point. At this point in the procedure, the disc space was identified radiographically. We found it easy to insert a needle at the C-3–C-4 disc space. The exposure was found to be readily obtained from the anterior portion of the first cervical vertebra distally to that of

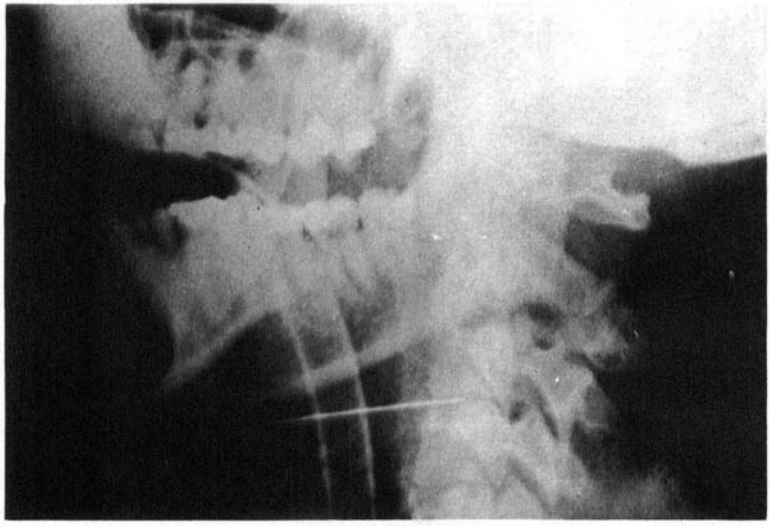

Figure 5. Operative X-ray showing placement of the marker needle at C-3–C-4 disc level.

the fourth cervical vertebra. Periosteal stripping of the longus colli and longus capitus muscles facilitated exposure of the appropriate vertebrae and disc space. We felt there was adequate space for the use of most neurosurgical instruments, including the smaller Cloward (1958) instruments, if necessary, at the C-2–C-3 level. We found it possible to remove the disc and perform a fusion without the necessity of resorting to these instruments. The wound was closed by simply approximating the platysma and skin. Bleeding was negligible, and a drain was not necessary.

Postoperatively, the patient was kept in Vinke tongs for a period of six weeks, at which time X-rays showed incorporation of the graft and adequate progress of the fusion. The patient was then placed in a four poster brace, and permitted to sit up in bed and to ambulate gradually. The patient had no neurologic deficit save for a problem with balance at the time of discharge. This was felt related to his extensive period of recumbency, though the possibility of vertebral artery trauma at the time of the original injury was entertained. However, the balance problem disappeared with time.

On follow-up four years later, the patient is now leading a normal life, is married, and is teaching. He has 90° of neck rotation to the right and to the left, and flexion such that he touches his chin to his chest, and extension of 20°.

DISCUSSION

The anterior approach to the mid and lower cervical spine, popularized by Southwick & Robinson (1955, 1957) and further described by Bailey & Badgley (1960) because of the limitations incurred by the superior

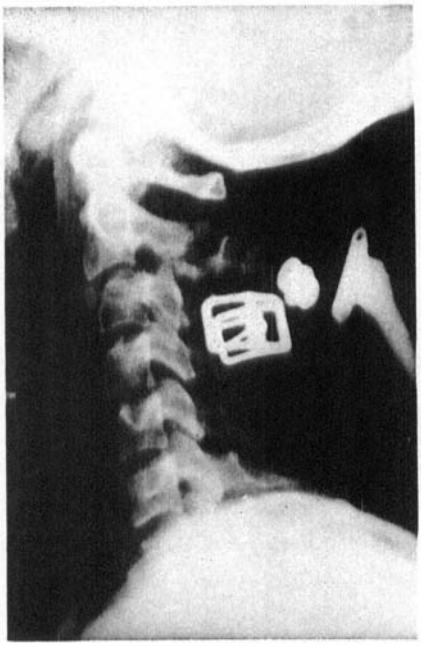

Figure 6. Lateral X-ray demonstrating the fusion mass between C-2 and C-3.

thyroid artery and adjacent superior laryngeal nerve was inapplicable here, necessitating an extensive search of the surgical literature to provide an answer to the problem in this case. The neurosurgical literature in the report of Stevenson et al. (1966) and the approach of MacNab (1967) did indicate the feasibility of dissection of the pharyngeal mucosa as far rostrally as the clivus and the vomer. We felt that the intrapharyngeal approach, because of a high infection rate reported (Fang 1962), was undesirable in this case. Our approach is different from that of Foille & Delmas (1921, 1940) and that of DeAndrade & MacNab (1967) in that it is anterior, thus avoiding the problems encountered in dealing with the extensive number of vital structures traversing the neck laterally.

SUMMARY

This approach to the anterior aspect of the first, second and third cervical vertebrae, though a formidable undertaking, obviates certain disadvantages heretofore present. In some cases it obviates the necessity of occiputal cervical fusion. Anterior structures can be readily fused in the presence of damaged posterior neural arch structures, or

other lesions precluding a posterior approach. Rotatory motion of the atlas and occiput can be preserved, as was demonstrated in this case. The time necessary for fusion was reduced to approximately six weeks. Vital structures are by and large avoided. The objection to the intrapharyngeal approach is hereby overcome.

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