Postoperative epidural hematoma as a complication of anterior cervical discectomy

Report of three cases

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In three cases, anterior cervical discectomy was complicated by acute postoperative paraplegia secondary to epidural hematomas at the operative sites. Prompt evacuation of the hematomas was followed by recovery in each instance. The source of bleeding was an arterial arcade that may be encountered during the course of removing the posterior longitudinal ligament. As a result of this experience, the authors suggest steps to be taken to avoid this uncommon complication.

KEY WORDS: • anterior cervical discectomy • cervical disc disease • spinal epidural hematoma • postoperative paraplegia

Despite conservative measures, degenerative disease of the cervical spine may be complicated by progressive radiculopathy and myelopathy. The majority of surgeons who have adopted an anterior approach to cervical spondylosis have performed an anterior cervical discectomy and interbody fusion by means of either the Smith-Robinson or the Cloward technique.\textsuperscript{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17}

We have employed a version of the technique of anterior cervical discectomy without fusion first advocated by Hirsch\textsuperscript{18} and Boldrey,\textsuperscript{2} and later by Murphy and Gado\textsuperscript{19} and Robertson.\textsuperscript{5} We agree with Epstein, \textit{et al.},\textsuperscript{7} that removal of osteophytes is the essential component of the procedure. The operating microscope has been used because it affords superior illumination and magnification in a small surgical field. Hankinson and Wilson\textsuperscript{8} reported the results from our series of cases in 1975. Subsequently, we have modified the procedure by routinely opening the posterior longitudinal ligament to ensure thorough removal of intraforaminal and intraspinal osteophytes. During the past year, we have encountered three cases of delayed acute epidural bleeding that were discovered soon after the patients awakened in the postanesthesia recovery room. In each case immediate evacuation of the hematoma was followed by reversal of paraplegia. This report examines the factors that may lead to this potentially disastrous complication.

Case Reports

\textbf{Case 1}

This 60-year-old man presented with a 6-year history of intermittent but progressive aching sensation around his right neck, shoulder, and arm. Occasional weakness
Hernatoma following cervical discectomy appeared around the shoulder, and advanced to involve the right hand, leading to difficulty in writing. Neurological examination showed only a slight decrease in pain sensation over the C-6 and C-7 dermatomes on the right. Plain films of the cervical spine showed changes of cervical spondylosis, and a myelogram confirmed defects at the C5-6, and C6-7 levels.

During the operation for anterior discectomy at the C5-6 and C6-7 levels, degenerative disc material was removed with curettes, and the appropriate intervertebral spaces were enlarged with the Hall drill* to a transverse diameter of 1 cm and a vertical diameter of 6 mm. Curettes were used to remove the posterior longitudinal ligament, exposing the dura, and to widen the intervertebral foramina. Epidural venous bleeding was minimal and cleared with irrigation and gentle pressure. The wound was dry at the time of closure.

Upon awakening from anesthesia, the patient was paraplegic and areflexic, with a sensory level that was complete to T1-2 bilaterally. Position sense was lost but deep joint sense was preserved in both the lower extremities. The obvious diagnosis was acute cervical cord compression; the patient was given dexamethasone and mannitol and was rushed back into the operating room for wound exploration.

At exploration of his wound, a small soft clot was found in the C5-6 epidural space, and a rubbery epidural clot was found at the C6-7 level, depressing the dura. When these were removed, vigorous arterial and venous bleeding commenced, coming from several directions and flooding the epidural cavity. At this point, the patient was awakened briefly from anesthesia and he was able to move all four extremities well. Enlargement of the intervertebral space failed to disclose the source of bleeding. The single maneuver that proved crucial to hemostasis was compression of the posterior longitudinal ligament against the posterior vertebral surface by an angled dissector introduced into the epidural space. The success of this maneuver not only indicated that the source of bleeding was in the posterior ligament but also suggested a means of coagulating these bleeding vessels. Further packing with Gelfoam and irrigation with cold Ringer's solution finally brought the bleeding under control. The operative field was observed for 15 minutes and remained dry, so it was closed. At the termination of the procedure a lumbar puncture with Queckenstedt's maneuver was performed, with normal manometrics.

The patient made an uneventful recovery and left the hospital 1 week later unimpaired. At no time during the preoperative, intraoperative, or postoperative neurological examination was a defect in his blood coagulation system discovered.

Case 2

This 52-year-old man was admitted for evaluation of pain in the left arm and left side of the neck. The pain dated back 13 years to the time when he suffered an acute cervical flexion-extension injury. He developed intermittent left neck and shoulder ache which subsequently radiated to the posterior aspect of his left arm, and the radial aspect of his forearm and fingers, accompanied by numbness. Motor testing revealed weakness of his long finger flexors and extensors, the intrinsic hand, and the triceps muscles on the left. The left triceps reflex was unobtainable. Sensory examination showed patchy impairment of sensation of all modalities in the left upper extremity. Initial blood evaluation showed a normal coagulation profile. Cervical spine films revealed degenerative changes, with slight foraminal encroachment by bony spurs at the C6-7 level bilaterally. A cervical myelogram demonstrated a significant anterior bar defect anteriorly and on the left at the C6-7 level, with a minimal defect at the C5-6 level anteriorly. The operative technique was similar to that used in the previous case in regard to removing the disc material at C6-7, widening the intervertebral space with an air drill, and opening the posterior longitudinal ligament and curetting away osteophytes centrally and laterally. Because of the complication encountered in the previous case, particular care was taken to obtain absolute hemostasis.

In the recovery room, the patient moved both legs and the right arm well. Initially he would not move the left arm. As he became more alert within the next 20 minutes he began to move his left arm but lost strength in

*Hall drill manufactured by Hall International, Inc., P.O. Box 4307, Santa Barbara, California.
both legs. He could perceive painful stimuli in all extremities at all times and his reflexes remained intact. After receiving Decadron and intravenous mannitol, the patient was returned to the operating room for exploration for possible cervical cord compression for an epidural clot.

At reoperation, a large rubbery clot was found in the intervertebral space, and after its removal, diffuse arterial bleeding was observed coming from the epidural space. Under the operating microscope no single source of bleeding could be identified from any surface or crevice. With an angled dissector, the epidural spaces above, below, and lateral to the surgical opening were explored systematically. The dissector was used to compress the posterior ligament against the posterior vertebral surface, and wherever bleeding diminished with this compressive maneuver, the area was coagulated. In this manner, multiple bleeding sites were identified and coagulated. After complete hemostasis was achieved, the patient was awakened transiently and he moved all extremities satisfactorily upon command. General anesthesia was re-induced and the wound was closed.

Postoperatively, the patient reported relief of pain, and he made an uneventful recovery.

Case 3

This 48-year-old man had developed interscapular pain and numbness in the lateral three fingers of his right hand while jogging. On admission there was a slight weakness of the right biceps and the intrinsic muscles of the hand. Sensory examination failed to disclose any loss. A cervical spine radiograph showed diffuse cervical spondylosis and myelography disclosed lateral root sleeve defects at the C4–5, C5–6, C6–7, and C7–T1 levels; the defects were particularly impressive at C5–6 and C6–7.

An anterior discectomy with removal of intraspinal and intraforaminal osteophytes was performed at the C5–6 and C6–7 levels. The entire field was dry before closure. In the recovery room the patient complained of diffuse neck pain but had normal strength in all extremities. Minutes later, he developed weakness in both legs, and soon became quadriplegic although he was breathing adequately. He was returned immediately to the operating room.

No hematoma was found at the C5–6 space. A clot was evacuated at the C6–7 epidural space, and brisk bleeding was thereupon encountered from the depths of the wound. Arterial blood spurted into both interspaces from behind the bony edges. Application of bone-wax was ineffective, and bleeding was finally controlled with coagulation using a small nerve hook cupped against the undersurfaces of the bone edges. The patient was awakened briefly to establish recovery of strength and, after hemostasis was achieved, the wound was closed. The patient made an uneventful recovery, although he has some persistent weakness of his right-hand grip. At no time, either preoperatively or postoperatively, did the hematological evaluation disclose any coagulation defects.

Discussion

The complication encountered in these patients appears to be unique to the maneuver of dural exposure through removal of the posterior longitudinal ligament. Exposure of the dura permits unobstructed access to the intervertebral foramen and facilitates removal of osteophytes from the posterior and posterolateral surfaces of the involved vertebral bodies; however, following this practice in approximately 100 cases at our affiliated hospitals we have encountered acute postoperative epidural hematomas in three patients.

A review of the vascular supply of the vertebral column indicates the probable source of arterial bleeding. The studies of Crock and Yoshizawa defined an arterial network in the region of the posterior longitudinal ligament. Arising from the vertebral arteries are anterior spinal canal branches on the posterior surface of the cervical vertebral bodies which sweep around each pedicle to enter the spinal canal from the C-2 level downward. After entering the spinal canal, these branches bifurcate into ascending and descending branches that are linked together to form a complex vascular arcade under cover of the posterior longitudinal ligament in the middle of each vertebral body. The deep cervical artery may give rise to branches that replace the anterior canal branches in the lower cervical region.

Branches arise from the arterial arcade to penetrate and supply the respective vertebral
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bodies. As the posterior ligament is curetted against the posterior vertebral body in the removal of the posterior osteophytes, these vessels may be injured. The reason for the delayed nature of this arterial bleeding is still unclear. We reviewed the recorded blood pressures of all three patients between the time of wound closure and the onset of the paraplegia, and no significant changes were noted. Coughing of any unusual degree during extubation was not a factor.

The important lesson learned in this experience is the absolute necessity of immediate decompression. Any maneuver short of immediate exploration might not have had the fortunate outcome obtained in our cases. Such a severe degree of spinal cord compression so soon after an anterior cervical operation indicates arterial bleeding. The problem is most likely to arise at the operative site, and the opened interspaces should be explored with all possible haste; this was done in all of our cases, with recovery of lost function. In the event of a negative exploration, a myelogram would be in order.

This complication, although serious, is uncommon, representing approximately 3% of all the cases we have treated with this surgical approach; if based on the risk per interspace, the rate would be less than 2%. We do not believe that this complication is related to the surgeons' skill or experience, and we will continue to remove the posterior longitudinal ligament, but with the following modifications: 1) when the disease is situated laterally, only the lateral aspects of the ligament will be removed; 2) as formerly, the ligament will be cut away by drawing an angled curette along the posterior surface of the osteophyte and vertebral body, and in addition, the cut surface of the ligament will be coagulated with low current, using a nerve hook or angled dissector pressed against the ligament while protecting the dura; and 3) patients will be observed in the postanesthesia recovery room for at least 3 hours.

References


This work was supported in part by NIH Training Grant NS05593.

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