

Major Leakage of Pleural Fluid Out an Epidural Catheter Tract in a Post-Thoracotomy Patient

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The use of epidural opiate analgesia *via* catheter in post-thoracotomy patients is well established.¹⁻³ If maintained properly, epidural catheters can be left in place for up to several days without significant risk of infection or unexpected migration of the catheter tip.⁴ To date, there have been no reports of leakage of any type of fluid (including cerebrospinal fluid) out the catheter tract (to the environment) upon removal of an epidural catheter, even if there was an initial dural puncture preceding a subsequent successful insertion of the epidural catheter using a different interspace. We report the occurrence of a large leak of a serosanguinous fluid from an epidural catheter tract in a post-thoracotomy patient that was probably an effusion of fluid from the pleural space. The leak was terminated by placing the patient in a position that greatly reduced the hydrostatic pressure gradient for outward flow.

REPORT OF CASE

The patient was a 68-yr-old woman who underwent a left posterolateral thoracotomy for a wedge resection of a solitary nodule in the superior segment of the left lower lobe. Prior to induction of general anesthesia, the patient was placed in the lateral decubitus position and the lumbar area was prepared with alcohol. An 18-G Touhy needle was inserted at the L2-3 interspace and a loss-of-resistance technique was used in an attempt to locate the epidural space. Upon entrance into what was felt to be the epidural space, a continuous leak of clear fluid was noted when the stylet was removed from the needle; it was obvious that the needle had entered the subarachnoid space and the needle was withdrawn. The procedure was repeated at the L1-2 level and the epidural catheter was threaded 2-3 cm into the epidural space in a standard manner. No blood or cerebrospinal fluid could be aspirated and none flowed out of the catheter spontaneously. A test dose of 5 ml of 1.5% lidocaine with epinephrine 1:200,000 was injected into the epidural catheter. The patient developed an appropriate bilateral band (L1-T11) of local anesthesia without any evidence of a subarachnoid or intravascular injection. The surgery was completed under general anesthesia (isoflurane 1-2%, fentanyl 400 µg) without any further untoward incident. Duramorph® 5 mg was injected through the epidural catheter prior to extubation of the trachea.

Postoperatively, a continuous infusion of 0.4 mg/h of morphine sulfate (0.1 mg/ml, 4 ml/h) per epidural catheter was begun with good pain relief. The patient had no oversedation, respiratory depression, headache, itching, nausea, vomiting, or breakthrough pain at any time postoperatively. On the second and third postoperative days, the left chest tube drained a total of approximately 150 ml of a serosanguinous straw-colored fluid. On the morning of postoperative day three the chest tube was removed followed 4 h later by discontinuation of the epidural opioid infusion and removal of the epidural catheter. Approximately 2 h later it was noted that the dressing over the epidural site was saturated with a serosanguinous straw-colored fluid. The dressing was replaced and observed. Several hours later, it was again noted that the epidural site dressing as well as all of the back part of her nightgown and the bedsheets were saturated with this same serosanguinous straw-colored fluid. Of note, wherever the fluid had dried (evaporated) from cloth, there was a straw-colored stain. Upon questioning, the patient again firmly denied any symptoms of headache affected by position or other side effects of spinal opioids.

The epidural site dressing was removed again and the epidural puncture site was closely examined. Drops of fluid were observed to be issuing from the epidural puncture site that looked identical to the previous chest tube fluid drainage. The drops of fluid exhibited the "hanging drop" phenomenon in that each time the patient inspired, the drop of fluid at the edge of the epidural tract would disappear back into the tract and then forward flow would resume on exhalation. Indeed, the rate of outward flow could be decreased by having the patient inspire more deeply or increased by having the patient exhale forcefully. The flow rate also seemed to be affected by position with increased flow upon sitting and decreased flow in the left lateral decubitus position. No masses or tissue boggyiness could be palpated in the area of the epidural puncture site. Two milliliters of fluid were collected for laboratory testing and a pressure dressing was applied. The patient was kept in the left lateral decubitus position overnight and the drainage of fluid ceased by the morning. The patient remained asymptomatic and had an uneventful and full recovery. The laboratory examination of the 2 ml of leaking fluid showed the presence of red blood cells, glucose, protein, and clear cells of an undetermined origin.

DISCUSSION

The main issues in this case are what was the composition and origin of the leaking fluid. There are five main possibilities. First, the epidural catheter could have been in the soft tissue outside the epidural space resulting in a collection of morphine sulfate fluid and perhaps a seroma that then leaked out when the catheter was removed. This possibility is very unlikely because the patient had very good analgesia at a very low dose of morphine sulfate, which would not be expected if the morphine were not being administered into the epidural or subarachnoid space. Furthermore, there was no edema or boggyiness on physical examination to suggest a fluid collection and fluid leaking from a soft tissue cyst or seroma would not exhibit

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the dramatic "hanging drop" phenomenon seen in this case. Finally, fluctuations in seroma fluid flow would be expected to be seen with pressure changes secondary to direct palpation and these were not observed.

A second possibility is that the epidural catheter was placed in the subarachnoid space and removal of the catheter was followed by a leak of cerebrospinal fluid from the subarachnoid space through a catheter tract. Again, this is improbable because 0.4 mg of morphine sulfate per hour into the subdural/subarachnoid space would most likely cause marked sedation and respiratory depression. In addition, if the volume of fluid that leaked out was cerebrospinal fluid then a positional headache would have likely resulted. The fluid was also continuously straw colored unlike the clear color of cerebrospinal fluid. The presence of glucose and protein in the collected fluid was not diagnostically helpful due to the presence of red blood and clear cells in the fluid.

The third consideration was a subarachnoid leak out the epidural catheter tract from the very first epidural attempt which resulted in a "wet tap." We have been unable to find a report of this complication in the literature. Furthermore, all of the arguments against the second consideration would apply to this third possibility.

A fourth consideration would be that the epidural catheter was intrapleural in its original placement. There are several important factors against this possibility. First, the surgeons did not observe the catheter in the pleural space. Second, it would be very difficult to thread the catheter from the L1-L2 level up to a minimum level of T12 (the lowest reflection of the pleura posteriorly) without meeting enough resistance to cause it to curl up (as it often does in the epidural space when it is threaded in too far). Furthermore, the catheter was known to be threaded in only 3 cm and it is improbable that this length of catheter, even if it were straight, could reach the level of the T12 reflection of pleura. Third, if the catheter were intrapleural, one would have expected a unilateral band of anesthesia from the lidocaine test dose, not bilateral as we found. Fourth, there is no literature precedent for intrapleural placement of epidural catheters from a lumbar approach. Finally, although there is no recorded experience with intrapleural narcotics, based on what is known about intrapleural absorption of other drugs and the pharmacokinetics of morphine sulfate, it is unlikely that this patient would get very good analgesia for 3 days from an initial 5-mg loading dose followed by an infusion of 400 µg/h (especially in a patient with a functioning chest tube).

Finally, the most likely explanation for our observation was that a small connection was inadvertently created between the pleural and epidural space during the thoracotomy which allowed pleural fluid to leak into the epidural space. The creation of a pleural-epidural space

communication is well described with regard to hemorrhage into the epidural space from the pleural space resulting in cord compression, ischemia, and post-thoracotomy paraplegia.^{5,6} Unfortunately, the testing of the collected fluid was inconclusive with regard to its origin; cytology revealed some red blood cells and other clear cells that could not be positively identified as mesothelial cells from the pleura or lungs. The draining fluid had the same straw color as the fluid in the chest tube, which is characteristic of a post-thoracotomy plasma-like pleural fluid effusion. Because the chest tube had been discontinued prior to noting the leakage of fluid, it was not possible to directly compare the two fluids or put radiopaque contrast into the pleural space to see if it entered the epidural space. Because the leakage of fluid ceased within 12 h, injection of radiopaque material into the catheter tract was not felt to be a productive or justified maneuver.

In conclusion, we describe a previously unreported complication of drainage of a large amount of a straw-colored serosanguinous fluid from an epidural catheter puncture site in a patient post-thoracotomy. Although a number of possible explanations exist, we think the most likely cause was that a communication between the pleural and epidural spaces was created at the time of surgery that allowed pleural fluid to leak into the epidural space. This explanation accounts for the large amount of leaked serosanguinous fluid, the similarity in appearance between the chest tube drainage and the leaked fluid, the "hanging drop" phenomenon, and the lack of symptoms of cerebrospinal fluid leak. This case demonstrates that the complication may be satisfactorily managed by applying a pressure dressing in the lateral decubitus position; this position should decrease the hydrostatic pressure against the pleural-epidural communication thereby facilitating the cessation of the leak.

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