Lumbar Pseudomeningocele Causing Hydronephrosis

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Abstract

Background/Objective: Pseudomeningocele is most commonly the result of a rent in the meninges during spine surgery. Noniatrogenic causes exist but are rare. Pseudomeningoceles may heal spontaneously, but they may also slowly enlarge. They rarely present as a mass within the abdomen. The objective of this study was to present the first case report of hydronephrosis secondary to lumbar pseudomeningocele.

Design: Single case report and literature review.

Methods: Single case report.

Results: This man had undergone extensive lumbar spine surgery for pain and spondylolisthesis. He subsequently developed a pseudomeningocele that caused hydronephrosis of the left kidney. He was treated with surgical intervention and had resolution of his hydronephrosis and his flank and groin pain. He also had improvement of his back pain.

Conclusions: This report shows an unusual cause of hydronephrosis—a pseudomeningocele presenting as an abdominal mass that compressed the ureter.

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Key Words: Hydronephrosis; Pseudomeningocele; Cauda equina syndrome; Lumbar surgery; Paraplegia; Spine surgery

INTRODUCTION

Lesions intrinsic to the ureter, such as kidney stones, cause obstruction of the ureter more frequently than lesions extrinsic to the ureter, such as a urinoma, abscess, lymphocele, or tumor. However, the damage to the kidney can be just as severe. This man developed ureteral obstruction as a consequence of a pseudomeningocele that developed after his previous spine surgery. In addition, he had partial cauda equina syndrome as a consequence of his spinal surgeries. This case illustrates a unique cause for obstructive uropathy after spinal surgery.

CASE REPORT

History

This 51-year-old man was evaluated for severe back pain several years ago. Grade 1 spondylolisthesis was identified at L3 to L4. He underwent a series of lumbar spine

operations. First, he had a multilevel posterior lumbar interbody fusion with instrumentation including pedicle screws at L3, L4, L5, and S1. He developed pseudoarthrosis at the L3–L4 interspace, and 1 year later had a revision of the previous surgery. The second spine operation consisted of an anterior lumbar interbody fusion (ALIF) at L3 to L4 and a posterolateral fusion between the adjacent transverse processes. This entailed a laparotomy for the anterior fusion and a second exposure of the lumbar spine for the posterior fusion. This procedure was complicated by retropulsion of the interbody bone graft at L3 to L4, resulting in an acute cauda equina syndrome. His third lumbar spine operation was again an anterior procedure at L3 to L4 to remove the retropulsed graft. During that operation, partial corpectomy of L3 and L4 was performed, followed by placement of an interbody cage graft. None of the operative reports mentioned a durotomy or cerebrospinal fluid (CSF) leak as a consequence of any of the procedures.

Diagnostic Workup

He presented to our institution 2 years after his last lumbar surgery complaining of left flank pain radiating to the groin and continued low back pain. Although he was able to walk, he had generalized bilateral lower extremity

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Figure 1. Abdominal CT showed a large fluid collection in the left retroperitoneum (arrows), marked dilatation of the left ureter, and hydronephrosis of the left kidney.

weakness from the L2 myotome distally, sensory loss from L2 distally, decreased anal sphincter tone, and a vague, nontender left upper quadrant abdominal mass. Computed tomography (CT) of the abdomen showed a $7.2 \times 4.3 \times 8.3$ -cm fluid collection in the left retroperitoneum anterior to the psoas muscle in the course of, and not separable from, the left ureter (Figure 1). The proximal ureter was markedly dilated, and the left kidney was hydronephrotic. An intravenous urogram showed high-grade obstructive uropathy (Figure 2). He had a percutaneous nephrostomy placed and CT-guided aspiration of the cystic mass with placement of an external drain. The fluid drained from the mass was

Figure 2. Intravenous urogram showed high-grade obstructive uropathy on the left (arrows).

Figure 3. Myelogram confirmed the diagnosis of a pseudomeningocele (4).

clear, and laboratory analysis was unremarkable. Almost immediately after the placement of the cyst drain, he complained of a severe postural headache. A β -2 transferrin level in the cyst fluid was positive, indicating presence of CSF. The external drain was removed, and a myelogram was performed that confirmed the diagnosis of a pseudomeningocele (Figure 3). In this study, the dye entered the abdominal cyst and went through a fistula in the body of the L3 vertebra connecting the spinal canal with the cyst. Given his history, the diagnosis of pseudomeningocele was made.

During his fourth spine operation, the dura was identified and incised from a posterior approach. On reflecting the nerve roots from the anterior outpouching of the meninges, we could see the titanium cage holding the bone graft where the previous corpectomies had been performed. A 10-mm opening or neck connected the spinal canal to the retroperitoneal cyst through the corpectomy. The dura leading in to the neck of the pseudomeningocele was circumferentially incised and closed with a line of sutures. A small graft of fascia lata was sewn over that suture line from the inside of the dura to reinforce the dural closure. Another patch was used to close our original posterior dural incision so that the dura would be patulous and not constricting the nerves within it. A revision of the fusion at L5/S1 was also performed, because the patient had a pseudoarthrosis at that level.

The postoperative course was uneventful. An early follow-up CT scan showed a decrease in the size of the pseudomeningocele. One month later, an antegrade pyelogram was performed that showed resolution of the ureteral obstruction, allowing the removal of his percu-

taneous nephrostomy. At the 18-month follow-up, he reported resolution of flank and groin pain and improvement in back pain. A CT scan showed complete resolution of the anterior pseudomeningocele and hydronephrosis.

DISCUSSION

The original indication for surgery was back pain and Grade 1 spondylolisthesis. He ultimately had a posterior spinal fusion of 4 segments, an anterior interbody fusion within the disk space, a titanium cage graft covering 2 vertebrae, and 5 pedicle screws in his vertebrae. Despite aggressive surgery, he had little relief of his back pain, inadequate fusion of his low back, severe headaches, partial cauda equina syndrome, and later, kidney damage. No mention of a CSF leak was identified in any of the operative records. It is not clear whether the original spinal fluid leak occurred during one of the operations or as a consequence of the titanium cage injuring the dura after the second procedure. However, at some point in this process, he sustained a dural injury, and a CSF-containing cyst developed. This pseudomeningocele compressed and ultimately obstructed his ureter, requiring treatment for obstructive uropathy.

The possibility exists that the retroperitoneal approach for the anterior lumbar surgery could have caused scarring or damage to the urogenital system and subsequently caused or contributed to the ureteral obstruction. However, the contrast-enhanced CT scan, the Intravenous Urogram, and the response to treatment all point to the pseudomeningocele as the cause of the uropathy.

A meningocele is part of a spectrum of anomalies seen in spina bifida (1). At the most benign end of the spectrum is the common, usually asymptomatic failure of the vertebral laminae to fuse in the midline (spina bifida occulta). When the failure of fusion occurs earlier in gestation, the meninges become involved with a CSF-containing cyst that initially forms within the spinal canal. Malformed, unfused laminae overlie this cyst, and the skin may or may not be intact over these meningoceles. In its simplest form, a meningocele consists of a spinal fluid-containing cyst lined with normal, albeit stretched, meninges. These birth defects occur relatively commonly and are often associated with severe neurologic and orthopedic concerns (1). Pseudomeningocele, on the other hand, is almost always of iatrogenic origin and is not associated with congenital anomalies (2–4). They do rarely occur after trauma (5). Like a meningocele, a pseudomeningocele is a CSF-containing cyst, but the wall of the cyst consists of scar tissue rather than a meningeal membrane. This report concerns an iatrogenic pseudomeningocele in the abdomen. Congenital meningoceles that present in the pelvis are beyond the scope of our report.

Pseudomeningoceles may slowly enlarge, and they usually make their presence known as an unsightly lump

under the skin, usually under the incision from a spine operation (2–4,6–13). They are often not especially painful but may leak spinal fluid as they enlarge (9). They may compromise the function of surrounding structures by compression, but usually this is not a major issue because the vast majority of pseudomeningoceles form along the incision line and there are few vital structures in the area (3). In this case, contrary to the usual pattern, the pseudomeningocele tracked anteriorly through the surgically created spinal defect into the retroperitoneal space. Ultimately, it became large enough to be a palpable abdominal mass and to obstruct his left ureter.

This case exemplifies many of the principles that should not be abandoned when performing spine surgery. This man had maximal surgical treatment for a condition that might have been treated by less complicated and risky means. Anterior approaches have additional potential complications attributable to operating in the abdomen and around the sympathetic nerves. Ideally, the procedure with the least risk that can potentially solve a patient's problem is preferred.

The history of multiple lumbar spinal surgeries, and especially multiple anterior spinal surgeries in association with a slipped bone graft that resulted in a partial cauda equine syndrome, caused pseudomeningocele to rise high on the list of differential diagnoses (3,4,6,10,13). Urinoma, lymphocele, and abscess were also considered in the differential diagnosis, and each could occur as a complication of anterior lumbar spinal surgery (14). Unrelated causes such as benign or malignant tumors could also be considered. However, when the β -2 transferrin level came back as positive, the fluid was clearly established as CSF (15). Pseudomeningocele therefore was likely, and a CT scan after the myelogram confirmed the diagnosis. It clearly showed that the cyst contents and the spinal fluid were contiguous (Figure 2).

Surgical planning for the repair of a pseudomeningocele involved identifying the neck of the lesion and where the dura could be closed to eradicate the opening between the dural and the cyst. Such plans are often straightforward, but implementation of the surgery was complicated by his previous operations. Thus, these procedures are not without risk. However, once the dural opening was exposed, it was oversewn and reinforced as necessary. We anticipate this to be a definitive solution. With the closure of the dura, the pseudomeningocele has gotten progressively smaller and his hydronephrosis has resolved. However, he does have a damaged kidney, is more likely to develop arachnoiditis as a consequence to any operation that involves opening of the dura, and this last operation had little positive effect on his cauda equine syndrome or his back pain.

CONCLUSION

Pseudomeningocele is an unusual but well-known complication of spinal surgery. It should be considered

in the differential diagnosis of paraspinal fluid collections identified at any time after spinal surgery. Usually the origin of the fluid is obvious, but when unclear, the presence of β -2 transferrin establishes the fluid as spinal fluid (15). The types of spinal interventions that have been associated with pseudomeningoceles range from simple lumbar puncture to complex anterior and posterior operations (2,3,6–12). The presence of a pseudomeningocele anterior to the spine and causing ureteral obstruction is distinctly rare, and we could find no similar case in the literature. However, anterior abdominal and pelvic pseudomeningoceles have been reported (13,16,17). Initially, the cause of his obstructive uropathy was not clear; however, the presence of a cyst just anterior to the spine that had been previously operated on should certainly raise the suspicion of a pseudomeningocele. The absence of spinal fluid being observed at earlier operations may indicate that the dura and arachnoid were injured when the bone graft repulsed into the spinal canal. It is not clear whether that occurred during the surgical procedure or later. A magnetic resonance image would not be expected to be as diagnostic as a CT scan after a myelogram in this situation because of the degradation of the magnetic resonance image because of the metal in the bone graft. The presence of dye in the cyst after it had been injected into the lumbar subarachnoid space is diagnostic of a communication between the 2 spaces. A mass obstructing the ureter is a well-known cause for obstructive uropathy, but this is certainly an unusual cause for such a mass. However, with ever more lumbar spinal surgery being performed, particularly from a trans-abdominal approach, it may not be the last pseudomeningocele to cause ureteral obstruction.

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