



Arachnoiditis Ossificans Following Repeat Epidural Steroid Injections: A Case Study

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ABSTRACT

Background: Arachnoiditis ossificans is a rare entity resulting from chronic inflammation, leading to scarring, fibrosis, and, ultimately, calcification. It is usually preceded by trauma, infection, or interventional procedures involving disruption of the dura. When present in the lumbar spine, most patients present with progressive radicular symptoms in the setting of chronic pain. Computed tomography (CT) scan is the diagnostic tool of choice and is often ordered to further assess uncertain magnetic resonance imaging (MRI) findings. There is no gold standard treatment, but most patients ultimately require surgical intervention with mixed success rates. Upon review of the literature, no documented cases of arachnoiditis ossificans occurring in active-duty service members.

Case Presentation: The case presents a 31-year-old male veteran with a history of multiple epidural steroid injections who developed arachnoiditis ossificans in the absence of typical risk factors.

Conclusions: Generally considered a safe alternative to surgery, epidural steroid injections are not without risk of serious long-term complications that should be considered during the treatment of low back pain among veterans.

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Low back pain is one of the most common symptoms encountered in primary care (Traeger et al., 2017). In the absence of ‘red flag symptoms’ requiring expedited workup and/or surgical intervention, patients are initially managed with conservative measures, including lifestyle changes, exercise and physical therapy, oral analgesics, and epidural steroid injections (ESIs). Arachnoiditis ossificans (AO) is a rare disorder that occurs when there is abnormal calcification and ossification of the arachnoid mater due to chronic inflammation. This can occur due to any cause of arachnoiditis but is most often associated with spinal procedures involving dural puncture. This case presents a young male veteran with a history of multiple ESIs who developed AO in the absence of prior spinal surgery, trauma, or infection.

CASE

A 31-year-old male veteran presented to the primary care clinic with chronic progressive low back pain and new onset of bowel, bladder, and erectile dysfunction. Over the course of 6 years, his pain was managed conservatively by primary care, physical therapy, and pain management at multiple military treatment facilities. He completed intermittent physical therapy and had seven ESIs to maintain functionality until the recent onset of new neurological symptoms. He denied any symptoms consistent with dural puncture or other acute complications following any of his ESIs. Despite his history of high-level athletics and exceptional fitness level, at the time of presentation, he had difficulty performing activities of daily living without pain, and his exercise was limited to walking.

The physical exam was largely unremarkable, besides decreased sensation to light touch over the posterolateral thigh. MRI without contrast (Figures 1a and 1b) demonstrated an intraspinal arachnoid cyst and arachnoid ossifications. The intraspinal arachnoid cyst extended from the mid-L3 level superiorly to the S1–S2 level inferiorly with peripheral displacements and probable adhesions of the regional cauda equina nerves.

The patient was referred for neurosurgical evaluation (Figures 2a and 2b). The examination was again largely unremarkable, except for decreased posterolateral thigh sensation. Through shared decision-making, the choice was made to proceed with surgical intervention. He completed L4/L5 laminoplasty with decompression of thecal sac and nerve roots, including medial facetectomies and foraminotomies, without complications. Although he was able to return to full duty without restrictions, he has not had a full resolution of pain. This condition and his surgical history disqualify him from many military programs

and occupations. It is difficult to determine whether occupational restrictions will develop. However, he is at a much higher risk of disability requiring restrictions, which may impact his suitability for continued military service.



Figure 1a MRI Without Contrast Axial.

Note. T2-weighted MRI without contrast showing displacement of nerve roots to the periphery of the thecal sac at the levels of L4–S1, known as ‘empty thecal sac sign,’ and is indicative of adhesive arachnoiditis.



Figure 1b MRI Without Contrast Sagittal.

Note. T2-weighted MRI without contrast showing displacement of nerve roots to the periphery of the thecal sac at the levels of L4–S1, known as ‘empty thecal sac sign,’ and is indicative of adhesive arachnoiditis.



Figure 2a CT Without Contrast Axial.

Note. CT without contrast demonstrates calcifications along the dura and thecal sac extending from L3 into the sacrum.



Figure 2b CT Without Contrast Sagittal.

Note. CT without contrast demonstrates calcifications along the dura and thecal sac extending from L3 into the sacrum.

DISCUSSION

Back pain is one of the most common reasons for patients to seek medical care and is the leading cause of chronic pain. The 2019 National Health Interview Survey conducted by the National Center for Health Statistics found that back pain is the leading cause of pain by body region, with

39.0% of respondents reporting back pain in the past 3 months (Lucas et al. 2021). A wide variety of treatment options are available in the acute setting, including heat, NSAIDs, muscle relaxants, acupuncture, exercise, and physical therapy. Regardless of treatment, about 90% of episodes will resolve within 6 weeks (Chiodo et al., 2020). Little evidence supports the use of any type of injection for nonspecific acute low back pain.

Epidural Steroid Injections are commonly used to relieve pain and inflammation associated with various conditions, particularly spinal disorders such as herniated discs, spinal stenosis, and sciatica. They were first introduced in the 1950s and, with the advent of pain management as a field of medicine, have continued to gain popularity for treating refractory low back pain. Epidural Steroid Injections seem effective in relieving symptoms in the short term and delaying surgery, but evidence of any long-term benefits is still lacking. Thus, there is no consensus on using ESIs for patients with chronic lumbar pain (Carassiti et al., 2022). While ESIs can provide significant relief for many patients, like any medical procedure, they carry potential risks and complications. Possible complications include bleeding, infection, nerve injury, dural puncture, epidural abscess, and hematomas. Arachnoiditis is another known rare side effect of ESIs, with most cases postulated to be due to inadvertent dural puncture. Chronic inflammation from arachnoiditis can lead to granulomatous tissue formation, fibrosis, dural adhesions (adhesive arachnoiditis), and further progression to the bony metaplasia characteristic of arachnoiditis ossificans.

Arachnoiditis ossificans is a rare and challenging condition that can lead to significant morbidity and disability. Although the pathogenesis of this condition is not fully understood, it is believed to result from chronic inflammation and fibrosis of the arachnoid membrane, leading to calcification and ossification (Nagashima et al., 2022). There are less than 100 reported cases in the literature, with the vast majority of them occurring in individuals greater than 50 years old. This is consistent with the chronic progressive nature of arachnoiditis leading to ossification, as well as the common age group requiring surgical procedures of the spine. Diagnosis of AO can be challenging and requires a high index of suspicion. CT scan is the most useful imaging modality for the diagnosis, with characteristic findings of linear or nodular calcification-ossifications of the arachnoid membrane and clumping of nerve roots. There has yet to be a consensus on treatment, largely in part due to the rarity of the disease. Initial treatment is often conservative; however, surgical intervention may be necessary in cases of progressive neurological deficits or refractory pain. Surgical success rates are mixed, with approximately 60% of patients reporting improvement, 30% with no improvement, and 6% with worsening symptoms (Eisenberg et al., 2019).

Multiple large-scale studies have been conducted to determine the safety of ESIs, but they are limited to short-term complications (Eworuke et al., 2021). Little research has focused on long-term complications, and available data suggests that most long-term complications arise from acute injuries that progress over time. It is otherwise difficult to determine whether serious neurologic complications that do not present until years later are due to past ESIs (Jung et al., 2014). Arachnoiditis ossificans or its precursor, adhesive arachnoiditis, following ESIs is either not occurring or not being reported in current literature.

The case presents a rare diagnosis in the overall veteran population that is even more exceedingly rare in a young, otherwise healthy patient without a history of prior spinal surgery, injection, or trauma. With more widespread use of injections for refractory low back pain, it is important for physicians to consider not only the short-term complications but also the long-term complications that can arise from repetitive treatments. As long-term complications such as AO can lead to significant morbidity, further research and documentation of long-term complications of ESIs are needed to help providers determine whether repetitive injections for refractory pain are providing additional benefits that outweigh these risks.

CONCLUSION

The case presented describes a rare clinical finding in the absence of known risk factors. Although a causal link between this patient's history of ESIs and the development of arachnoiditis ossificans cannot be determined, there are no documented cases in the literature postulated to be linked to the history of ESIs. This case adds to the limited available research on long-term complications of ESIs. Further research is needed to determine the extent to which these complications should impact treatment choice for refractory low back pain.

ETHICS AND CONSENT

This case study was conducted in compliance with ethical standards to protect the individual involved. Written patient consent was obtained.

COMPETING INTERESTS

The authors have no competing interests to declare.

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