

Delaying Epidural Steroid Injections During an Infection

Patricia Zheng, MD¹; Shaan Sudhakaran, MD²; and Zachary L. McCormick, MD³ on behalf of the Spine Intervention Society's Patient Safety Committee

¹ University of California, San Francisco, Dept of Orthopaedic Surgery, San Francisco, California, U.S.;

² National Spine and Pain Centers, Washington, D.C., U.S.

³ University of Utah, Division of Physical Medicine and Rehabilitation, Salt Lake City, Utah, U.S.

Myth: Concurrent antibiotic use is an absolute contraindication to the performance of an epidural steroid injection (ESI).

Fact: There is a theoretical, small increased risk of infection associated with an ESI in a patient taking antibiotics. However, there is little empiric evidence to guide when, and for how long, to delay an ESI in the setting of ongoing infection and antibiotic treatment.

Epidural steroid injections (ESIs) are a safe and effective means of treating radicular pain syndromes when performed according to evidence-based guidelines [1-4]. As with all interventions, ESIs have inherent risks including but not limited to vasovagal reactions, headache, facial flushing, transient pain, numbness or tingling, and exceedingly rarely, neurologic compromise and infection [5]. Because steroid administration can suppress the immune system [6,7], anecdotally, many physicians delay ESIs in the case of an active infection requiring treatment with antibiotics. However, practices vary substantially due to a lack of published guidance regarding when, and for how long, to delay ESIs during treatment of an infection with antibiotics.

Risk of infection with ESI

Skin puncture during ESIs can introduce pathogens into the body. Furthermore, systemic corticosteroid therapy may adversely affect both the innate and the adaptive immune response. The ability of neutrophils to migrate to sites of infection is impaired by corticosteroids [8]. Macrophage and monocyte function may also be inhibited by corticosteroids [9,10]. The capability of plasma cells (terminally differentiated B-lymphocytes) to produce immunoglobulins IgG and IgA is reduced 10- 20% by corticosteroids [11]. Large cohort studies suggest that the risk of infection is exceedingly low, though these studies did not mention whether injections were performed in patients with active or recent signs of infection. Three large cohort studies found a 0% incidence of post-injection infection: McGrath et al. reported on over 4,265 injections over seven years including cervical, lumbar, and caudal ESIs [12]; Karaman et al. reviewed 1305 transforaminal lumbar ESIs [5]; El-Yahchouchi et al. reviewed 16,638 consecutive procedures of all spine segments [4]. Alternatively, a study of 52,935 ESI procedures in 22,059 patients revealed 244 adverse events with four major complications of infection (three cases of spine infection, one case of septic shock with an unknown focus – no further details provided, all after caudal or interlaminar

ESIs) [13]. Furthermore, case reports of infection after ESIs exist. Hooten et al. summarized 14 reports of epidural abscesses and/or meningitis with eight patients having had underlying medical illnesses that adversely affect immune function [14]. It was not clear if any of them had active infections or were on antibiotics prior to the injection.

Risk of infection associated with steroid injection during active unrecognized remote or systemic infection

Data that supports the need to delay steroid injection in the context of active infection is sparse. It is clear that intra-articular joint injections should not be performed in the setting of septic arthritis [15]. In a review of 1528 cases of alleged treatment errors relating to injections, 278 cases of complications were identified in cases involving steroid injection. Of those, 223 cases of infection were identified following intra-articular, paravertebral, intra-muscular and other injections. The authors ultimately determined that 73 “treatment errors in corticosteroid injection leading to infection” occurred, including 24 cases of missed infection at the time of injection [16]. Unfortunately, the types of injections leading to infections, type of infections, and clinical outcomes were not reported.

General literature on delaying elective procedures in the setting of active infection

In studies of post-operative infections, remote site infection increased the rate of post-operative infection by a factor of 2.7-5.3 [17]. Specifically, in a study of 2,349 post-operative patients, of whom 208 had a documented remote infection (mostly skin infections, urinary tract infections, pulmonary infections, abscess infections – not further clarified, and perirectal tissue abscesses), 178 developed wound infections. The wound infection rate in the 208 patients with remote infections was 14.4%, whereas it was 6.9% in the 2,141 patients without known remote infections [18]. These studies highlight the consensus that active infection should be recognized and appropriately treated before procedures are pursued.

The anesthesiology literature suggests that preoperative pyrexia is one of most common reasons for cancellation of elective surgeries [19]. The presence of fever is concerning, as it can indicate a systemic infection that may hamper postprocedural recovery and cloud post-procedural management given the increased difficulties of distinguishing between surgically related complications or pre-existing infection [20]. Furthermore, an association between percutaneous regional anesthesia techniques and risk of central nervous system infection in bacteremic patients has been observed [21]. Alternatively, there is literature that epidural anesthesia may be safe in patients with ongoing infection as multiple studies have shown that spinal and epidural anesthesia may be safe even in women with active chorioamnionitis [22,23].

Risk of infection with steroid injection once antibiotics have been initiated

The literature on how long to delay steroid injection after the initiation of antibiotics is sparse. Studies have shown that after infections such as urinary tract infection, sterilization is achieved within three days of antibiotic therapy in 86% [24]. With group A streptococci pharyngitis, 91% of children treated bacteria were undetectable the next morning [25]. Intra-articular steroid injections have been trialed in animals with concurrent antibiotic administration in efforts to decrease inflammatory joint damage with no significant difference in infection-related outcomes [26]. In relation to skin flora, which may be most relevant to ESIs, it is thought that most bacteria from the dermal layers may be eradicated within the first few days of antibiotic therapy and that 5 days of antibiotic therapy is equally effective as 10 days for uncomplicated cellulitis [27]. In the Valentine study, patients with known remote infections were less likely to have developed subsequent wound infections if they had received antibiotics at least 24 hours before surgery: only 8.8% (2.1-15.5%) of the patients who developed subsequent wound infections had started antibiotics at least 24 hours before surgery (68 total) compared with 24.5% (15.8-33.2%) who had only received prophylactic antibiotics within 24 hours of surgery [18]. This suggests that even 24 hours of antibiotic treatment may be helpful in preventing procedure site infection in the context of an active remote infection. However, similar data does not exist when the procedure is an ESI. As such, guidance based on direct evidence on how long to delay an ESIs in the context of a concurrent infection after antibiotics have been initiated is not possible.

Guidance

Data to guide practice is sparse but suggests the need to carefully weigh risks [especially given the patient's underlying medical illness(es) that may adversely affect immune function] versus benefits when deciding to pursue an elective procedure such as an ESI:

- Systemic infections: In cases of suspected systemic infection by symptoms of fever, cough, dysuria, or elevated white blood count, workup and establishment of treatment is recommended prior to ESI.
- Localized infections at the site of planned injection
 - o In the case of local infection in the region of the planned injection, but in which antibiotics have not been initiated, work up and establishment of treatment is recommended prior to ESI.
 - o In the case of local infection in the region of the planned injection in which antibiotics have been initiated, it is unclear when it is safe to proceed with injection. Detailed assessment of individual comorbidities, infectious symptoms, response to antibiotic course, possible consultation of an infectious disease specialist, along with detailed discussion regarding the risks, benefits, and alternatives are possible recommendations. Given the lack of evidence, propose to err on the side of caution and await complete resolution of infection prior to proceeding.

- Localized infection at a remote site with no evidence of systemic infection
 - In the case of local infection in an area remote to the injection region and with no evidence of system infection, if antibiotics has not been initiated, it is unclear whether to proceed. Though, based on post-operative infection literature, it is best to workup the infection and initiate treatment prior to ESI.
 - In the case of a contained infection in an area remote to the injection region with no evidence of system infection, if an antibiotic has been started, it is also unclear when it is safe to proceed. A detailed assessment of individual comorbidities, infectious symptoms, response to the antibiotic course, possible consultation of an infectious disease specialist, along with detailed discussion regarding the risks, benefits, and alternatives on a case-by-case basis are recommended. However, in the absence of unique circumstances, one should wait until antibiotic treatment has been completed and the patient is asymptomatic.

References

1. Bogduk N. Practice Guidelines for Spinal Diagnostic and Treatment Procedures. San Francisco: International Spine Intervention Society, 2013.
2. Carr CM, Plastaras CT, Pingree MJ, Smuck M, Maus TP, Geske JR, et al. Immediate adverse events in interventional pain procedures: a multi-institutional study. *Pain Med* 2016;17(12):2155-61.
3. Plastaras C, McCormick ZL, Garvan C, Macron D, Joshi A, Chimes G, et al. Adverse events associated with fluoroscopically guided lumbosacral transforaminal epidural steroid injections. *Spine J* 2015;15(10):2157-65.
4. El-Yahchouchi CA, Plastaras CT, Maus TP, Carr CM, McCormick ZL, Geske JR, et al. Adverse event rates associated with transforaminal and interlaminar epidural steroid injections: a multi-institutional study. *Pain Med* 2016;17(2):239-49.
5. Karaman H, Kavak GO, Tüfek A, Yldrm ZB. The complications of transforaminal lumbar epidural steroid injections. *Spine* 2011;36(13):E819-24.
6. Glucocorticoid impact: Infections and vaccinations factfinder. Spine Intervention Society, 2014.
7. Miller DC, Patel J, Gill J, Mattie R, Saffarian M, Schneider BJ, Popescu A, Babaria V, McCormick ZL. Corticosteroid injections and COVID-19 infection risk. *Pain Med*. 2020 Aug 1;21(8):1703-1706.
8. Meagher LC, Cousin JM, Seckl JR, Haslett C. Opposing effects of glucocorticoids on the rate of apoptosis in neutrophilic and eosinophilic granulocytes. *J Immunol* 1996;156(11):4422-8.
9. Rinehart JJ, Balcerzak SP, Sagone AL, LoBuglio AF. Effects of corticosteroids on human monocyte function. *J Clin Invest* 1974;54(6):1337-43.
10. Rinehart JJ, Sagone AL, Balcerzak SP, Ackerman GA, LoBuglio AF. Effects of corticosteroid therapy on human monocyte function. *N Engl J Med* 1975;292(5):236-41.
11. Fedor ME, Rubinstein A. Effects of long-term low-dose corticosteroid therapy on humoral immunity. *Ann Allergy Asthma Immunol* 2006;97(1):113-6.
12. McGrath JM, Schaefer MP, Malkamaki DM. Incidence and characteristics of complications from epidural steroid injections. *Pain Med* 2011;12(5):726-31.
13. Lee JW, Lee E, Lee GY, Kang Y, Ahn JM, Kang HS. Epidural steroid injection-related events requiring hospitalisation or emergency room visits among 52,935 procedures performed at a single centre. *Eur Radiol* 2018;28(1):418-27.
14. Hooten WM, Kinney MO, Huntoon MA. Epidural abscess and meningitis after epidural corticosteroid injection. *Mayo Clinic Proceedings* 2004;79(5):682-6.
15. Zuber TJ. Knee joint aspiration and injection. *Am Fam Physician* 2002;66(8):1497-500, 503-4, 507.
16. Holland C, Jaeger L, Smentkowski U, Weber B, Otto C. Septic and aseptic complications of corticosteroid injections: an assessment of 278 cases reviewed by expert commissions and mediation boards from 2005 to 2009. *Dtsch Arztebl Int* 2012;109(24):425-30.
17. Edwards LD. The epidemiology of 2056 remote site infections and 1966 surgical wound infections occurring in 1865 patients: a four year study of 40,923 operations at Rush-Presbyterian-St. Luke's Hospital, Chicago. *Ann Surg* 1976;184(6):758-66.
18. Valentine RJ, Weigelt JA, Dryer D, Rodgers C. Effect of remote infections on clean wound infection rates. *Am J Infect Control* 1986;14(2):64-7.
19. Matzek LJ, Smith BB, Mauermann WJ, Bower TC, Smith MM. Same-day cancellation in vascular surgery: 10-year review at a large tertiary care center. *Ann Vasc Surg* 2020;62:349-55.
20. Jain R, Saxena D. Pyrexia: An update on importance in clinical practice. *Indian J Anaesth* 2015;59(4):207-11.
21. Wedel DJ, Horlocker TT. Regional anesthesia in the febrile or infected patient. *Reg Anesth Pain Med* 2006;31(4):324-33.
22. Bader AM, Gilbertson L, Kirz L, Datta S. Regional anesthesia in women with chorioamnionitis. *Reg Anesth*. 1992 Mar-Apr;17(2):84-6.
23. Goodman EJ, DeHorta E, Taguiam JM. Safety of spinal and epidural anesthesia in patients with chorioamnionitis. *Reg Anesth* 1996;21(5):436-41.

24. Fair William R, Crane David B, Peterson Lloyd J, Dahmer C, Tague B, Amos W. Three-day treatment of urinary tract infections. *Journal of Urology* 1980;123(5):717-21.
25. Schwartz RH, Kim D, Martin M, Pichichero ME. A reappraisal of the minimum duration of antibiotic treatment before approval of return to school for children with streptococcal pharyngitis. *Pediatr Infect Dis J* 2015;34(12):1302-4.
26. Wysenbeek AJ, Leitman M, Amit M, Lushkov G, Robinson D, Boldur I, et al. Experimental septic arthritis in rabbits treated by a combination of antibiotic and steroid drugs. *Clin Exp Rheumatol* 1996;14(5):507-12.
27. Hepburn MJ, Dooley DP, Skidmore PJ, Ellis MW, Starnes WF, Hasewinkle WC. Comparison of short-course (5 days) and standard (10 days) treatment for uncomplicated cellulitis. *Archives of Internal Medicine* 2004;164(15):1669-74.