

Epidural Steroid Injections and Hyperglycemia FactFinder

Clark Smith MD MPH; Nikolai Bogduk, MD, PhD; Alison Stout, DO; David O'Brien, MD;
Jeffrey Laseter, MD; Benoy Benny, MD; Wade King, MMed; Andrew Engel, MD

Committed to providing helpful information to International Spine Intervention Society members about key patient safety issues, the Society's Patient Safety Committee has developed a FactFinder series. FactFinders will explore and debunk myths surrounding patient safety issues. The intent of this FactFinder is to address potential safety issues associated with hyperglycemia and epidural steroid administration.

Myth #1: Epidural steroid injections do not affect blood glucose levels.

Fact: Administration of epidural glucocorticoids results in temporary hyperglycemia. This usually does not result in any serious consequences. Although catastrophic complications might be imaginable, the literature is limited to a few case reports. Precautions can be taken to reduce risks.

Epidural steroid injection (ESI) is a non-operative treatment option for patients with neck and back pain. Hyperglycemia is a known effect of glucocorticoid administration. The exact effect on blood glucose in any particular patient due to epidural administration of corticosteroids has not been established. The effects of a temporary elevation in blood glucose are usually transient and minor.

Studies have variously found that after ESI, glucose levels may rise for up to 2 days¹, 2 weeks in susceptible patients², 7-14 days in diabetics and an average of 1 day in non-diabetics, or 2 days in diabetic patients³. None of these studies demonstrated any serious consequences of temporarily elevated blood glucose.

Good pre-injection control of diabetes is likely beneficial. Younes *et al.* suggested that good control of diabetes (defined in this case as HbA1C <7%) should ideally be achieved before the initiation of local glucocorticoid treatment.⁴ However, a study found that pre-injection HbA1C levels did not predict post-injection increase in glucose.³ Others have shown that there is no correlation between HbA1C levels before injection and hyperglycemia after injection.³ One of the proposed mechanisms for hyperglycemia after ESI is that some patients with diabetes may have decreased ability to clear steroids through the liver due to decreased cytochrome p450 3A4 expression and activity.⁵ This may lead to an increase in frequency and severity of systemic effects including hyperglycemia.⁶ Glucocorticoids may also cause increased insulin resistance.⁵ This may explain some unpredictability in determining which patients are at the highest risk.

Although catastrophic complications might be imaginable, the literature is limited to a few case reports. There was one case of a diabetic patient developing hyperosmolar non-ketotic

coma lasting 24 hours after ESI administration.⁵ There is also a report of a patient with no known diabetic history who developed diabetic ketoacidosis 1 week following a cervical ESI with 40mg of triamcinolone.⁷ Of note, two trigger point injections that included 4mg dexamethasone had been administered to this patient in the preceding weeks. Despite the paucity of literature reporting serious complications secondary to hyperglycemia after ESI, several authors of this FactFinder reported rare occurrences of hyperglycemia >400mg/dl after ESI requiring brief hospitalization, but not resulting in known lasting consequences.

Epidural corticosteroids may also cause temporary hyperglycemia in non-diabetic patients. Other than elevation in blood glucose, this has not resulted in any known serious or catastrophic consequences. A study examined glucose and insulin levels in 10 healthy volunteers after a single caudal ESI with 80mg triamcinolone. Subjects were found to have increased fasting glucose levels lasting several days. All subjects had normal fasting blood glucose levels at 1 week and none suffered adverse consequences other than a temporary elevation in blood glucose.⁵

In order to minimize risk, we make several recommendations, based primarily on level V (expert opinion) evidence. Although there is no published evidence upon which guidelines might be based, a sensible protocol would include the following:

- We suggest that physicians educate diabetic patients about the need to monitor blood sugars several times a day for at least 2 days prior to their procedure.
- Patients should monitor their blood sugar for at least one week after epidural injection of steroids. Insulin or medication adjustment may be necessary.
- Due to the potential for increase in insulin resistance secondary to ESI, simply adjusting medications post-procedure may not be enough. Physicians should also consider modifying or decreasing the steroid dose in diabetics. There is some evidence that reducing the dose of corticosteroid in diabetics abates the transient hyperglycemia.⁸ Depending on the type of injection being performed, physicians should consider whether injecting a glucocorticoid has any benefit at all. Administering a treatment of no proven benefit, or proven to have no benefit beyond that of placebo, is questionable in its own right. Proceeding with the treatment becomes more questionable if it exposes the patient to added risk because of their diabetes.
- In theory, patients who have pain relief from an epidural steroid injection should be able to increase their exercise. Increased activity should decrease blood glucose mitigating the effects of the steroid. In clinical practice this benefit has not been demonstrated.

Myth #2: There is a “safe” pre-procedure fasting blood glucose cutoff, below which a hyperglycemic episode will not occur.

Fact: There is no established “safe” cutoff value for blood glucose levels prior to epidural administration of corticosteroids. Patients with very poor glucose control are likely at higher risk. Some physicians use a pre-procedure fasting blood glucose cutoff value of 200 mg/dL.

There have not been sufficient studies to establish a “safe” cutoff value for blood glucose levels prior to corticosteroid administration in the epidural space. For patients with poor glucose control, injection of steroids should be postponed until blood sugar is adequately controlled. Although there are no published data, some physicians involved in the development of this FactFinder reported that establishing a fasting blood glucose cut-off level of 200mg/dl has resulted in a decrease in hyperglycemia (requiring treatment or hospitalization) after ESI in their practices. Yet, a firm cutoff value does not take into account the direction and slope of the blood sugar, and therefore, is not advised as an absolute measure. In the office, a patient may have a sub-200mg/dl blood sugar, but that level could be rapidly rising. The addition of steroids might worsen the elevated blood sugar. Conversely, a patient could have a blood sugar slightly above 200mg/dl that is normalizing, and steroid may pose minimal additional risk. Although it has not been documented in the literature that diabetic patients who do not achieve good blood glucose control prior to ESI are at a greater risk than those patients whose blood glucose is well-controlled³, it is likely that these patients are at higher risk.

Conclusion

Based upon the current state of the evidence, it is reasonable to conclude that epidural steroid injections do increase serum glucose levels. In the vast majority of published data, temporary elevation in blood glucose after ESI did not result in any serious or lasting consequences. Although catastrophic complications might be imaginable, the literature is limited to a few case reports. These risks should be discussed in the informed consent process and physicians may wish to consider implementing the precautions above in an effort to minimize the potential for complications.

References:

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