FactFinders for Patient Safety

Preprocedural Serum Glucose Cutoff for Steroid Injections

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MYTH: There is an absolute cutoff for serum glucose before corticosteroid injections.

FACT: No universally accepted "safe" pre-injection glucose cutoff exists, but expert consensus and studies provide some guidance, and physicians should engage in shared decision-making with patients to consider individualized thresholds to mitigate potential harms.

Steroid injections are widely used for pain management but can pose systemic risks, including hyperglycemia [1,2]. As reviewed in another FactFinder on steroids and hyperglycemia, the systemic absorption of glucocorticoids from these injections can significantly impact glucose metabolism in susceptible individuals, which on rare occasions has led to life-threatening conditions such as diabetic ketoacidosis and/or hyperosmolar hyperglycemic state [3]. Physicians should consider evaluating blood glucose control in patients with diabetes mellitus (DM), either through available laboratory values or by obtaining a blood glucose level.

Risks of Hyperglycemia After Steroid Injections

Research indicates that glucocorticoids from steroid injections are absorbed systemically, leading to transient increases in blood glucose levels [4-8]. Details have been further described in a FactFinder on steroids and hyperglycemia [3]. While nondiabetic individuals may experience minor fluctuations, diabetic patients often see more prolonged and significant hyperglycemia following steroid injections [4]. In a 2016 systematic review of intra-articular steroid injections in patients with well-controlled type 2 diabetes, all seven small prospective studies found a post-injection increase in blood sugar, which was "substantial" in four studies; the peak blood glucose level observed was 500 mg/dL [7]. No studies commented on adverse effects related to hyperglycemia [7]. Blood glucose levels peaked between 2 and 84 hours after injection, with a return to baseline occurring anywhere from 18 hours to 21 days later [7]. A notable case study reported a diabetic patient with a Hemoglobin A1c (A1c) of 7.5 experiencing hyperosmolar hyperglycemic coma within 24 hours of receiving a steroid injection, highlighting the need for careful glucose monitoring [1].

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Recommended Glucose Cutoffs

Values from two laboratory tests have been correlated with post-operative risks and can be considered to assist in establishing cutoffs for recommended serum glucose before steroid injections. Random blood glucose can be tested at the bedside and has been associated with postoperative outcomes [9]. A retrospective study of 61,000 patients undergoing elective non-cardiac surgery found that mortality was higher (12% versus 3-5%) at one year in patients with blood glucose levels greater than 216 mg/dL compared to those with blood glucose levels between 60 and 100 mg/dL [10]. Another test is A1c, a blood test that measures the percentage of glycosylated hemoglobin and reflects an individual's average blood glucose over the past 120 days. In an analysis of 70 patients with DM, Twu and colleagues found that higher pre-injection A1c levels were associated with higher post-injection blood glucose levels for the first 2 days after peripheral joint injections [6]. Conversely, Even and colleagues found that while epidural steroid injections were associated with a post-injection increase in serum glucose, there was no correlation between pre-injection diabetic control, represented by A1c levels, and post-injection serum glucose [2].

Professional societies have not proposed absolute glucose cutoff thresholds for steroid injections. However, the American Academy of Family Physicians and the European Alliance of Associations for Rheumatology recommend that diabetic patients be informed about the risk of transient hyperglycemia following intra-articular glucocorticoids and the necessity of glucose monitoring for the next 72 hours [11,12]. While the American Diabetes Association (ADA) does not recommend a set cutoff before steroid injections, it does recommend a blood glucose goal of 100-180 mg/dL within 4 hours of surgery and an A1c goal of <8% (which correlates also to a blood glucose level of around 183 mg/dL) for elective surgeries whenever possible [13].

Risk Considerations and Clinical Recommendations

Due to the absence of absolute serum glucose cutoffs before steroid injections, physicians should carefully consider the individual scenario and inform patients of the risks before electing to proceed. Healthcare providers should evaluate the most recent serum glucose and/or A1c levels in diabetic patients before administering steroid injections. In patients with poorly controlled DM (A1c >8.0 or fasting blood glucose >130 mg/dL), obtaining a blood glucose level before the procedure could be considered. If above 180 mg/dL, postponing the injection can be considered. Additionally, all patients with DM should be counseled on the potential for glucose elevations for at least 72 hours after the procedure. Establishing a frequent glucose monitoring schedule and an action plan for when to seek care is advisable, especially for insulin-dependent patients. While no exact glucose value has been established for needing to seek care, symptomatic hyperglycemia (excessive thirst, frequent urination, headache, nausea, vomiting, confusion, blurred vision, tachycardia, altered mentation) and consistent readings of over 300 mg/dL can be considered as this has been proposed as a threshold for starting insulin [14].

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Conclusion

No universally accepted "safe" pre-procedure glucose cutoff exists for corticosteroid injections in patients with DM. Providers should consider the risks and benefits of each scenario to mitigate potential harms.

- Providers should review the most recent serum glucose and A1c levels in patients with DM. In patients with evidence of poorly controlled DM, the physician may consider checking a pre-procedural blood glucose level.
- In line with American Diabetes Association (ADA) recommendations, a blood glucose level of greater than 180 mg/dL and A1c≥8% may prompt more detailed discussions of risks and benefits of proceeding.
- Following a steroid injection, establishing a frequent glucose monitoring schedule and an action plan for when to seek care is advisable, especially for insulin-dependent patients.

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