

FPIN's Clinical Inquiries

Effect of Steroid Injections on Blood Glucose Level

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Clinical Question

What are the change in and duration of hyperglycemia after intra-articular steroid injections in patients with diabetes mellitus?

Evidence-Based Answer

In patients with well-controlled type 2 diabetes, blood glucose levels may reach peak values of 165 to 500 mg per dL (9.16 to 27.75 mmol per L) at 2 to 84 hours after intra-articular steroid injections and return to baseline in 18 hours to 21 days. Patients with type 2 diabetes receiving injections of extended-release triamcinolone had no significant increase in blood glucose compared with a 23% increase in patients receiving crystalline suspension triamcinolone. Patients with type 2 diabetes showed a statistically significant, but

clinically questionable, increase in fructosamine levels of 4.1% above baseline, measured two to three weeks after intra-articular knee injections. Patients with poorly controlled diabetes should be informed of the potential risk of transient hyperglycemia following an intra-articular steroid injection and should closely monitor glucose levels, particularly on days 1 to 3 postinjection. (Strength of Recommendation: C, consensus opinion, disease-oriented evidence.)

Evidence Summary

A 2016 systematic review included seven prospective studies of patients with well-controlled type 2 diabetes (n = 72) and analyzed blood glucose levels after intra-articular steroid injections.¹ Patients received injections into the knee (five studies; n = 42), shoulder (three studies; n = 10), glenohumeral joint (one study; n = 18), elbow (one case report; n = 1), or ankle (one case report; n = 1) using 35 to 80 mg of methylprednisolone acetate (three studies; n = 31), 40 mg of triamcinolone acetonide (three studies; n = 23), 40 mg of triamcinolone hexacetonide (one study; n = 12), or 5.7 mg of celestone chronodose (one study; n = 6). The studies examined statistically significant increases in postinjection glucose levels compared with preinjection levels. All studies showed a trend toward increased glucose levels, with substantial variability in the change and duration; however, only four of the seven studies reached statistical significance. Those four studies showed peak blood glucose levels ranging from 165 to 500 mg per dL, with two studies reporting mean peak levels of 320 mg per dL (17.76 mmol per L) and 322 mg per dL (17.87 mmol per L) and two studies reporting median peak levels of 239 mg per dL (13.26 mmol per L) and 288 mg per dL (15.98 mmol per L). The time to peak blood glucose level was 2 to 84 hours, and the time to return to baseline was 18 hours to 21 days. Limitations included

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heterogeneity between studies and inclusion of only patients with well-controlled diabetes.

A 2018 randomized controlled study (n = 33) compared average daily glucose levels following intra-articular injection of two formulations of triamcinolone acetonide.² Patients with type 2 diabetes who were using oral diabetes medications and had knee osteoarthritis received an injection of 32 mg of extended-release triamcinolone (n = 18) or 40 mg of crystalline suspension triamcinolone (n = 15). Blood glucose levels were assessed through continuous glucose monitoring from one week preinjection through two weeks postinjection. The primary endpoint was a change in average blood glucose levels three days after steroid injection compared with the three days before. Patients receiving extended-release triamcinolone experienced a statistically significant (23%) increase in blood glucose levels from baseline through posttreatment days 1 through 3 (162 mg per dL [8.99 mmol per L] vs. 199 mg per dL [11.04 mmol per L]; $P = .035$). No statistically significant increase in blood glucose levels was observed in patients receiving extended-release triamcinolone from baseline through days 1 through 3 posttreatment. Study limitations were the small sample size and the exclusion of patients with type 2 diabetes treated with injectable medications.

A 2016 case-control study (n = 36) compared fructosamine levels in patients receiving intra-articular knee injections and patients treated with nonsteroidal anti-inflammatory drugs (NSAIDs) alone.³ Fructosamine is a glycosylated protein administered as a proxy for blood glucose control over the previous two to three weeks. Patients with type 2 diabetes who had unsuccessful physical therapy and NSAID treatment for knee osteoarthritis (n = 18) received intra-articular knee injections of 80 mg of methylprednisolone acetate. The control group (n = 18) were age- and sex-matched patients with type 2 diabetes who managed their knee osteoarthritis with NSAIDs. Blood tests were obtained for all participants at enrollment before the administration of steroid injections and again 15 to 20 days later. Patients

who received steroid injections experienced a statistically significant increase in fructosamine levels at follow-up over baseline (264 to 275; $P = .035$). No change was observed in the control group. Although the average level of fructosamine was statistically increased by 4.1% more than the mean baseline, it is not clear that this increase has any clinical significance.

Recommendations From Others

A 2021 consortium opinion developed by a multidisciplinary task force within the European Alliance of Associations for Rheumatology established evidence-based recommendations to guide health professionals using intra-articular therapies in adult patients with peripheral arthropathies.⁴ The recommendation addressing the risk of hyperglycemia in patients with diabetes after intra-articular therapy included evidence from one systematic review, one randomized controlled trial, and one prospective cohort study. Based on this evidence, the task force stated that “diabetic patients, especially those with suboptimal control, should be informed about the risk of transient increased glycaemia following [intra-articular glucocorticoids] and advised about the need to monitor glucose levels particularly from first to third day.”

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