Intra-Articular Corticosteroid Injections and Hyperglycemia

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Myth: Intra-articular steroid injections do not result in systemic blood glucose changes.

Fact: The intra-articular administration of steroids may result in hyperglycemia both in diabetic patients and in non-diabetic patients. Significant complications are rare, but may be mitigated with proper evaluation of existing risk factors, patient education, and close monitoring after an intra-articular injection of steroids.

ntra-articular injection of steroids is commonly performed to treat sacroiliac and zygapophysial joint pain. Intravenous and oral steroids have hyperglycemic effects on the body, caused by decreasing insulin sensitivity, modulating peripheral glucose uptake, and hepatic gluconeogenesis [1]. There is no literature currently available that specifically investigates the effects of spinal intra-articular injections, but as a surrogate the literature on the effects on blood glucose of intra-articular injections of steroids into peripheral joints can be considered.

Transient and self-limited hyperglycemia have been reported in non-diabetic patients following peripheral intraarticular injections [2,3]. The increase in blood glucose was less than 40 mg/dl, and levels returned to near baseline by 24 hours. These changes are of minimal statistical significance [2,3]. Patients with diabetes appear to be more adversely affected. In patients with well-controlled diabetes (HbA1c of <7, approximately equivalent to 154 mg/dl), mean peak glucose levels rose to the 300 mg/dl range at 1-2 days after administration [4,5]. Less significant elevations persisted for up to 5-7 days. This has been demonstrated with injections into various joints and with various steroid preparations such as methylprednisolone and betamethasone [4,5]. Similarly, different formulations of triamcinolone (hexacetonide and acetonide) in well-controlled diabetics produced median peak glucose values of 239.5 mg/dl and 288 mg/dl, respectively, 24-32 hours after injection [6]. No serious complications were noted in any of these studies.

Younes *et al.* studied the effects of three consecutive peripheral intra-articular injections or epidural steroid injections in patients with and without diabetes [7]. One day following the injection, there was a significant increase in post-prandial glucose in all groups. At day 7, however, only patients who had received intra-articular injections had failed to return to baseline. The group of patients who received an intra-articular steroid injection did have a higher proportion of diabetic patients. Data were not stratified for diabetic patients and non-diabetic patients.

Armstrong et al. looked at serum methylprednisolone levels and their effect on plasma cortisol levels following unilateral intra-articular injections into the knee of 40 mg or 80 mg as well as bilateral injections of 80 mg or 160 mg total dose [8]. Interestingly, systemic absorption and effect on serum cortisol was greater when an 80 mg total dose was administered bilaterally compared to an 80 mg total dose administered unilaterally [8]. One proposed explanation for this is that bilateral injections reach a greater surface area of synovium, allowing for greater systemic absorption. This conjecture warns that sacroiliac joint steroid injections might have greater effects on plasma glucose levels than do injections into zygapophysial joints.

The risk of serious complications due to hyperglycemia following intra-articular injections of steroids is ostensibly low, given the few publications on this matter. There is at least one report of hyperglycemic, hyperosmolar coma requiring admission to an intensive care unit in a patient concurrently on ritonavir, a potent cytochrome P450 3a4 inhibitor, following an intra-articular injection into the hip [9-11].

Although there is no explicit evidence on the hyperglycemic effects of spinal intra-articular injections of steroids, the limited evidence shows that injections of steroids into peripheral joints may elevate blood glucose levels more so than epidural injections. Meanwhile it is known that epidural injections of steroids can have systemic effects [12]. Therefore, we feel that it is prudent for physicians to observe the following recommendations when performing spinal intra-articular injections of steroids.



- All patients with diabetes should have a provider who can be contacted to discuss any difficulty that they may experience with controlling their blood glucose levels.
- Before the procedure, diabetic patients should be told of the possible hyperglycemic effects, as part of the informed consent process; they should check their blood glucose for at least two days before the procedure. Although a safe cut-off value has not been established, some physicians would suggest canceling the procedure if the blood glucose is noted to be greater than 200 mg/dl.
- The number of joints injected should be considered, in addition to the total amount of steroid.
- On the day of the procedure, steroids should not be administered gratuitously if the procedure is only a diagnostic block; only local anesthetic should be used.
- After the procedure, patients should monitor their blood glucose until levels return to baseline, and adjust their treatment accordingly.

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