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Retrospective Study

Flushing Following Interlaminar Lumbar Epidural Steroid Injection with Dexamethasone

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Background: Epidural steroid injections are commonly used in managing radicular pain. Most complications related to epidural injections are minor and self-limited. Flushing is considered as one such minor side effect. Flushing has been studied using various steroid preparations including methylprednisone, triamcinolone, and betamethasone but its frequency has never been studied using dexamethasone.

Objective: This study evaluates the frequency of flushing associated with fluoroscopy-guided lumbar epidural steroid injections using dexamethasone.

Study Design: Retrospective cohort design study. Patients presenting with low back pain were evaluated and offered a fluoroscopically guided lumbar epidural steroid injection using dexamethasone via an interlaminar approach as part of a conservative care treatment plan.

Setting: University-based Pain Management Center.

Intervention: All injections were performed consecutively over a 2-month period by one staff member using 16 mg (4 mg/mL) of dexamethasone. A staff physician specifically asked each participant about the presence of flushing following the procedure prior to discharge on the day of injection and again on follow-up within 48 hours after the injections. The answers were documented as "YES" or "NO."

Results: A total of 150 participants received fluoroscopically guided interlaminar epidural steroid injection. All participants received 16 mg (4 mg/mL) of dexamethasone with 2 mL of 0.2% ropiviciane. Overall incidence of flushing was 42 out of 150 cases (28%). Of the 42 participants who experienced flushing, 12 (28%) experienced the symptom prior to discharge following the procedure. Twenty-seven of the 42 (64%) were female ($P < 0.05$). All the participants who experienced flushing noted resolution by 48 hours. No other major side effects or complications were noted.

Limitations: Follow-up data were solely based on subjective reports by patients via telecommunication. Follow-up time was limited to only 48 hours, which overlooks the possibility that more participants might have noted flushing after the 48 hour limit.

Conclusions: Flushing is commonly reported following epidural steroid injections. With an incidence of 28%, injections using dexamethasone 16 mg by interlaminar epidural route appear to be associated with more flushing reaction than previously reported with other steroid preparations. Additionally, female participants are more likely to experience flushing though the reactions seem to be self-limiting with resolution by 48 hours.

Key words: flushing, side effects, epidural, back pain, lumbar, steroid, dexamethasone, injections.

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Epidural steroid injections are commonly used for the treatment of chronic spinal pain (1). Epidural steroids have been shown to decrease pain in patients suffering from low back pain. Various steroid preparations, in combination with local anesthetics, are available and routinely used.

The mechanism of action of epidural injections for pain relief is not well understood. It is presumed to stem from the anti-inflammatory effects of corticosteroids (2), even though an inflammatory basis for either axial or radicular pain has not been proven (3,4). Other proposed mechanisms range from membrane stabilization to inhibition of nociceptive C fiber transmission (5,6). It is believed that local anesthetics help to relieve pain by interrupting the pain spasm cycle and reverberating nociceptive transmission.

Although most patients tolerate epidural injections without any side effects or complications, some have been reported (7-15) which are either related to needle placement or to drug administration. Serious reported complications include spinal cord trauma, spinal cord or epidural hematoma, vascular injury, pulmonary embolism and death (14-16). Intravascular administration of particulate steroids in transforaminal epidural injections might occur inadvertently resulting in potentially catastrophic vascular complications and spinal cord infarction (17,18). However, most complications are minor and non-specific. One such minor side effect is flushing.

Flushing is a well documented side effect with corticosteroid administration (7-11,13-15). Flushing has been studied via various routes of epidural administration (7-10,15,19,20). In addition, frequency of flushing has been studied with various steroid preparations including methylprednisone, triamcinolone, and betamethasone (20-22), but no studies have been done so far using dexamethasone. Recently, dexamethasone has become increasingly popular in epidural steroid injections due to its non-particulate properties, and hence its potential for less risk of embolic infarcts, even after accidental intra-arterial injection (23). This study evaluates the frequency of flushing associated with fluoroscopy-guided lumbar interlaminar epidural injections using dexamethasone.

Methods

Participants

The study was approved by the West Virginia University Institutional Review Board for Protection of human research participants (IRB).

The participants were referred to a university-based Pain Management Center for evaluation and treatment of chronic low back pain. They were treated during a 2-month period in 2009.

Procedure

The participants were evaluated and offered a fluoroscopically guided lumbar epidural steroid injection via an interlaminar approach for treatment of low back pain with radicular symptoms. The procedure's risks and benefits were discussed with each participant. Informed written consent for treatment was obtained prior to each injection. The data was collected on consecutive participants from August 2009 to September 2009. The procedure was performed by one staff member on 150 participants using 16mg (4mg/ml) of dexamethasone.

Data Collection

A staff physician specifically asked each participant prior to discharge on the day of injection about the presence or absence of flushing following the injection, and again on follow-up when they were contacted via telecommunication 48 hours after the injection. Participants were specifically asked about the presence or absence of flushing, defined as a sensation of warmth or redness of the skin, without rash. The answers were documented as "YES" or "NO."

Statistical Analysis

Significance was calculated using chi-square test. Results were considered significant with *P* value of less than or equal to 0.05.

Results

A total of 150 participants received fluoroscopically guided interlaminar epidural steroid injections. All participants received 16mg (4mg/mL) of dexamethasone with 2ml of 0.2% ropiviciane.

Overall incidence of flushing was 42 out of 150 cases (28%). Of the 42 participants who experienced flushing, 12 (29%) experienced the symptom prior to discharge. Twenty-seven of the 42 (64%) were female. All the participants who experienced flushing noted resolution within 48 hours. No other major side effects or complications were noted.

Discussion

Flushing as a side effect after steroid administration is currently believed to be immunoglobulin (IgE)

Table 1. *Flushing Reaction*

	Male	Female	Total
Flushing	15	27	42
No Flushing	61	47	108

Table 2. *Flushing on discharge vs. within 48 hours*

	On Discharge	Within 48 hours	Total
Flushing	12	30	42

and histamine mediated (19,24). It has been documented with various steroid preparations and via various routes of administration.

Due to several case reports of central nervous system injuries after transforaminal steroid injections, various steroid preparations based on particle size have been studied (23,25,26). Though dexamethasone is considered to be potentially safer than other preparations because it is a non-particulate steroid, its role in epidural injections is still awaiting further studies. However, such complications have not been reported with interlaminar steroid injections (27,28). Nonetheless, various steroid preparations are preferentially used based on particle size, duration of action, efficacy, and mechanism of action.

The incidence of flushing following lumbar epidural steroid injections with dexamethasone in this study is significantly higher than that previously documented with other steroid preparations. Previous studies on betamethasone, methylprednisolone, and triamcinolone have reported rates varying from as low as zero up to 11% (7-9,20,21,24). Additionally, the rate of flushing varied according to the route of administration of the steroid preparation, although no studies have yet been done directly comparing the incidence of flushing in different routes.

The reason for a higher incidence of flushing in our study is unclear. Dexamethasone is a long acting steroid preparation that has minimal or no mineralocorticoid activity but with increased glucocorticoid potency. Accordingly, one possible reason might be due to increased systemic activity as a result of increased washout of dexamethasone from the epidural space (29). Other possible reasons for the increased incidence include the higher chosen dose of dexamethasone (16 mg) compared to steroid doses used in other studies (9,20) as well as the use of ropivacaine, which may have contributed to the higher incidence.

Ropivacaine is an amino amide local anesthetic with a shorter duration of action and less intense motor block compared to similar local anesthetics (30). Side effects of ropivacaine include hypotension, bradycardia, paresthesia, tinnitus, dizziness, and nervousness. Hypersensitivity reactions also occur. They include fever, urticaria, pruritis, erythema and even anaphylaxis. Furthermore, compounds such as methylparaben and sodium bisulfite which are used as preservatives in dexamethasone steroid, have been implicated in allergic reactions to local anesthetics (31).

Despite the increased frequency of flushing, as in previous reports, all were self-limited and resolved within 48 hours (24). Additionally, there was an increased frequency of flushing in female participants. With chi square value of 5.21 and $P < 0.05$, results were significant. Females have been reported as a risk for flushing, although the etiology is still unclear (22).

A potential weakness in the design of this study is the follow-up manner in which data were collected since they were solely based on the patients' subjective reports of flushing via telecommunication, which might be different than a true flushing reaction. Other limitations include the 48-hour follow-up time limit as more participants may have noted flushing after 48 hours as well as our decision to use ropivacaine as a local anesthetic, which might have played a role in the higher incidence. It is also of importance to explore the incidence of flushing in other routes as well, especially the transforaminal route, since dexamethasone might be of more use in the future because of its non-particulate properties.

Conclusion

Flushing is commonly reported following epidural steroid injections. With an incidence of 28%, injections using dexamethasone 16 mg by interlaminar epidural route appear to be associated with more flushing reactions than these previously reported with other steroid preparations, although the dexamethasone reaction seems to be limited with resolution within 48 hours. Additionally, female participants were more likely to experience a flushing reaction, although the etiology is still unclear.

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