

Cross-Sectional Survey

Variations in Interlaminar Epidural Steroid Injection Practice Patterns by Interventional Pain Management Physicians in the United States

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Disclaimer: This work was funded by the Department of Anesthesiology, Perioperative Care and Pain Medicine, New York University Langone Health, New York City, New York.

Manuscript received: 03-28-2018
Revised manuscript received: 04-25-2018
Accepted for publication: 04-27-2018

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Background: Previous surveys have identified variations in practice patterns related to epidural steroid injections. Since then, the United States Food and Drug Administration (FDA) has required the addition of drug warning labels for injectable corticosteroids. Updated evidence, as well as scrutiny from regulatory agencies, may affect practice patterns.

Objective: To provide an update on interlaminar epidural steroid injection (ILES) practice patterns, we surveyed interventional pain management (IPM) physicians in the United States.

Study Design and Setting: This was a cross-sectional survey of IPM physicians in the United States.

Methods: A web-based survey was distributed to IPM physicians in the United States selected from the Accreditation Council for Graduate Medical Education accredited pain medicine fellowship program list as well as the American Society of Interventional Pain Physicians membership database. Physicians were queried about ILES practices, including needle size, use of image guidance, level of injection, identification of the epidural space, and preference for injectate.

Results: A total of 249 responses were analyzed. All respondents used image guidance for ILES. There were variations in needle size, use of contrast, number of fluoroscopic views utilized, technique for identifying the epidural space, and choice of injectate.

Limitations: The response rate is a limitation, thus the results may not be representative of all United States IPM physicians.

Conclusions: Though all respondents used image guidance for ILES, variations in other ILES practices still exist. Since the closure of this survey, a multi-society pain workgroup published recommendations regarding ESI practices. Our survey findings support the need for more evidence-based guidelines regarding ESI.

Key words: Epidural injection, epidural steroids, survey, low back pain, neck pain, technique

Pain Physician 2018; 21:E493-E499

Low back and neck pain are important causes that lead to disability. Low back pain has an estimated lifetime prevalence of 75-80% of the population (1). Neck pain has an estimated lifetime prevalence of 50% (2). Interlaminar epidural steroid injection (ILES) is a commonly employed interventional procedure used to manage chronic,

painful spinal conditions. In the interlaminar technique, injection to the epidural space is performed between 2 adjacent lamina. The main goal of ESI is to facilitate therapy by reducing pain with the added benefit of potentially limiting opioid consumption (3). In systematic reviews, ESIs were associated with short-term improvement in pain intensity and function for lumbar

radiculopathy (4-6). Similar results have been found in the cervical spine (7). Combining cervical ESIs with conservative measures provides superior outcomes to either treatment method alone (8). It is believed that these injections provide relief via anti-inflammatory, irrigative and neuromodulatory effects (9). In order to accomplish this, medication should be delivered as close to the targeted area as possible. The addition of fluoroscopy to the interlaminar epidural approach has allowed for more precise delivery of the medication to the epidural space and reduced procedure-related complications (10).

Despite the fact that ESIs have been used for decades, there is no consensus among physicians on the peri-procedural standards, technical approach or effective injectate. A survey from Cluff et al (11) found there is varying practice on almost every technical aspect of ESIs, including the use of fluoroscopy, patient position, and choice of injectate.

Though generally safe, there have been rare instances of catastrophic injuries associated with ESIs. Since the publication of the Cluff et al (11) survey, the label for triamcinolone was updated in 2011 indicating it was not for epidural use. In April 2014 the United States Food and Drug Administration (FDA) required the addition of a warning to drug labels for injectable corticosteroids describing the risks of rare, but serious, neurologic events, including stroke, paralysis, and death (12). The FDA coordinated a multi-society pain workgroup (MPW) to develop recommendations to minimize risks with ESIs, but consensus was not reached on all suggestions, and the FDA itself has not modified its initial warning based on feedback from the MPW.

The purpose of this study was to identify ILESIs practice patterns among United States pain physicians and expound upon previous examinations.

METHODS

This study was approved by the Institutional Review Board of our institution.

Survey

A 22-item questionnaire was created to obtain information about practice patterns related to ESIs. The survey included open-ended and closed-ended questions. Results regarding peri-procedure monitoring and transforaminal epidural steroid injection practices

have been previously submitted for publication. This manuscript focuses on specific practices related to ILESIs (Appendix I).

Study Patients

Patients were interventional pain management (IPM) physicians in the United States. A survey link was sent to 1,800 IPM physicians selected from the Accreditation Council for Graduate Medical Education accredited pain medicine fellowship program list as well as the American Society of Interventional Pain Physicians membership database.

Data Collection

Survey data were collected and stored in a password protected account using the online survey service company Survey Monkey (San Mateo, CA). After the initial e-mail link was sent, reminder emails were sent at 1, 2, 3, and 4 weeks. A final e-mail reminder was sent out 4 months later. Completion of the survey was voluntary. Only the principal investigator and actively involved researchers had access to the data. Data were collected between October 28, 2014, and April 2, 2015.

Analysis

Survey responses were analyzed using Survey Monkey and Excel software with frequency analysis.

RESULTS

Demographics

There were 249 IPM physicians who responded to the survey, yielding a 13.8% response rate. Of the respondents, 73% worked in private practice, 21% in academics, 2% in a government hospital, and 4% other, including hospital employment. Of the 238 who reported primary specialty, 69% had an anesthesiology background and 24% had a background in physical medicine and rehabilitation. Other specialties represented were psychiatry, radiology, neurosurgery, and orthopedics.

Respondents had been performing ESIs for a median of 15 years (IQR 9-24 years). For those who perform cervical ILESIs, the median number performed per month was 20 (IQR 10-30). For those who perform lumbar ILESIs, the median number performed per month was 30 (IQR 10-50). For those performing caudal ESI, the median done per month was 10 (IQR 5-20).

Injection Practices

Regarding needle size, for cervical ILESIs, 20 gauge (G), 18 G, and 17 G needles were preferred (52.4, 30.9, and 9% of respondents, respectively). Less commonly preferred sizes included 22 G, 19 G, and 16 G needles. Similarly, for lumbar ILESIs, 20 G, 18 G, and 17G needles were preferred (44.7, 35.7, 8.9% of respondents, respectively). There was a wider range of less preferred needle sizes, from 15 G to 27 G needles. For caudal ESI, 22 G, 20 G, and 18 G needles were preferred (36.6, 20.9, 20% of respondents, respectively). There was a wide range of less preferred needle sizes, from 16 G to 27 G needles.

Of those who responded to questions regarding image guidance, all used image guidance for cervical ILESIs and lumbar ILESIs. The percentage of respondents who used particular views is listed in Table 1. Anteroposterior (AP) views were used by the majority of respondents. For cervical ILESIs, 69.6% of respondents used more than one view all the time. For lumbar ILESIs, 44.2% of respondents used more than one view all the time. Contrast was used 100% of the time by 73.8 and 69.1% of respondents for cervical and lumbar ILESIs, respectively. Contrast was used selectively by 21.9 and 27.1% of respondents for cervical and lumbar ILESIs, respectively. Contrast was not used by 4.3 and 3.8% of respondents for cervical and lumbar ILESIs, respectively. Live fluoroscopy was used all the time by 70.9 and 62.5% of respondents for cervical and lumbar ILESIs, respectively. Live fluoroscopy was used selectively by 15.2 and 18.8% of respondents for cervical and lumbar ILESIs, respectively. Live fluoroscopy was not used by 13.9 and 18.7% of respondents for cervical and lumbar ILESIs, respectively. For cervical ILESIs, 59.4% of respondents always used contrast in combination with live fluoroscopy. For lumbar ILESIs, 52.1% of respondents always used contrast in combination with live fluoroscopy. The majority of respondents preferred the loss of resistance technique to identify the epidural space for both cervical and lumbar ILESIs. Hanging drop was the second most common technique utilized to confirm the epidural placement. Other preferences are listed in Table 2.

Regarding level of injection for cervical ILESIs, 19.8% of respondents always perform the injection at C7-T1; 63.3% of respondents always perform at either C6-7 or C7-T1. A small percentage of respondents will sometimes perform ILESIs at higher levels (C5-6 33.3%, C4-5 12.7%, and C3-4 8% of respondents).

Preferences for injectate solution are listed in Tables 3 and 4. For local anesthetics, the most commonly

Table 1. Percentage of respondents who use view 100% of the time.

	Cervical ILESIs (n = 237)	Lumbar ILESIs (n = 240)
AP	89	90
Lateral	36.2	50.4
CLO	27	9.6
AP only	6.8	3.8
AP + lateral only	35	26.2
AP + CLO only	26.6	9.6
AP + lateral + CLO	8	4.6

ILESIs = interlaminar epidural steroid injection; AP = anteroposterior; CLO = contralateral oblique.

Table 2. Percentage of respondents that prefer each technique for identifying epidural space.

	Cervical ILESIs (n = 235)	Lumbar ILESIs (n = 242)
Loss of resistance	87.2	93.4
Hanging drop	8.1	0.8
Fluid column	1.3	1.7
Fluoroscopy only	3.4	4.1

ILESIs = interlaminar epidural steroid injection

Table 3. Percentage of respondents that prefer each local anesthetic in injectate.

	Cervical ILESIs (n = 237)	Lumbar ILESIs (n = 240)	Caudal (n = 237)
Bupivacaine	19.8	35	40.1
Lidocaine	30.4	39.6	38
Ropivacaine	2.5	2.9	3
None	46	21.7	18.1
Other	1.3	0.8	0.8

ILESIs = interlaminar epidural steroid injection

Table 4. Percentage of respondents that prefer each steroid in injectate.

	Cervical ILESIs (n = 236)	Lumbar ILESIs (n = 238)	Caudal (n = 241)
Betamethasone	25	15.6	16.6
Dexamethasone	24.6	10.5	9.6
Methylprednisolone	33.9	50.4	50.6
Triamcinolone	15.6	22.7	22
No steroid	0.9	0.8	1.2

ILESIs = interlaminar epidural steroid injection

preferred agents are none for cervical ILESI (46% of respondents), lidocaine for lumbar ILESI (39.6%), and bupivacaine for caudal ESI (40.1%). For steroid, the most commonly preferred agent was methylprednisolone (33.9, 50.4, and 50.6% of respondents for cervical, lumbar, and caudal ESI, respectively).

Discussion

This survey provides an update on ILESI practice patterns among United States IPM physicians and elucidates the variations in practice that still exist to date.

Injection Practices

In 2002, Cluff et al (11) noted that approximately 49% of practices used fluoroscopy for ESI. In comparison, all practitioners in this survey use image guidance for ILESI which aligns with recommendations put forth by several societies (13). A majority of physicians use multiple views for cervical procedures, with 69.6% of respondents using more than one view all the time. For lumbar ILESI, 44.2% of respondents used more than one view all the time. In our survey contrast was used by 95.7 and 96.2% of respondents when performing cervical and lumbar ILESI, respectively. In comparison, in the Cluff et al (11) survey from 2002, 94% of practices routinely used contrast for ILESI and 6% did not. Cluff et al (11) noted that 91.8% of practices in 2002 reported using the loss of resistance technique to identify the epidural space. Although the overall use of loss or resistance remains about the same (90.3% in our study), use of "hanging drop" for cervical ESI has decreased significantly compared to 2002 (8.1% of individual respondents compared to 52.7% of practices in 2002) (11).

Our survey found that 36.7% of respondents sometimes perform cervical ILESI higher than the C7-T1 or C6-C7 level. It has been recommended that cervical ILESI not be performed above the C6-7 level (13). This recommendation is noted to be based on the anatomical gaps in the ligamentum flavum and the smaller epidural space in the cervical area, but not from complications during the procedure itself (13,14).

Use of local anesthetics for cervical procedures was noted to be none for 46% of interventionalists likely because cervical local anesthetic administration creates a high risk of profound cardiovascular effect and anes-

thesia if inadvertently injected in the intrathecal space (15). In comparison, 57.5% of practice respondents in the survey performed by Cluff et al (11) in 2002 were still using local anesthetics in cervical ESI; 3.8% of these practices were using solely local anesthetic. Lidocaine and bupivacaine are still commonly used for lumbar and caudal ESIs, respectively, with lower risks of intrathecal complications.

Epidural steroid practices have been under significant scrutiny since the labeling for triamcinolone was updated in 2011 stating it was not for epidural use followed by the announcement in 2014 that injectable corticosteroids should carry a warning label about serious adverse events. Even with the label indicating triamcinolone is not for epidural use, practitioners continue to use this steroid for ILESI (3rd most common for cervical, 2nd most common for lumbar and caudal). In our study, we found that most practitioners use the particulate steroid methylprednisolone in 33.9% cervical, 50.4% lumbar, and 50.6% caudal injections. The non-particulate steroid, dexamethasone, is more commonly used in cervical interlaminar ESIs (24.6% versus 10.5% and 9.6% for lumbar and caudal ESI, respectively).

One of the major limitations to the study was the low response rate of 13.8%. Thus the results may not be representative of all IPM physicians in the US. The questionnaire was kept brief to improve participation in the survey, which limited the collection of valuable details including the rationale behind practice methods and policies.

Recommendations from the MPW were published shortly after final collection of responses for this survey (13). Nonetheless, interventionalists seemed to be trending towards recommendations set forth by the MPW. Our survey focuses predominantly on injection practices, which include needle size, use of image guidance, level of injection, identification of the epidural space, and preference for injectates. This study elucidates the discrepancies that still exist amongst the practitioners who perform these injections. As the MPW recommendations were published after completion of this survey, future surveys could re-assess ESI practice patterns. More evidence-based guidelines need to be developed to improve the efficacy and safety of these procedures.

Appendix 1: ILESI survey questions.

Please only complete this survey if you perform epidural steroid injections.

What is the practice setting in which you perform interventional procedures?

- Academic
- Private Practice
- Government Hospital (e.g., VA)
- Other (please specify) _____

How many years have you been performing epidural steroid injections? _____

On average, how many epidural steroid injections of each type do you perform monthly?

Cervical interlaminar _____

Lumbar interlaminar _____

Caudal _____

What gauge needle do you prefer for the following techniques?

Cervical interlaminar _____

Lumbar interlaminar _____

Caudal _____

What percent of the time do you use the following during performance of cervical interlaminar epidurals?

AP view _____

Lateral view _____

Contralateral oblique _____

Contrast _____

Live fluoroscopy _____

Catheter to injection medications _____

What percent of the time do you use the following during performance of lumbar interlaminar epidurals?

AP view _____

Lateral view _____

Contralateral oblique _____

Contrast _____

Live fluoroscopy _____

Catheter to injection medications _____

What is your preferred technique to identify the epidural space when performing a cervical interlaminar epidural?

- Loss of resistance
- Hanging drop
- Fluid column
- Fluoro only

What is your preferred technique to identify the epidural space when performing a lumbar interlaminar epidural?

- Loss of resistance
- Hanging drop
- Fluid column
- Fluoro only

What percent of cervical interlaminar ESIs that you perform are at the following levels?

C3-4 _____

C4-5 _____

C5-6 _____

C6-7 _____

C7-T1 _____

Appendix 1 (cont.): ILESI survey questions.

Which steroid do you routinely inject for cervical interlaminar epidural?

- Betamethasone (Celestone)
- Methylprednisolone (DepoMedrol)
- Triamcinolone (Kenalog)
- Dexamethasone (Decadron)
- No steroids are injected

Which steroid do you routinely inject for lumbar interlaminar epidural?

- Betamethasone (Celestone)
- Methylprednisolone (DepoMedrol)
- Triamcinolone (Kenalog)
- Dexamethasone (Decadron)
- No steroids are injected

Which steroid do you routinely inject for caudal epidural?

- Betamethasone (Celestone)
- Methylprednisolone (DepoMedrol)
- Triamcinolone (Kenalog)
- Dexamethasone (Decadron)
- No steroids are injected

What local anesthetic do you routinely inject in the epidural space for cervical interlaminar epidural?

- Bupivacaine
- Lidocaine
- Mepivacaine
- Ropivacaine
- None
- Other

What local anesthetic do you routinely inject in the epidural space for lumbar interlaminar epidural?

- Bupivacaine
- Lidocaine
- Mepivacaine
- Ropivacaine
- None
- Other

What local anesthetic do you routinely inject in the epidural space for caudal epidural?

- Bupivacaine
- Lidocaine
- Mepivacaine
- Ropivacaine
- None
- Other

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