Randomized Trial

Fluoroscopic Cervical Interlaminar Epidural Injections in Managing Chronic Pain of Cervical Postsurgery Syndrome: Preliminary Results of a Randomized, Double-Blind, Active Control Trial

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Background: Cervical postsurgery syndrome is common with increasing cervical surgical interventions. Cervical spine surgery may fail in a certain proportion of patients with continued pain secondary to pseudoarthrosis, adjacent segment degeneration, inadequate decompression, iatrogenic instability, facet joint arthritis, deformity, and spinal stenosis. Among the various treatments available for managing cervical postsurgery syndrome, epidural steroid injections are one of the most common nonsurgical interventions. However there have not been any systematic evaluations regarding the effectiveness of cervical epidural injections in cervical postsurgery syndrome.

Study Design: A randomized, double-blind, active control trial.

Setting: A specialty referral, private interventional pain management practice in the United States.

Objectives: To evaluate the effectiveness of cervical interlaminar epidural injections of local anesthetic with or without steroids in providing effective and long-lasting relief in the management of chronic neck pain and upper extremity pain in patients with cervical postsurgery syndrome, and to evaluate the differences between local anesthetic with or without steroids.

Methods: Patients were randomly assigned to one of 2 groups: Group I patients received cervical interlaminar epidural injections of local anesthetic (lidocaine 0.5%, 5 mL); Group II patients received cervical interlaminar epidural injections with 0.5% lidocaine, 4 mL, mixed with 1 mL of nonparticulate betamethasone.

The study was designed to include 120 patients with 60 patients in each group. This analysis includes 56 patients. Randomization was performed by computer-generated, random allocation sequence by simple randomization.

Outcomes Assessment: Outcome measures included the Numeric Rating Scale (NRS), the Neck Disability Index (NDI), employment status, and opioid intake. Assessments at baseline and 3, 6, and 12 months posttreatment.
Significant pain relief was defined as 50% or more; significant improvement in NDI was defined as a reduction of 50% or more.

Results: Significant pain relief (≥ 50%) was demonstrated in 71% of patients in Group I and 68% of patients in Group II. Functional status improvement was demonstrated by a reduction (> 50%) in the NDI scores in 71% of Group I and 64% of Group II at 12 months. The overall average procedures per year were 4.0 ± 0.7 in Group I and 4.1 ± 1.0 in Group II; the average total relief per year was 39.6 ± 11.8 weeks in Group I and 41.2 ± 15.8 weeks in Group II over the 52 week study period in the patients defined as successful. In the successful group, the combined pain relief and neck disability improvement was seen in 87% in Group I and 72% of the patients in Group II.

Limitations: The study results are limited by the lack of a placebo group and a preliminary report of 56 patients, 28 in each group.

Conclusion: Cervical interlaminar epidural injections with local anesthetic with or without steroids were effective in 67% of patients overall and 87% in Group I and 72% in Group II, in successful group patients with chronic function-limiting neck pain and upper extremity pain secondary to cervical postsurgery syndrome.

Key words: Chronic neck pain, upper extremity pain, cervical disc herniation, cervical spinal stenosis, cervical postsurgery syndrome, cervical epidural injections, epidural steroids, local anesthetics.
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Chronic persistent neck pain is common in the adult general population, with an explosion of diagnostic and therapeutic measures resulting in a health care crisis (1-23). Cervical spine surgery within the United States has risen dramatically over the past 2 decades (22,23), with a 10-fold geographic variation (24). Cervical spine fusions are the most common surgical interventions for degenerative cervical spine disease (15,22-26). Optimistic estimations of fusion for neck pain in the literature are approximately 70% favorable results (22). Thus, cervical spine surgery may fail in a certain proportion of patients secondary to pseudoarthrosis, epidural fibrosis, adjacent segment degeneration, inadequate decompression, iatrogenic instability, facet joint arthritis, spinal stenosis, and deformity (22). In an analysis of preoperation after surgical treatment of degenerative cervical spine disorders in 900 cases (25), the authors evaluated 5 different operative techniques. They showed an overall revision rate of 13.4%, as high as 32% for posterior instrumentation, and 42% pseudoarthrosis rates for cervical discectomy and fusion over 3 or more levels (22,25-28).

Cervical postsurgery syndrome represents a cluster of symptoms following cervical spine surgery wherein the expectations of the patient and spine surgeon are not met. Animal models of postlumbar laminectomy syndrome demonstrated paraspinal muscle spasms, tail contractures, pain behaviors, tactile allodynia, epidural and perineural scarring, and nerve root adherence to the underlying disc and pedicle (29-33). It also has been postulated that there may be a final common pathway with all the described etiologies, which results in peripheral and central facilitation potentiated by inflammatory and nerve injury mechanisms (31-33).

Cervical epidural injections (interlaminar or transforaminal) have been used to treat chronic neck and radicular pain from herniated discs, spinal stenosis, pain of discogenic origin, and cervical postsurgery syndrome (1). However, the evidence for cervical interlaminar epidural injections has been a subject of debate and at best is only moderately successful in managing cervical radiculopathy. There have not been any significant evaluations for cervical postsurgery syndrome, only the sporadic inclusion of patients in evaluating the effectiveness of cervical epidural injections(1,34-36). Recent studies utilizing fluoroscopic cervical interlaminar epidural injections for cervical disc herniation or axial pain have illustrated promising results, especially in patients who are judged to be successful in practical controlled, randomized, double-blind trials (37,38).

The underlying mechanism of epidurally administered local anesthetic and steroids is not clear. It has been hypothesized that the effects of a neural blockade are dependent on the anti-inflammatory properties of corticosteroids (39-45). However, there is also emerging evidence that local anesthetics may be equally effective as steroids in managing various types of spinal pain with multiple interventions (1,8,37,38,42,46-59).

Cervical epidural injections have not been performed utilizing contemporary interventional pain management techniques with fluoroscopy and targeted delivery of medication in cervical postsurgery syndrome. Consequently, this study is undertaken to evaluate the role of cervical interlaminar epidural injections in patients with chronic, function-limiting, neck pain and upper extremity pain secondary to cervical postsurgery syndrome using local anesthetic with or without steroids. The study is designed to evaluate 120 patients. This preliminary report includes 56 patients completing a one-year follow-up.

Methods

The study is being conducted in a private interventional pain management practice and specialty referral center in the United States. It is being performed based on Consolidated Standards of Reporting Trials (CONSORT) guidelines (60). The study protocol was approved by the Institutional Review Board (IRB) and registered with the U.S. Clinical Trial Registry.

Participants

New patients presenting for interventional pain management were recruited as study participants.

Interventions

All patients were provided with the IRB-approved protocol and informed consent which described in detail all aspects of the study and withdrawal process.

Patients were assigned to one of 2 groups: Group I patients received cervical interlaminar epidural injections of local anesthetic (lidocaine 0.5%, 5 mL); Group II patients received cervical interlaminar epidural injections with 0.5% lidocaine, 4 mL, mixed with 1 mL (6 mg) of nonparticulate betamethasone for a total of 5 mL of injectate.

Pre-Enrollment Evaluation

The pre-enrollment evaluation included demographic data, medical and surgical history with coexisting disease(s), radiologic investigations, physical examination, pain rating scores using the Numeric Rating Scale (NRS), work status, opioid intake, and functional status assessment using the Neck Disability Index (NDI).

Inclusion Criteria

Inclusion criteria were patients with cervical postsurgery syndrome with surgery performed at least one year before enrollment; patients who were 18 years of age; patients with a history of chronic function-limiting neck and upper extremity pain of at least 6 months duration one year after surgery; and patients who were competent to understand the study protocol and provide voluntary, written informed consent and participate in outcome measurements.

Exclusion criteria were those without previous cervical spine surgery; uncontrollable or unstable opioid use; uncontrolled psychiatric disorders; uncontrolled medical illness either acute or chronic; any conditions that could interfere with the interpretation of the outcome assessments; pregnant or lactating women; and patients with a history or potential for adverse reaction(s) to local anesthetics or steroid.

Description of Interventions

All cervical interlaminar epidural procedures were performed by one physician in an ambulatory surgery setting, in a sterile operating room, under fluoroscopy, with patients in the prone position, under appropriate monitoring with intravenous access and sedation with midazolam and fentanyl. Access to the epidural space was obtained under sterile conditions with the loss of resistance technique under fluoroscopic visualization. The epidural space was entered between C7 and T1 to C5 and C6 with confirmation by injection of nonionic contrast medium, but always below the scar from posterior surgical interventions. Following this, an injection of 5 mL of preservative-free lidocaine hydrochloride 0.5% or 4 mL of preservative-free lidocaine mixed with 6 mg of nonparticulate betamethasone was carried out.

Repeat cervical epidural injections were provided based on the response to prior cervical epidural injections, determined by improvement in physical and functional status. Further, repeat cervical epidural injections were performed only when increased levels of pain were reported with deteriorating relief below 50%.

Additional Interventions

All patients underwent the treatments as assigned. A patient was unblinded on request or if an emergency situation arose. Patients who were nonresponsive continued with conservative management and were followed without further epidural injections unless they requested unblinding.

Co-Interventions

Most patients were receiving opioids, nonopioid analgesics, and adjuvant analgesics; some were involved in a therapeutic exercise program. If patients were improving significantly and the medical necessity for these drugs was lacking, medications were stopped or dosages were decreased. In addition, some dosages were increased, based on medical necessity. All patients continued previously directed exercise programs, as well as their work. Thus, in this study, there was no specific physical therapy, occupational therapy, bracing, or other interventions offered other than the study intervention.

Objectives

The study was designed to evaluate the effectiveness of cervical interlaminar epidural injections with or without steroids in managing chronic neck and upper extremity pain secondary to cervical postsurgery syndrome in providing effective and long-lasting pain relief and to evaluate the differences between local anesthetic with or without steroids.

Outcomes

Outcomes measured included NRS, NDI, work status, and opioid intake in terms of morphine equivalents. Assessments were done at baseline, 3, 6, and 12 months posttreatment.

Significant improvement was defined as at least 50% pain relief associated with 50% improvement in NDI. The NRS and NDI have been shown to be valid and reliable in patients with mechanical neck pain (61-63).

Opioid intake was evaluated based on the dosage frequency and schedule of the drug, with conversion to morphine equivalents (64).

Patients unemployed or employed on a part-time basis with limited or no employment due to pain were classified as employable. Patients who chose not to work, were retired, or were homemakers (not working, but not due to pain) were not considered to be in the employment pool.

Sample Size

The sample size was calculated based on significant pain relief. Considering a 0.05 2-sided significance level, a power of 80%, and an allocation ratio of 1:1, 55 patients in each group were estimated (65). Allowing for a 10% attrition/ noncompliance rate, 60 patients were required.

Previous studies of interventional techniques identified 50 to 60 patients or even smaller numbers as appropriate (29,30,49-59,66-68).

Randomization

From a total of 120 patients, 60 patients will be randomly assigned into each group.

Sequence Generation

Randomization was performed by computer-generated random allocations sequence by simple randomization.

Allocation Concealment

The operating room nurse assisting with the procedure randomized the patients and prepared the drugs appropriately.

Implementation

Participants were invited to enroll in the study if they met inclusion criteria. One of the 3 nurses assigned as coordinators of the study enrolled the participants and assigned participants to their respective groups.

Blinding (Masking)

Participants and those administering the interventions were blinded to the group assignments. Both solutions were clear; it was impossible to identify if the steroid had been added or not. Further, blinding was ensured by mixing the patients with other patients receiving routine treatment and by not informing the physician performing the procedures which patients were in the study. All one-year follow-up patients were selected by a statistician not involved in patient care. The unblinding results were not disclosed to either the treating physician, other participants, or patients not enrolled in the study. Thus, the nature of blinding was not interrupted.

Statistical Methods

Statistical analyses included the chi-squared statistic, Fisher's exact test, t test, and paired t test. Results were considered statistically significant if the P value was less than 0.05.

Chi-squared statistic was used to test the differences in proportions. Fisher's exact test was used wherever the expected value was less than 5; a paired t test was used to compare the pre- and posttreatment results of average pain scores and NDI measurements at baseline versus 3, 6, and 12 months. For comparison of mean scores between groups, t test was performed.

Intent-to-Treat-Analysis

An intent-to-treat-analysis was performed. Either the last follow-up data or initial data were utilized in patients who dropped out of the study and no other data were available. Sensitivity analysis was performed utilizing best case, worse case, and last follow-up data.

Results

Participant Flow

Figure 1 illustrates the participant flow.

Recruitment

The recruitment period was started in February 2008 and is ongoing.

Baseline Data

Baseline demographic and clinical characteristics of each group are illustrated in Table 1. There were no significant differences noted except for gender. Of the 56 patients included in the study, anterior surgery was performed in 49 or 88% of the patients, posterior surgery in 5 or 9% of the patients, and both anterior and posterior surgery in 4 or 7% of the patients.

Analysis of Data

Numbers Analyzed

A schematic illustration of patient flow is provided in Fig. 1. Fifty-six patients completed the one-year follow-up; 28 patients in each group. The data were available in the majority of the included patients. An intent-to-treat analysis was performed due to unavailable data at 12 months for 4 patients in Group I and for 2 patients in Group II.

Sensitivity Analysis

A sensitivity analysis with changes in the numeric pain scores was performed utilizing the last follow-up score, best case scenario, and worst case scenario. There were no significant differences; therefore, the intent-to-treat analysis with last follow-up visit was used.

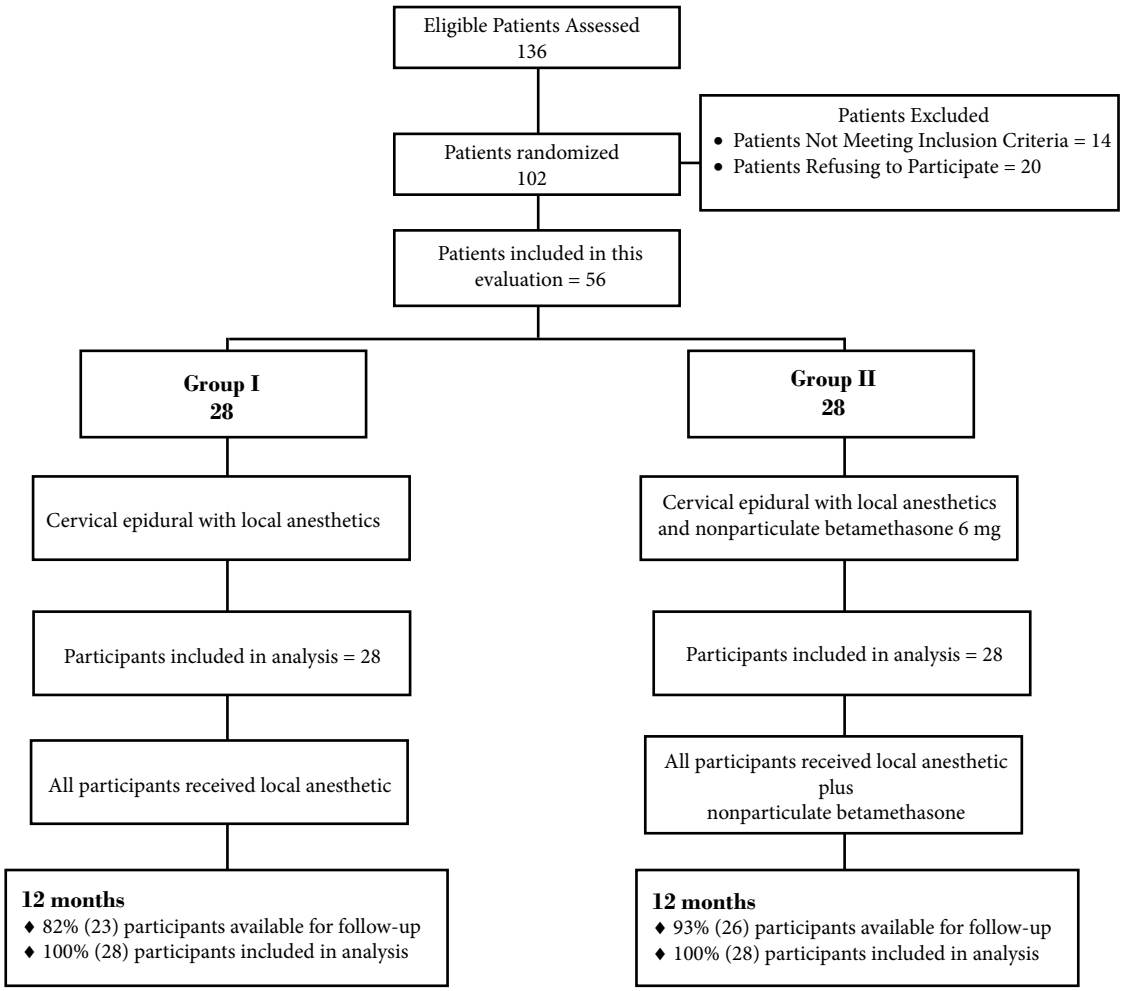

Fig. 1. *Schematic presentation of patient flow at one-year follow-up of 56 patients.*

Outcomes

Pain Relief

Table 2 illustrates the NRS scores. Pain scores changed significantly from baseline at 3, 6, and 12 months in both groups.

Functional Assessment

Functional assessment results assessed by the NDI are illustrated in Table 3.

Employment Characteristics

Table 4 demonstrates employment characteristics in both groups.

Opioid Intake

Table 5 illustrates the daily opioid intake between the groups at baseline, at 3 months, at 6 months, and at 12 months, with no significant changes.

Therapeutic Procedural Characteristics

Therapeutic procedural characteristics are illustrated in Table 6. Epidural entry was performed between C7 and T1 in 32% of the patients, between C6 and C7 in 57% of the patients, and between C5 and C6 in 11% of the patients.

Average pain relief per year showed no significant differences: 33.2 + 17.4 weeks in Group I and 37.8 ± 18.2 weeks in Group II. The average number of injec-

Table 1. *Baseline demographic characteristics.*

		Group 1 (28)	Group II (28)	*P* value
Sex	Male	36%	68%	0.016
	Female	64%	32%	
Age	Mean ± standard deviation (SD)	48.3 + 9.9	49.0 + 10.3	0.782
Weight	Mean ± SD	200.0 ± 50.6	179.2 ± 39.9	0.093
Height	Mean ± SD	65.6 ± 4.2	68.2 ± 5.0	0.03
Duration of Pain (months)	Mean ± SD	122.3 ± 77.7	111.2 ± 73.9	0.585
Onset of Pain	Gradual	50%	36%	0.280
	Injury	50%	64%	
Neck Pain Distribution	Neck pain only	14%	14%	0.993
	Neck pain worse than upper extremity	50%	53%	
	Upper extremity worse than neck pain	4%	4%	
	Both equal	32%	29%	
Surgical Interventions	Anterior surgery	86% (24)	89% (25)	1.000
	Posterior surgery	14% (4)	4% (1)	0.352
	Anterior and posterior surgery	7% (2)	7% (2)	0.570
Number of Surgeries	One	86% (24)	79% (22)	0.485
	Two	11% (3)	18% (5)	
	> Two	3% (1)	3% (1)	
Numeric Rating Score	Mean ± SD	8.0 ± 1.23	7.8 ± 0.9	0.534
Neck Disability Index	Mean ± SD	30.0 ± 5.0	28.8 ± 4.0	0.289

Table 2. *Mean pain relief of NRS scores and proportion of patients with significant pain relief (≥ 50%).*

Numeric Rating Score	Group I (28)	Group II (28)	*P* value
	Mean ± SD	Mean ± SD	
Baseline	8.0 ± 1.23	7.8 ± 0.9	0.534
3 months	3.7* ± 1.2 (79%)	4.0* ± 1.2 (71%)	0.369
6 months	3.7* ± 1.1 (71%)	3.8* ± 1.1 (75%)	0.714
12 months	3.6* ± 1.1 (71%)	3.9* ± 1.4 (68%)	0.465

Percentages in parentheses indicate proportion of participants with significant relief (≥ 50% reduction in Numeric Rating Score from baseline)

* indicates significant difference with baseline values ($P < 0.001$)

Table 3. Functional assessment evaluated by Neck Disability Index with mean improvement and proportion of patients with significant improvement.

Neck Disability Index	Group I (28)	Group II (28)	*P* value
	Mean ± SD	Mean ± SD	
Baseline	30.0 ± 5.0	28.8 ± 4.0	0.289
3 months	15.9* ± 5.3 (71%)	14.8* ± 5.7 (75%)	0.451
6 months	15.3* ± 5.0 (68%)	14.6* ± 5.8 (75%)	0.656
12 months	15.0* ± 4.7 (71%)	15.0* ± 5.6 (64%)	0.9980

Percentages in parenthesis indicate proportion of patients with significant improvement with NDI scores from baseline (≥ 50%).

* indicates significant difference with baseline values ($P < 0.001$)

tions per year was 3.7 ± 0.9 in Group I and 4.0 ± 1.1 in Group II. However, when patients were separated into successful and failed groups, the average number of injections per year was 4.0 ± 0.7 in Group I and 4.1 ± 1.0 in Group II in the successful group, and 2.4 ± 0.6 for Group I and 2.7 ± 0.6 for Group II in the failed group. Total relief of 39.6 ± 11.8 weeks was obtained in the successful group in Group I; in Group II it was 41.2 ± 15.8 weeks. In contrast, the total relief was 4.4 ± 1.7 weeks in Group I and 9.0 ± 9.6 weeks in Group II for the failed groups.

The initial therapy was considered to be successful if a patient obtained consistent relief lasting at least 3 weeks with 2 initial injections. All others were considered failures.

Combined significant pain relief and functional status improvement are illustrated in Fig.2.

Table 4. *Employment characteristics.*

Employment Status	Group I		Group II	
	Baseline	12 months	Baseline	12 months
Employed Part-time	2	2	1	0
Employed Full-time	2	2	6	8
Unemployed (Due to Pain)	2	2	2	1
Not Working	0	0	0	0
Eligible for Employment	6	6	9	9
Total Employed	4	4	7	8
Housewife	18	18	16	16
Disabled	3	13	2	2
Retired	1	1	1	1
Total Number of Patients	28	28	28	28

Table 5. *Daily opioid intake (morphine equivalence mg).*

Opioid Intake (Morphine Equivalence in mg)	Group I (28)	Group II (28)	P value
	Mean ± SD	Mean ± SD	
Baseline	52.21 ± 42.34	90.32 ± 104.54	0.079
3 months	44.68 ± 42.91	64.25 ± 56.01	0.148
6 months	44.68 ± 42.91	63.54 ± 56.20	0.164
12 months	53.74 ± 51.00	63.54 ± 56.20	0.502

Table 6. *Therapeutic procedural characteristics with procedural frequency, average relief per procedure, and average total relief in weeks over a period of one year.*

	Successful Patients		Failed Patients		Combined	
	Group I (23)	Group II (25)	Group I (5)	Group II (3)	Group I (28)	Group II (28)
1st Procedure Relief	5.2 ± 3.4 (24)	4.8 ± 4.1 (25)	1.9 ± 1.6 (5)	1.4 ± 1.0 (3)	4.6 ± 3.4 (28)	4.5 ± 4.1 (28)
2nd Procedure Relief	8.8 ± 3.7 (23)	7.8 ± 4.6 (25)	2.0 ± 2.1 (5)	1.3 ± 1.5 (3)	7.6 ± 4.3 (28)	7.1 ± 4.8 (28)
3rd Procedure Relief	12.4 ± 5.1 (22)	14.9 ± 12.0 (23)	1.5 ± 2.1 (2)	9.5 ± 12.0 (2)	11.5 ± 5.8 (24)	14.5 ± 11.9 (25)
4th Procedure Relief	13.2 ± 3.3 (20)	12.1 ± 1.9 (19)	-	-	13.2 ± 3.3 (20)	12.1 ± 1.9 (19)
5th Procedure Relief	12.5 ± 1 (4)	13.0 ± 6.1 (10)	-	-	12.5 ± 1 (4)	13.0 ± 6.1 (10)
Number of Procedures per Year	4.0 ± 0.7 (23)	4.1 ± 1.0 (25)	2.4 ± 0.6 (5)	2.7 ± 0.6 (3)	3.7 ± 0.9 (28)	4.0 ± 1.1 (28)
Average Relief per Procedure	9.8 ± 12.8 (23)	10.2 ± 4.6 (25)	1.9 ± 0.6 (5)	3.3 ± 3.1 (3)	8.4 ± 3.8 (28)	9.4 ± 4.9 (28)
Average Relief per Procedure 3rd Procedure and After	12.8 ± 3.1 (22)	15.3 ± 11.9 (23)	1.4 ± 1.9 (2)	9.4 ± 12.2 (2)	11.8 ± 4.4 (24)	14.8 ± 11.8 (25)
Total Relief per Year (weeks)	39.6 ± 11.8 (23)	41.2 ± 15.8 (25)	4.4 ± 1.7 (5)	9.0 ± 9.6 (3)	33.2 ± 17.4 (28)	37.8 ± 18.2 (28)

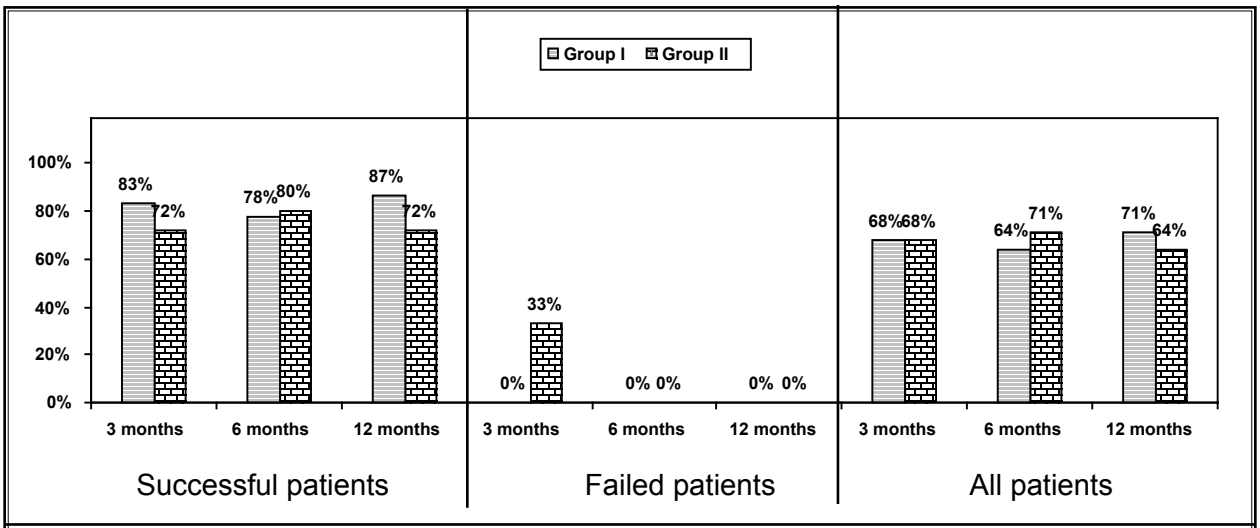

Fig. 2. *Illustration of reduction (at least 50%) in average pain and Neck Disability Index from baseline.*

Table 7. *Characteristics of changes in weight.*

Weight (lbs)	Group I (28)	Group II (28)	*P* value
	Mean ± SD	Mean ± SD	
Weight at Beginning	200.0 ± 50.6	179.2 ± 39.9	0.093
Weight at One Year	199.0 ± 50.8	176.6 ± 36.2	0.063
Change	- 1.0 ± 17.0	-2.6 ± 9.3	0.663
Lost Weight	50%	46%	0.578
No Change	14%	7%	
Gained Weight	36%	47%	

Changes in Weight

There were no differences in change (gain or loss) in body weight from baseline in both groups (Table 7).

Adverse Events

Of the 215 cervical epidural procedures performed, there were 2 subarachnoid punctures and 2 intravascular entries. There were no headaches or other complications.

Discussion

This preliminary report of the one-year follow-up of a randomized trial of 56 patients with cervical postsurgery syndrome demonstrates significant pain relief (≥ 50%) and significant improvement in functional status (50% or greater reduction in NDI scores) in 71% receiving local anesthetic only and 64% receiving local anesthetic and steroids. The overall average procedures per year was 3.7 ± 0.9 in Group I and 4.0 ± 1.1 in Group II, with an average total relief per year of 33.2 ± 17.4 weeks in Group I and 37.8 ± 18.2 weeks in Group II, for the 52 week period. However, in the successful group total relief per year was 39.6 ± 11.8 weeks in Group I and 41.2 ± 15.8 weeks in Group II with average relief per procedure of 12.8 ± 3.1 weeks in Group I and 15.3 ± 11.9 weeks in Group II subsequent to the first 2 procedures.

Despite significant use of epidural injections in the cervical spine, there has been only one systematic review (1), and a Cochrane review of medicinal and injection therapies for mechanical neck disorders (69). Of the randomized evaluations included in the evidence synthesis (34-36), Benyamin et al (1) concluded that all 3 studies showed positive results for short-term relief, whereas 2 were positive for long-term relief; the results of long-term relief were not available for one study (36), defining short-term relief as 6 months, and long-term relief as greater than 6 months. As illustrated in the present study, cervical interlaminar epidural injections of local anesthetic with or without steroids do not provide long-term relief, even though long-term relief can be achieved by appropriate patient evaluation and judicious use of repeat injection therapy. The study illustrates an average relief of 11.8 to 14.8 weeks in the therapeutic phase after 2 initial injections. These re-

sults are similar to patients with low back pain secondary to postsurgery syndrome treated with caudal epidural injections with or without steroids utilizing the same methodology, but somewhat less effective than cervical epidural injections in patients with or without disc herniation.

Further, this study also provides insight into successful or failed groups based on the first 2 procedures. The patients in the successful group who had good pain relief with the first and second procedures showed average relief from 39.6 to 41.2 weeks out of 52 weeks. The average number of procedures per year was 4. In contrast, in the failed group, the average relief per procedure was 1.9 to 3.3 weeks, with overall 4.4 to 9.0 weeks of relief in one year.

One of the advantages of this evaluation is its generalizability to interventional pain management settings. This is the first study performed under fluoroscopic visualization in the United States. The results of this study can be applied to individual patients or groups that differ from those controlled in the placebo trials. Pragmatic or practical clinical trials (with an active control) measuring effectiveness are considered more appropriate than explanatory trials measuring efficacy (7-10,18,70-73). Pragmatic trials are best designed to provide the results of treatment benefits produced in routine clinical practice, measuring existence of effect and comparison of 2 treatments in contrast to explanatory trials (placebo control) that measure efficacy and absolute effect size. The present design with active control shows not only the existence of effect, but also compares 2 commonly used therapies (72). This study is also different from other studies since we used repeat cervical interlaminar epidural injections based on the requirement that there be an increase in pain and deterioration in functional status, rather than routinely providing 3 injections or being limited to 3 procedures or limiting them even to only one or 2 procedures. Further, this study also has taken into consideration that the initial 2 procedures do not last for long periods of time. If the initial relief did not last more than one to 3 weeks, then the procedures did not provide long-term relief as was observed in the failed patients.

The study may be criticized or considered as deficient due to the lack of a placebo group and that this is a preliminary analysis (7-10,18,74). However, the issue of a lack of a placebo group is addressed in pragmatic trials with a treatment response that accounts for the total difference between 2 treatments, as well as associated placebo effects, thus providing internal validity. This preliminary report might resolve to some extent the issue of local anesthetics with or without steroids in managing chronic function-limiting neck pain and upper extremity pain in patients with cervical postsurgery syndrome. The preliminary sample size is appropriate based on recent studies (67,68).

Placebo-controlled neural blockade is not realistic even though it has been misinterpreted (18,74-76). Some have mistakenly reported that any local anesthetic injection which yields similar results as steroids is considered a placebo. However, these interpretations are inaccurate. The evaluations have illustrated sodium chloride solution and dextrose to be active agents. Sodium chloride solution has different effects when injected into either the disc, the facet joint, or paraspinal muscles (77-80).

While the mechanism of action of steroids and local anesthetic has been described (36,39-48,81-85), there is emerging evidence that local anesthetics may be equally as effective as steroids in managing low back and neck pain without disc herniation and also pain of facet joint origin (37,38,42,48-58). It has been reported that multiple pathophysiologic mechanisms involved in chronic pain, including noxious peripheral stimulation, excess nociception resulting in the sensitization of the pain pathways at several neuronal levels, and excess release of neurotransmitters causing complex central responses including hyperalgesia or wind-up (36), result in an increase in nociceptive sensitization of the nervous system (85,86) and phenotype changes which are also considered as part of the neuronal plasticity (85-87). Thus, there is evidence for the long-term effect of either local anesthetics or steroids in managing radicular pain. Corticosteroid anti-inflammatory properties have been associated with the inhibition of prostaglandin synthesis and decreases in regional levels or inflammatory mediators such as interleukin-1, tumor necrosis factor, and phospholipase A2 (36,39-48,88-90). The results of this preliminary report show no additional improvement with corticosteroids in managing chronic neck pain with or without upper extremity pain. In addition, corticosteroids are also known to possess direct neurotoxic effects on peripheral nerve tissue unlike local anesthetics (91-93).

In summary, the evidence in this preliminary evaluation of a randomized, controlled, double-blind trial demonstrates that cervical interlaminar epidural injections in patients with previous cervical surgery who have continued pain supports that patients may be

treated with cervical interlaminar epidural injections with or without steroids.

Multiple complications also have been described with cervical epidural injections, including infection, bleeding, neural trauma, etc. (1,94-99); however, only 2 cases of subarachnoid puncture and intervascular entry were observed without further side effects.

Conclusion

The assessment of the preliminary results of this randomized, controlled, double-blind trial of cervical interlaminar epidural injections in chronic function-limiting neck pain and upper extremity pain in cervical postsurgery syndrome demonstrated significant pain relief in over 72% of patients with improvement in functional status, requiring 4 procedures per year and providing almost 40 weeks of relief during a 52-week period in appropriately selected patients.

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