

Contralateral Oblique vs Lateral fluoroscopic approaches to cervical epidural: A comparative study for symptomatic cervical disc herniation

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Abstract

Aims: This study was to compare contralateral oblique (CLO) and the classic lateral (CL) fluoroscopic approach to interlaminar cervical epidural steroid injection in terms of pain relief in patients with unilateral upper extremity radicular pain. **Methods:** This was a randomized clinical trial being conducted in one pain center in Hyderabad India. Fifty patients were allocated into two groups of 25 each. After confirmation of radiocontrast spread in the epidural space by fluoroscopic guidance, dexamethasone 8 mg and bupivacaine 0.125% in a volume of 4 ml were delivered to the epidural space. Evaluation of pain intensity before and 2 month after the procedure was accomplished using the numeric rating scale (NRS) respectively. **Results:** Demographic and baseline characteristics of the cases showed significant statistical difference. Improvements in the NRS were observed in both groups; meanwhile, improvements were more pronounced in the CLO-CESI group as compared to the CL-CESI group ($P<0.01$). With the CLO approach the ventral spread of radiocontrast was significantly higher (25%) than with the CL approach (4%) ($P<0.01$). All patients in CLO group showed radiocontrast spread ipsilateral to the painful side and all patients in the CL group showed a midline distribution of radiocontrast. **Conclusion:** CLO-CESI provides superior pain relief and improvement of functional disability in patients with unilateral upper extremity radicular pain in comparison to the classic CL-CESI

Key words: Radicular pain, contralateral oblique (CLO), classic lateral (CL), fluoroscopy

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Introduction

Cervical epidural steroid injection (CESI) has been used in treatment of radicular upper extremity pain [1-3]. Several reports of success of these procedures in reduction of upper extremity pain from cervical disc herniation have been presented in the literature [4,5]. Although long-term effectiveness of CESI in such instances is debatable, CESI seems a reasonable choice for management of those patients who are reluctant to undergo surgery and those who are not good candidates for surgical interventions [3]. Transforaminal (TF), MIL, PSIL, and paramedian interlaminar (PMIL) routes are among the routes of epidural access [6]. It is believed that the TF route is more target specific and delivers the injectate to a closer vicinity of the pathologic site [1, 7-9].

The TF approach may be associated with devastating complications and it is strongly recommended that this procedure be performed under continuous fluoroscopic imaging and with the help of digital subtraction angiography. It is also recommended that in the cervical region only non-particulate steroid be used [7, 10]. Hazards attributed to the TF approach has led to a search for safer techniques [1, 11]. A number of reports support the superior efficacy of the PSIL approach in the lumbar region in treatment of radicular lower extremity pain [11-13]. This study was to compare contralateral oblique (CLO) and the classic lateral (CL) fluoroscopic approach to interlaminar cervical epidural steroid injection in terms of pain relief in patients with unilateral upper extremity radicular pain

Materials and methods

After institutional review board approval, 50 patients of 18 to 60 years of age are enrolled in this prospective study in patients suffering with neck pain and radicular pain of cervical disc prolapse etiology at Gandhi hospital Secunderabad from August 2019 to August 2020. Each participant underwent a thorough standard evaluation by a single pain physician which included an evaluation of their clinical history, physical examination, x-rays, magnetic resonance imaging (MRI).

Inclusion Criteria

- Chief complaint of neck pain radiating to one upper extremity
- Failed analgesic and nonpharmacologic therapy trial of at least 6 weeks.
- Duration of current neck pain for greater than 6 weeks and less than a year
- Symptoms due to acute disc disease with prolapse
- Correlation between the clinically determined level(s) of radiculopathy and the findings on MRI.
- Inability to tolerate physical therapy or no benefited from ongoing physical therapy

Exclusion Criteria

- Previous cervical spine surgeries or epidural steroid injections in the previous 6 months
- Clinical or imaging evidence of cervical cord compression.
- Cauda equina syndrome, arachnoiditis, progressive neurologic deficit
- Central spinal canal stenosis (congenital or acquired) from other origins, vertebral compression fracture(s)
- Active cancer diagnosis, history of substance abuse, current psychiatric co-morbidity, pregnancy

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- Myelographic contrast allergy, steroid allergy, local anesthetic allergy

Methods of collection of data

During the above said period 50 patients with neck pain satisfying the inclusion criteria are selected. The Patients are randomly allocated to one of the two groups of 25 patients each. Group CLO – For contralateral oblique view, Group CL view – For midline approach. Patients are explained about the procedure and informed and written consent obtained. Routine NPO protocols will be followed. Intravenous line is secured. Following monitors are connected – NIBP, SpO₂, ECG. Patients assumed prone position on a fluoroscopy table. The posterior cervical region was prepared with povidone-iodine 10% and draped in a sterile manner. Using fluoroscopic imaging needle entry points either at the C7-T1, C6-C7. Lidocaine 1%, 3-4 mL was used for local anesthesia. Using a saline loss-of-resistance technique a 18-gauge 3.5 inch Tuohy needle was advanced to the epidural space. Anteroposterior fluoroscopic images were used to guide the needle in a midline or contralateral oblique view. A contralateral oblique view was defined as a needle course passing between the lateral edge of the cervical spinous process and the medial border of the lamina in an anteroposterior (AP) fluoroscopic view. A midline trajectory was defined as a course confined to the borders of the cervical spinous process in an AP fluoroscopic view. We used lateral fluoroscopic control views in the

midline group and 50° contralateral oblique control views in the parasagittal group in order to add to the safety of the procedure. Upon acquiring a loss-of-resistance and after negative aspiration for cerebrospinal fluid or blood, 2 mL of the radiocontrast agent (Ominpaque TM, GE Healthcare, UK) was injected and fluoroscopic images (AP, lateral and 50° contralateral oblique) were taken to confirm the epidural distribution of the radiocontrast (Figures 3 and 4). Next, a 4 mL volume of dexamethasone 8 mg in bupivacaine 0.125% were incrementally injected. Patients were observed for 30 minutes before discharge from the clinic.

Statistical analysis

Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Data was also represented using appropriate diagrams like bar diagram, pie diagram and box plots. All Quantitative variables were checked for normal distribution within each category of explanatory variable by using visual inspection of histograms and normality Q-Q plots. Categorical outcomes were compared between study groups using Chi square test / Fisher's Exact test (If the overall sample size was < 20 or if the expected number in any one of the cells is < 5, Fisher's exact test was used.)

*P value < 0.05 was considered statistically significant.

**P value < 0.001 was considered statistically highly significant.

Results

Table no. 1: Comparison of age group distribution between the two groups

Age group(yrs)	CLO group (N=25)	CL group (N=25)	P value
	n (%)	n (%)	0.089
20-30	2 (8)	1 (4)	
30-40	6 (24)	7 (28)	
40-50	8 (32)	9 (36)	
50-60	9 (36)	8 (32)	
Total	25 (100.0)	25 (100.0)	

Table no. 2: Comparison of sex distribution between the two groups

Sex	IL group (N=25)	CL group (N=25)	P value
	n (%)	n (%)	
Male	21 (84)	20 (80)	0.4
Female	4 (16)	5 (20)	

No significant difference in Age and sex among two groups

Table no. 3: Comparison of laterality of radicular pain between the two groups

Side	CLO group (N=25)	CL group (N=25)	P value
	n (%)	n (%)	0.5
Left	11 (44)	14 (56)	
Right	14 (56)	11 (44)	

In Group CLO, 11 patient suffered from left lower limb radicular pain and 14 patients had right lower limb radicular pain. In Group CL, 14 patients presented with left lower limb radicular pain and 11 patients had right lower limb radicular pain.

Table no. 4: Comparison of Level of approach between the two groups

Level	CLO group (N=25)	CL group (N=25)	P value
	n (%)	n (%)	
C7-T1	24 (96)	24 (96)	0.8
T1-T2	1 (4)	1 (4)	

Among the fifty patients, most patients underwent at C7-T1 level in both the groups

Table no.5: Comparison of Numerical Rating scale for pain between the two groups

Intervals	CLO group (n=25)		CL group (n=25)		P value
	Mean	SD	Mean	SD	
NRS Before ESI					
NRS 30 min	3.04	1.05	3.72	0.84	0.0075
NRS 2WK	1.28	0.79	3.04	0.93	0.0001
NRS 2MONTHS	1.32	0.74	2.08	1.28	0.0066

NRS 30 mins after epidural steroid injection reduced in both the groups but it is more in CLO group. The difference among the 2 groups was significant (P value-0.007*). The results are significant even after 2nd and 2nd month

Table no. 6: Comparison of herniated disc level between the two groups

Intervals	CLO group (n=25)	CL group (n=25)	P value*
	n (%)	n (%)	
C4-C5	0	1	0.5
C5-C6	70	68	
C6-C7	30	31	

Table no.7: Comparison of Reduction of analgesic use between the two groups

Reduction in analgesic use	CLO group (N=25)	CL group (N=25)	P value
	n (%)	n (%)	
No	1 (4)	10 (40)	<0.01*
Yes	24 (96)	15 (60)	
Complication			
None	24 ()	25 (100.0)	0.03*
Vasovagal reaction	1 (3.3)	0	

one patient in the CLO group had a vasovagal reaction, during the procedure which was treated with Inj.Atropine 0.6mg and i.v fluids. We did not encounter any other complication during the study.

Table no 8 : pattern of radio contrast spread in CLO and CL groups

Radio contrast spread pattern.	CLO group.	CL group	P-value
Predominantly ipsilateral left.	11(44).	2(8)	<0.01
Predominantly midline	0(0).	17(68)	
Predominantly ipsilateral right.	14(56).	4(16)	
Ventral	5(25).	1(4)	

Cervical epidural steroid injections are among the most prevalent interventions used in the management of cervical radicular pain due to disc herniation. This procedure is especially valuable in those who are poor candidates for surgery [1-5]. We compared the clinical efficacy of two different approaches to CESI in a parallel randomized double-blind clinical trial; CLO-CESI and CL-CESI. Both groups showed clinically significant improvement regarding to both pain intensity and degree of functional disability of cervical origin. The CLO-CESI group, however, showed superior outcome after 30min, 2nd week and 2nd month of the procedure.

Targeted approach to the delivery of medications into the epidural space has been investigated in the lumbar region. The rationale behind taking a TF approach to access the epidural space has been the hypothesis that ventral spread of the injectate addresses the pathology site more thoroughly [11, 14-16]. Reports of devastating complications with the TF approach have urged practitioners to develop new techniques avoiding the neural foramina in case of cervical radicular pain. Complications such as arterial spasm, arterial dissection, nerve root trauma, spinal cord trauma, brainstem infarction, and death have been attributed to this route of epidural access [17, 18]. CLO approach has been advocated as an alternative to the CL approach in the lumbar region. Higher ventral spread of radiocontrast and superior efficacy of the CLO approach in comparison to the CL approach in unilateral lower extremity radicular pain has been shown in a number of studies [11, 12]. KD Candido *et al.*, [13] observed a striking 100% percent ventral spread of radiocontrast [5 mL] in the lateral CLO-ESI group in the lumbar region as opposed to a 75% ventral spread in the CL-ESI group.

Recently two groups of investigators have introduced alternative techniques; E. Choi *et al.*, [1] introduced the modified paramedian technique for targeted delivery of the injectate into the cervical epidural space and compared it with the TF route of epidural delivery. Despite the fact that ventral spread of radiocontrast was significantly higher in the modified paramedian group, no clinically significant difference in the efficacy of the two approaches was observed at any point during the study time span. Zachary L McCormick *et al.*, [19] compared the standard interlaminar CESI with targeted CESI by leading an epidural catheter to the site corresponding to the radicular

pathology after a midline interlaminar needle insertion. Although they observed meaningful clinical improvement in both groups, they did not report any outcome difference between the group subjects.

Although we observed clinically significant improvements in the scores NRS in both groups, those improvements were significantly more pronounced in the CLO-CESI group. Radiocontrast distribution (2 mL) to the ventral epidural space was seen in 25% (5/25) of patients in the CLO-CESI group and only in 4% (1/25) in the MIL-CESI group. Reports of radiocontrast spread to the ventral epidural space in the cervical region are highly variable; Jatinder Gill *et al.*, [20] performed a three-dimensional analysis of cervical contrast spread pattern. They did not report any instance of ventral spread of radiocontrast in their study. Accordingly, they warned that with low volumes of radiocontrast (2 mL) visualization of radiocontrast in the ventral epidural space should raise concerns regarding a subarachnoid spread. In contrary to those observations E Choi *et al.*, [1] reported a 90.4% anterior contrast spread using 2 mL of radiocontrast through a modified paramedian interlaminar approach to the cervical epidural space. Difference in types of cervical pathologies in study subjects may explain such variabilities.

Due to the incidence of devastating complications attributed to the TF approach, this route of access to the cervical epidural space cannot be advocated.. We propose the CLO-CESI [ipsilateral to the radicular symptoms] as an effective and safe alternative to the TF, modified paramedian and MIL approaches.

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