Medial Branch Block Versus Cervical Retrolaminar Block in Cervical Facet Joint Arthropathy: A randomized, Controlled Trial

Original Article

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ABSTRACT

Introduction: Chronic posterior neck pain known to be caused by cervical facet joints (CFJ) arthropathy in 54% to 67% of the cases. Cervical medial branch nerve neurolysis or blocks (CMBB) and intraarticular injections have used for reducing neck pain caused by facet joint arthropathy. This randomized clinical trial aimed to compare between the efficacy and safety of cervical retrolaminar block (CRB) versus CMBB in the management of the CFJ pain.

Methods: Seventy patients were divided into 2 groups randomly: CMBB group in which CMBB was done at the level of the affected dermatome and one level above giving dexamethasone 1 mL and 1% lidocaine 0.5 mL in each level, whereas CRB group, cervical retrolaminar block (CRB) was done giving dexamethasone 2 mL and 1% lidocaine 3 mL for each dermatomal level affected . For all patients numerical rating score (NRS) was done before the block, 2 weeks, 2 and 3 months after (in which 0= no pain, 10 =worst pain). NDI (Neck Disability Index) was carried out prior to the block and 2 weeks after. Complications were also monitored.

Results: No statistically significant difference between the studied groups in NRS and NDI however they both improve in the two groups. The approach time was longer in CMBB group, whereas the vascular injury was lower in CRB group.

Conclusions Cervical retrolaminar block has the same efficacy as CMBB in CFJ pain management, improved NDI, less time of procedure with no significant adverse events.

Key Words: Cervical facet joint, medial cervical branch, retrolaminar.

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INTRODUCTION

Cervical facet joint arthropathy (FJA) is a common cause of neck pain[1]. Many techniques have been mentioned in its treatment as CMBB and intraarticular injections[2].

The benefits for intraarticular facet joints injections have limited evidence. On the other hand, the medial branch blocks produce average results but the complications are more possible to happen [3].

Recently paraneuraxial nerve blocks have been widely used clinically because their anatomical and clinical characteristics in addition to their amazing success rate with significant analgesic efficacy. Furthermore, they offer lots of advantages over the neuraxial nerve blocks[4].

Retrolaminar block is one of the paraneuraxial nerve blocks which has recently gained popularity on the anesthesia for truncal surgery or the truncal pain syndromes (thoracic and lumber)[5,6] While cervical retrolaminar block (CRB) is a new subject and studies on it are few[4].

CRB is an easy technique which is superior to others that it eliminates the probability of pneumothorax, the unintentional injections into intrathecal spaces or the epidural and the damage of the nerve root[7].

From these points, our study was carried out to compare the safety and the efficacy of CRB versus CMBB in the cervical facet joint pain management.

METHODS

Study design and participants

This randomized prospective comparative open study was conducted from January 2022 to August 2022 in pain clinics at Mansoura University Hospitals. The study was approved by the ethical committees, Faculty of Medicine; Mansoura University, (Code number:R.21.11.1534), recorded in the clinical trials.gov. (NCT05184881) and has the compliance with Helsinki Declaration. All study participants should sign an informed written consent before the procedure and after full explanation about the procedure and its consequences.

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Inclusion criteria; Cervical FJA patients who did not respond to the conservative therapy (such as non-steroidal anti-inflammatory drugs, physiotherapy and lifestyle modifications), >18 years old, body mass index less than 30, numeric rating scale (NRS) ≥ four, ASA I and II .

Kemp test (extension of the neck combined with rotation) is a provocative test used to detect pain from facet joint should be positive and cervical magnetic resonance imaging was significant. Diagnostic cervical facet joint block was done one day before the procedure by local anesthesia (0.5 ml of bupivacaine 0.5 %) using fluoroscopy and it should provide pain improvement more than 80 %.

Exclusion criteria ;Any patient refuse to participate, unstable respiratory or cardiovascular problems, bleeding disorder, disturbed local anatomy, allergic reactions to used medications, local or systemic sepsis and history of neurologic or psychiatric diseases.

All the patients expressed their pain by using the numerical rating score (NRS) where zero equal no pain and ten equal the worst pain.

Randomization

Patients were randomly collected by a computer-generated list (1:1). The distributed results were put in closed envelopes by one of our team and held the envelopes until the approach day; he gave one of them to the anesthesiologist who did the block.

Participants were allocated into two groups

- CRB group (35 patients): CRB was done at each affected dermatomal level by 3 mL 1% lidocaine and 2 mL dexamethasone (8mg/2ml).
- CMBB group (35 patients); CMBB was done by 0.5 mL 1% lidocaine and 1 mL dexamethasone (8mg/2ml) both one level above and at the dermatomal level that is affected.

In both blocks, the total dose of dexamethasone should not exceed 16 mg while lidocaine should not exceed 300 mg.

Techniques

At the operating room, electrocardiogram (ECG), Non-invasive blood pressure, and pulse oximetry were monitored, 20 gauge cannula was inserted and 500ml of NaCl 0.9% was infused .

CRB

Under fluoroscopic visualization ,patient placed prone , the cervical lamina was identified at the desired level. Skin sterilization was done , a 25-gauge spinal needle was advanced. The position of the needle tip was assured by fluoroscopy, at the posterior surface of the cervical lamina of the affected facet joint level. After aspiration, 3 mL 1% lidocaine and 2 mL dexamethasone (8mg/2ml) were injected (Figure 1).

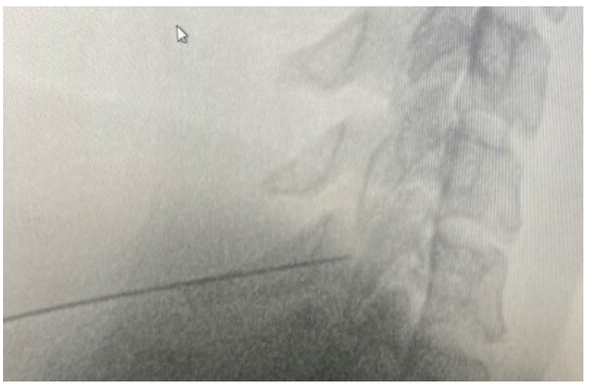

Fig. 1: A fluoroscopic lateral view, the tip of the needle was at the posterior aspect of the cervical lamina.

CMBB

Under fluoroscopic visualization and in supine position, the waist of the articular pillars was identified at the affected level. Sterilization of the skin was done, spinal needle 25-gauge was advanced and its tip was directed to the midpoint of the waists of the articular pillars and was checked by fluoroscopy. Following suction to evade any vascular puncture, 0.5 mL 1% lidocaine and 1 mL dexamethasone (8mg/2ml) were injected (Figure 2)**.** Each facet joint receives innervation from two medial branches, one from the same level and the other from the level above the affected facet joint. Therefore, the procedure was done at the level above too.

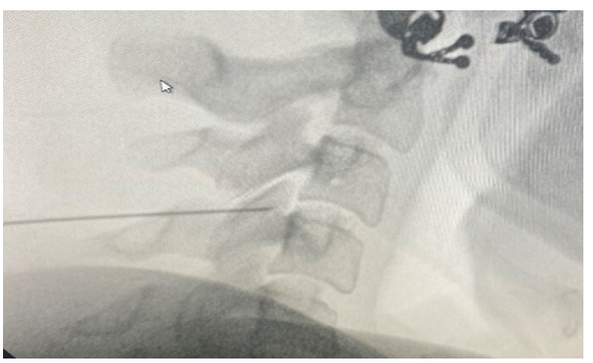

Fig. 2: A fluoroscopic lateral view, the tip of the needle was in the mid-point of the waists, of the cervical articular pillars.

All patients were transported and observed at the postoperative care unit for half to one hour.

Study Outcomes

Primary outcome NRS was measured before, two weeks, two and three months following the approach.

Secondary outcomes

- NDI was assessed before and two weeks following the approach[8].
- All side effects were properly evaluated including vascular injury.

Statistical analysis

The collected data were statistically analyzed using SPSS (version 25). Shapiro-Wilk test was utilized to detect the normality of the data distribution, which was expressed as mean±SD, while non-normally distributed variables were expressed as median and inter-quartile range, or numbers and percentages.

Normally distributed continuous data was done by One-way ANOVA test while for abnormal distribution of continuous data, Kruskal Wallis tests was utilized. Chi square test was utilized to assess categorical data. Entire tests were utilized with 95% CI. Pearson's correlation was measured when required. In terms of the previously used tests, *P* was considered significant when its value was less than equal to 0.05.

Sample Size Calculation

The Power Analysis and PASS windows 2017 using data obtained from a pilot study conducted on 10 cases in pain clinic at Mansoura University Hospital using NRS postinjection as the primary outcomes. Cases were assigned into 2 groups: CRB group and CMBB group; NRS 2.54 ± 0.53 for the CRB group and 2.89 ± 0.23 for the CMBB group. Sample size of thirty one cases in each group achieved 95% power (1-β or it is the probability of rejecting when the null hypothesis was false) in the proposed study, the significance level was used two-sided two-sample unequal-variance t-test of 5% and an effect size 0.85. 10% drop-out was predicted, therefore, thirty five patients were listed in each group.

RESULTS

The patient's demographic data has no statistically significant difference. The procedure time was longer in CMBB group than CRB group with statistically significant difference (23.74 ± 3.062 vs16.94 ± 2.363 minutes, respectively). The vascular injury was greater in CMBB group (11.4%) than CRB (0%) with $P < 0.05$ (Table 1).

According to NRS, there was enhancement in pain relief in the two groups with no significant difference throughout the follow up period. However, in both group, there were significant improvement at two weeks, two and three months in comparison with the basal values (Table 2).

Lifting in NDI showed statistically significant difference in comparison with the basal value. While the other items revealed no significant difference. After the block NDI, pain, headache, driving, work, personal care , recreation and sleeping showed statistically significant differences compared to the basal values in each group. Between groups, driving showed better results in the CRB group than the CMBB group ($P<0.046$) and the remain items showed no statistically significant difference (Table 3)

Table 1: patient's demographic data, duration of the procedure (min) and the incidence of vascular injuries between both groups.

	CMBB group (N= 35)	CRB group (N= 35)	95% CI	*P*
Age (years)	38.86±11.685	40.31±12.778	-7.3, 4.38	0.62
Gender: Male Female	 20 (57.1%) 15 (42.9%)	 17 (48.6%) 18 (51.4%)		0.473
Duration of the procedure (min)	23.74±3.06	16.94±2.36	-8.10, - 5.50	< 0.001
Vascular injury	4 (11.4%)	Zero (zero percent)	OR= 0.47	0.039

Data is expressed as mean &SD or as number and %. CRB: Cervical retrolaminar block; CMBB: Cervical medial branch block; CI: Confidence interval. $P \leq 0.05$ is significant

Table 2: The NRS in between both groups.

NRS	CMBB group (N= 35)	CRB group (N= 35)	95% CI	*P*	*P*1
Basal	6.40±1.37	6.26 ±1.462	-0.53,0.82	0.679	
2 weeks post block	1.80±1.232*	1.94±1.371*	-0.76,0.48	0.726	< 0.001
2 months post block	2.23±1.140*	2.46±1.421*	-0.84,0.38	0.671	< 0.001
3 months post block	3.09±1.245*	3.23 ±1.416*	-0.78,0.48	0.563	< 0.001

Data are expressed as mean ±SD. NRS: Numerical rating scale. CI: Confidence interval. *P* compared between groups. *P*1 compared between basal and after block in each group. $P \leq 0.05$ is significant.* Statistically significant to the basal.

Table 3: Neck disability index before and after the block in the studied groups.

After the block	CMBB group (N= 35)	CRB group (N= 35)	95% CI	*P*
Pain:				
Before	3.71±0.71	3.71±0.71	-0.22,0.45	0.478
After	1.60 ± 1.035*	1.60 ± 0.976*	-0.48, 0.48	1
*P*1	< 0.001	< 0.001		
Personal care:				
Before	2.14±0.879	2.14±0.879	-0.67, 0.15	0.214
After	1.71 ± 0.926*	1.94 ± 0.998*	-0.69, 0.23	0.309
*P*1	0.05	0.04		
Lifting:				
Before	3.46±1.01	2.94±0.938	0.05,0.98	0.032
After	3.17 ± 0.985	2.94 ± 0.998	-0.24, 0.70	0.344
Reading:				
Before	2.31±0.796	2.66±0.873	-0.74, 0.06	0.119
After	1.97 ± 1.175	2.34 ± 1.187	-0.93, 0.19	0.174
Headache:				
Before	3.09±1.121	2.97±1.175	-0.43,0.66	0.752
After	1.51 ± 0.853*	1.43 ± 0.850*	-0.32, 0.49	0.696
*P*1	< 0.001	< 0.001		
Driving:				
Before	3.31 ± 0.993	3.66 ± 0.838	-0.78, 0.10	0.110
After	2.63 ± 1.003*	2.11 ± 0.993*	0.04, 0.99	0.046
*P*1	0.0058	< 0.001		
Sleeping:				
Before	3.40±0.914	3.60±0.914	-0.64, 0.24	0.370
After	1.43 ± 0.979*	1.43 ± 0.850*	-0.44, 0.44	0.956
*P*1	< 0.001	< 0.001		
Concentration:				
Before	2.29±0.86	2.06±0.873	-0.18,0.64	0.238
After	2.11 ± 1.105	2.09 ± 1.011	-0.48, 0.53	0.961
Work:				
Before	3.09 ± 0.926	3.09± 0.926	-0.44,0.44	1
After	2.11 ± 0.900*	1.97 ± 0.923*	-0.29, 0.58	0.515
*P*1	< 0.001	< 0.001		
Recreation:				
Before	3.69±0.832	3.89±0.831	-0.6, 0.2	0.377
After	2.37 ± 1.060*	2.26 ± 1.010*	-0.38, 0.61	0.524
*P*1	< 0.001	< 0.001		

Data is expressed as mean±SD. CI: Confidence interval, CMBB: Cervical medial branch block, CRB: Cervical retrolaminar block.

DISCUSSION

The CFJ is a synovial joint that permits the cervical joint to extent and flex with limiting rotation and prevents the vertebrae slipping over each other. Pain arising from the facet joint could lead to disability among people, with a major economic impact[9]. Much research established CMBB efficiency in the context of the diagnosis of chronic neck pain that comes from the cervical facet joint as well as for its the management too[10,11]. However, Many complications as pneumothorax , vascular injury and spinal injection have been reported in CMBB[12]. So, for the first time, this study compares the efficacy and safety of CMBB and CRB for treatment of cervical facet joint pain and if CRB could be an effective alternative to CMBB.

NRS was significantly better during the follow-up (two weeks, two and three months) in comparison to the baseline in each group. While between groups, there was no statistically significant difference.

This gives an advantage for CRB. Although many reports stated the efficacy of CMBB for cervical facet joint pain, but it still has been associated with associated major troubles[13]. Another study displayed that, after the performance of CMBB on an adult subject (aged 27 years old), he complained of severe pain in the neck and shoulder, which ultimately ends in quadriparesis. He asked to do cervical spine imaging which revealed a contusion at the level of C4 and an evidence of intramedullary injection[14]. Furthermore, Park and his colleagues compared US and fluoroscopy-guided CMBB and found that; twelve patients were exposed to vascular

injury in the fluoroscopy group. As well as the current study, aspiration of blood occurred in 4 patients in CMBB group prior to injection, as a result, removal of the needle was performed and compression was applied for three min. The patients were closely monitored and after half an hour the procedure was repeated.

Considering the duration of the approach, it was less in CRB group than CMBB group. This could be explained by Voscopoulos *et al*. who informed that CRB is an easy procedure , needs less skill with less incidence of complications as nerve root damage, pneumothorax ,the epidural or intrathecal injection[15].

In both groups, NID showed better results in pain, headache, and usual daily activities (working, driving and relational activities) when compared to before the procedure. At the same time within group, driving was more improved in CRB group than CMBB group while there was no statistical difference in other items.

From the previous prospective studies that proved the efficacy of CMBB in chronic facet jointarthropathy, Machikanti and his colleagues who assessed the pain score after CMBB in chronic neck pain patients at intervals3, 6 and 12 months and found significant pain relief in 80%–95%[16]. Moreover, Hussain *et al*. who recorded an improvement in pain and NDI scores after CMBB with steroid and local anesthetic up to twelve weeks in chronic neck pain cases[10].

The spread of the injected drugs in CRB was estimated by Hochberg *et al*. in a cadaver and they established that it could diffuse cranially to C2, caudally to T3 and laterally to the s facet joints and the neural foramen. In addition, they evaluated the effectiveness of the US guided CRB in cervical radiculopathy and observed a significant enhancement in NRS after injection from 7.25 to 2.83 [4] In the same line, Khashan *et al*. investigated ninety-eight patients complained from cervical radiculopathy by performing ultrasound-guided CRB and they found reduction in NRS from 7.21±2.51 to 4.04±2.51 (P <0.01), 83% of patients had a lower NDI after the block than basal NDI and 8% of patients underwent surgery. Finally, they concluded that CRB could be used as another substitution for the cervical epidural and de-compressive surgeries in these cases[17].

LIMITATIONS

Despite the promising outcomes of the current study, the small sample size and single-centre study were considered the main limitations, so we need more prospective and comparative studies to confirm our results.

CONCLUSIONS

CRB has the same efficacy of CMBB in cervical facet joint pain management with same pain relief, improved NDI, less time of approach with no significant adverse events.

ABBREVIATIONS

(CMBB): Cervical medial branch block, **(CRB):** Cervical retrolaminar block, **(NRS):** Numerical rating scale,**(NDI):** Neck Disability Index.

CONFLICT OF INTERESTS

There are no conflicts of interest.

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