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"TO STUDY THE COMPARISON OF INTRAARTICULAR LUMBAR FACET JOINT STEROID INJECTIONS AND LUMBAR FACET JOINT RADIOFREQUENCY DENERVATION IN TREATMENT OF LOW BACK PAIN"

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ABSTRACT

Introduction: Lumbar facet joint degeneration is a source of chronic low back pain, with an incidence of 15% to 45% among patients with low back pain. Pain arising from the lumbar facet joints is a common cause of axial back pain in adults. Radiofrequency ablation (RF) of the medial branches of the spinal dorsal rami has been used as a treatment option. Various therapeutic techniques in the treatment of facet-related pain have been described in the literature, including intraarticular lumbar facet joint steroid injections and radiofrequency denervation.

Aim and Objective: To provide evidence based clinical practice guidelines for comparison of fluoroscopic guided facet joint radiofrequency ablation of medial branch and facet joint steroid injection for low back pain.

Material and Methods: This was a prospective non-randomized study carried out in the Department of Anaesthesia at Maharaja Institute of Medical Sciences for a period of 1 year i.e, April 2023 to April 2024 on patients who were admitted from casualty and outpatient's department with a diagnosis of chronic low back pain. All patients were assigned to LFJ

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intraarticular steroid infiltrations or RF denervation. All of the enrolled patients were suffering from LFJ-related pain at the L3/L4–L5/S1.

Results: In the present study, there were 65 patients screened out of which 8 patients drop out. There were 57 patients of low back pain in which the mean age of Group A patients was (62.26 ± 11.56) years and Group B patients was(55.75±10.25)years. It was observed that Males were more commonly affected than females. Duration of back pain of Group A patients was (1.72±0.85) years while that of Group B patients was (2.26±0.92) years. Vas scoring before procedure was found to be not significant. But vas scoring at 6 months after procedure was found to be very highly significant. Rolland Morris questionnaire before procedure in both the groups was found to be insignificant. But at 6 months after procedure between both groups was found to be highly significant.

Conclusion : Intraarticular steroid infiltration or radiofrequency denervation appear to be a managing option for chronic function-limiting low back pain of facet origin with favourable short- and midterm results in terms of pain relief and function improvement, but improvements were similar in both groups.

Keywords: Radiofrequency ablation; Lumbar facets; lower back Pain; Intraarticular steroid infiltration

INTRODUCTION

Chronic low back pain is considered a major public health problem worldwide [1]. Non traumatic low back pain is associated with high disability rates and the inability to work. In Germany, the annual prevalence rate of chronic low back pain has been found to be as high as 75% [2]. While the pathophysiology of chronic low back pain is multifactorial, it has been demonstrated that lumbar facet joint (zygapophysial)-related pain is involved in 15%–45% of cases [3].

Facet joints (zygapophyseal joints) are paired structures at the back of each vertebra that form a working motion unit that allows movement between two vertebrae. Facet joint pathology is an important cause of LBP especially in the elderly [4]. Lumbar facet joint syndrome has been defined as a kind of LBP with or without referred pain to the buttock, groin, or proximal thigh deriving from lumbar facet joints [5].

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Conventional radiofrequency (CRF) treatment involves continuous stimulation and results in ablation of nerves and tissues. The ablation is the result of frictional heat from a catheter needle [6]. In contrast to CRF, pulsed radiofrequency (PRF) uses a brief stimulation, followed by a long resting phase. PRF exposes the target nerves and tissues to an electric field, and rarely damages these structures [7]. Although the mechanism of PRF has not been clearly elucidated, it has been suggested that the electrical field produced by PRF can alter pain signals and have a selective effect on small unmyelinated fibers (C-fiber) [8,9]. Currently, PRF is used for various types of pain, including neuralgia, joint pain, and myofascial pain [10-12]. PRF stimulation on the lumbar medial branch has been reported to have a positive effect in the control of LFJ pain [13,14].

Intra-articular block with steroids and local anesthetics for lumbar facet joint pain has also been used with varied efficacy. Steroids have anti-inflammatory and immunosuppressive effects largely due to the inhibition of phospholipase A2. However, the long-term relief of LBP after facet intra-articular steroid injection can range from 18% to 63% [15].

Steroid injections are commonly used in various chronic musculoskeletal disorders. Due to the risk of complications and need for repeated injections, PRP was studied and found superior to steroid injections in recalcitrant lateral epicondylitis and knee osteoarthritis [16,17].

Lumbar intra-articular treatment with platelet-rich plasma (PRP)—an autologous blood derivative, is a new method in the treatment of LBP. It is suggested that healing occurs after PRP stimulates the recruitment, proliferation, and differentiation of cells involved in regeneration via growth factors and proteins released from the platelets [18,19].

Multiple therapeutic techniques with controversial results have been described and established in managing CLP caused by LFJ degeneration. Intraarticular LFJ injections, LFJ nerve blocks, and radiofrequency (RF) denervation have been shown to be effective [20]. The aim of LFJ injections is to bring steroids into the degenerated joint based on the belief that there is inflammation. The exact mechanism underlying the therapeutic effect of LFJ injections is unknown, whereas RF aims to cause denaturation of the first medial branch of the ramus dorsalis [21].

Due to such an overwhelmingly high incidence, physicians of multiple specialties perform interventional techniques in various settings. The frequency of application varies depending on the nature of the procedures and physicians. To date, diagnostic and therapeutic interventional

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techniques have been proven valid and effective, suggesting the importance of structural interventional pain management. Therefore, the present study was undertaken to study the comparison of intraarticular lumbar facet joint steroid injections and lumbar facet joint radiofrequency denervation in treatment of low back pain in patients attending a tertiary care centre.

MATERIAL AND METHODS

The prospective non-randomized study was conducted in the Department of Anaesthesia, at Maharaja Institute of Medical Sciences for a period of 1 year i.e, April 2023 to April 2024 on patients who were admitted from casualty and outpatient's Department with a diagnosis of chronic low back pain. All patients were assigned to LFJ intraarticular steroid infiltrations or RF denervation. All of the enrolled patients were suffering from LFJ-related pain at the L3/L4–L5/S1.

A total of 60 consecutive patients were assessed. Consecutive patients fulfilling the inclusion criteria were included in the study.

The study patients were randomly allocated into two groups:

Group A- 30 patients undergoing fluoroscopic guidedsteroid injection at facet joint

Group B- 30 patients undergoing radiofrequency ablation at facet joint for low back pain.

Inclusion Criteria:

- Age more than 30 years.
- Low back pain for at least 24 months.
- Low-back pain not responding to medicinal treatment for more than 3 months.
- A pain locally occurring at or around the lower back, not spreading to the legs.
- Palpation-induced sensitivity on the facet joint upon examination.
- Magnetic resonance imaging confirmation of facet joint hypertrophy.

Exclusion Criteria

- Central stenosis patients (>50% central or foraminal stenosis).

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- Patients who had additional pathologies such as infection or neoplasia.
- Patients who had a body mass index greater than 35.
- Patients with uncontrolled diabetes.

Intraarticular Diagnostic Blocks

Patients were placed prone; all injections were performed under fluoroscopy. The tender LFJs were palpated, marked, and located using a portable radiograph machine. Under aseptic conditions, a 22-G needle was inserted until bone was contacted at the edge of the LFJ. Adequate needle positioning was confirmed by injecting 1 mL of contrast medium. When the needle was in place, 0.5 mL of 0.5% bupivacaine was injected into the LFJ.

Radiofrequency Denervation

RF was performed according to the International Spine Intervention Society practice standards. All RF procedures were performed under fluoroscopic guidance in the prone position. Under aseptic conditions, 20-G curved RF needles with 100-mm active tips (BMC RF Cannula; Baylis Medical, Montreal, Quebec, Canada) were placed at the site of the dorsal ramus medial branch of the relevant L3/L4–L5/S1 LFJs. [22-24] Correct placement was confirmed using electrostimulation at 50 and 2 Hz for sensory and motor function, respectively. Then, 1 mL of 0.5% bupivacaine was injected through the cannula to decrease treatment-related pain, increase lesion size, and prevent postoperative neuritis. The RF probe was then reinserted into the cannula and lesion at a temperature of 80° for 90 seconds using a RF generator (Baylis Medical Pain Management Generator 115V; Baylis Medical).[25,26]

Intraarticular Injection of Steroids

The same setting was used for LFJ infiltrations and RF denervation. After positioning the RF needles into the LFJ under fluoroscopy, needle placement was confirmed by injecting 0.5 mL of contrast medium into the L3/L4–L5/S1 joints. If optimal positioning was achieved, a mixture of 0.5 mL of 0.5% bupivacaine and 1 mL of betamethasone (3 mg) was injected into the target joint. The RF probe was then reinserted into the cannula and the denervation process (80° for 90 seconds) was begun, but the electrodes were not connected to the pain generator device (Baylis Medical Pain Management Generator 115V).

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Statistical analysis:

Data recorded on the case report from and structured proforma were subsequently entered into a spreadsheet. Data management and analysis were performed using Microsoft Excel.

Ethical clearance:

The ethical committee clearance certificate was duly taken before starting of study by Institutional Medical Ethical Committee.

RESULTS

In the present study, we included 65 patients of low back pain. Out of which 8 patients dropped out so now total 57 patients were left. The patients were divided into Group A (n=28) and Group B (n = 29). Mean age of Group A patients was observed to be (62.26 ± 11.56) years and Group B patients was (55.75±10.25) years. There was a significant difference (p value 0.02 with CI 95%) found between two groups in terms of age distribution.(Table no.1 and graph no.1)

Age (in Years)	**Group A**		**Group B**	
	No.	**Percentage**	**No.**	**Percentage**
30 - 50	6	21.43	10	34.48
51 - 70	14	50.00	16	55.17
71 - 90	8	28.57	3	10.35
Total	**28**	**100**	**29**	**100**
Mean $\pm$ SD	62.26 $\pm$ 11.56		55.75 $\pm$ 10.25	
p value	0.02			

Table No. 1 : Age wise distribution of group A and group B .

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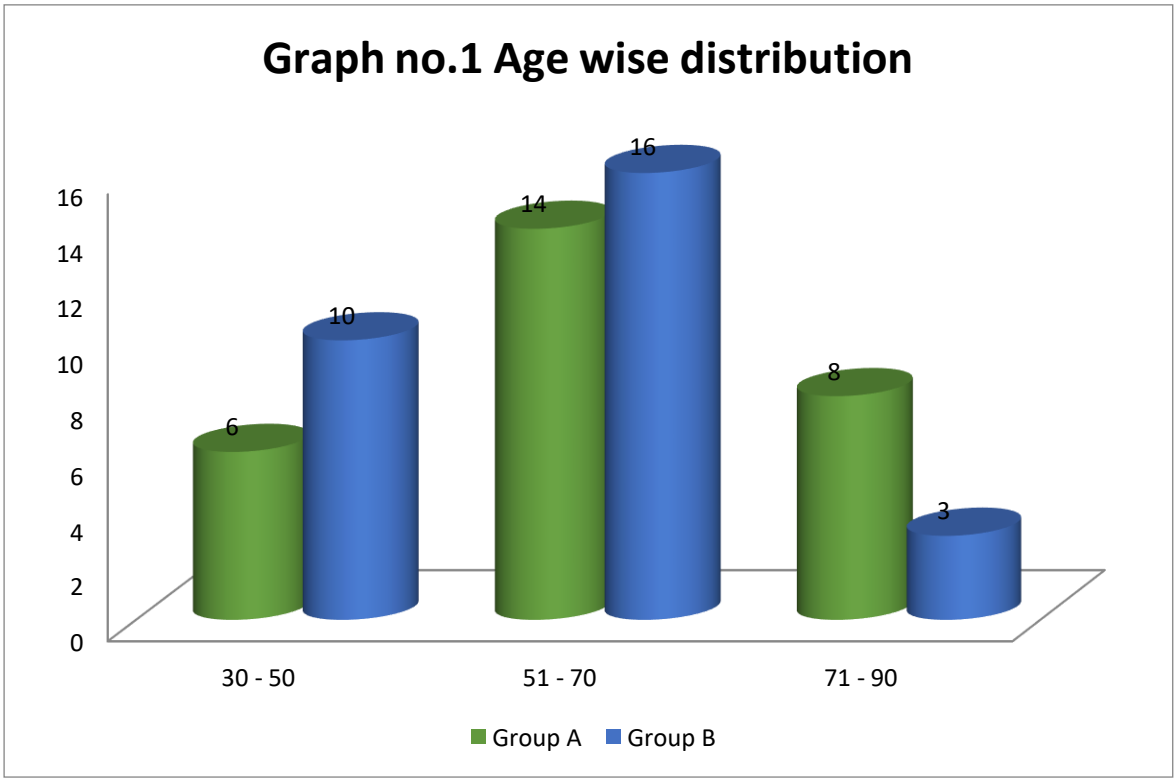

Graph No.1: Age wise distribution of group A and group B.

In the present study , among a total 57 patients , 30 patients were males and 27 patients were females.(Table no.2 and Graph no.2)

Gender	**Male**	**Female**
Group A	15	13
Group B	15	14
Total	**30**	**27**

Table No. 2 :Gender wise Distribution

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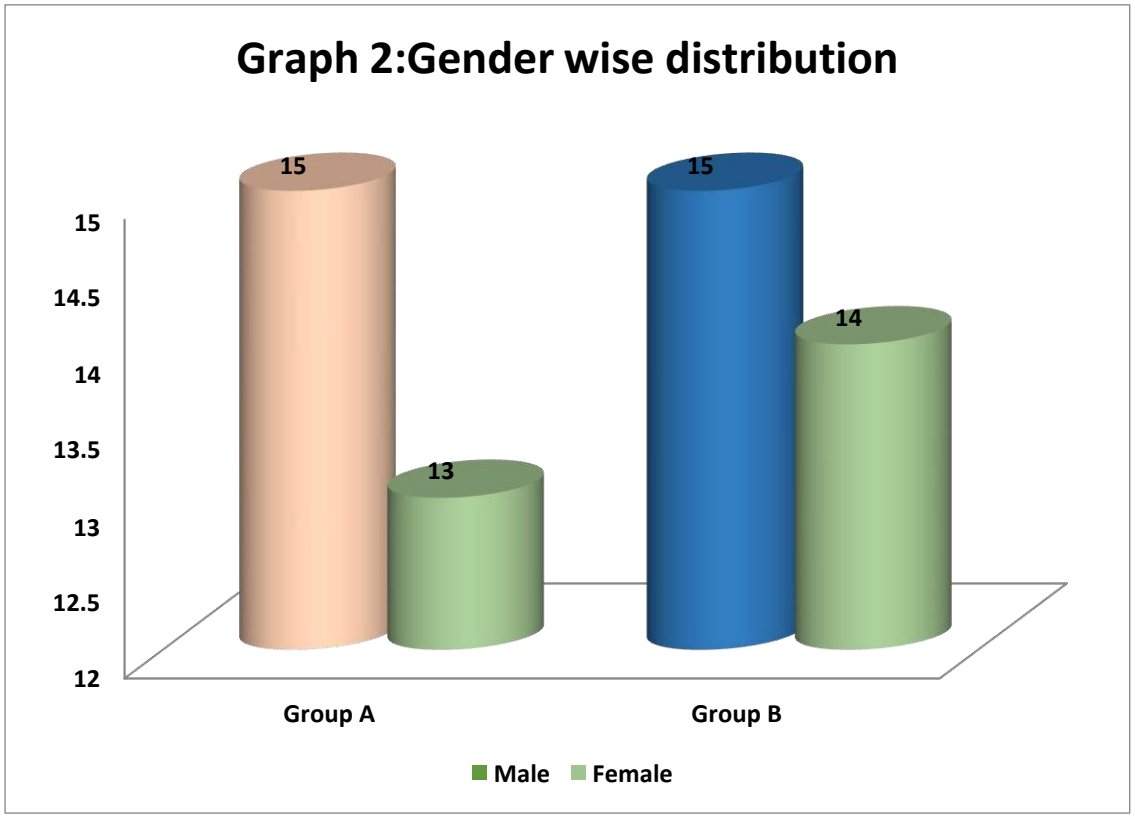

Graph no.2:Gender wise distribution

Mean and Standard deviation of Duration of back pain of Group A patients was (1.72±0.85) years while that of Group B patients was (2.26±0.92) years. There was significant difference between two groups in terms of duration of back pain. (Table no.3 and Graph no.3)

Duration of Back Pain	**Mean**	**SD**	**p value**
Group A	1.72	0.8551	0.024
Group B	2.26	0.9218	

Table No. 3 : Duration of Back Pain (Years)

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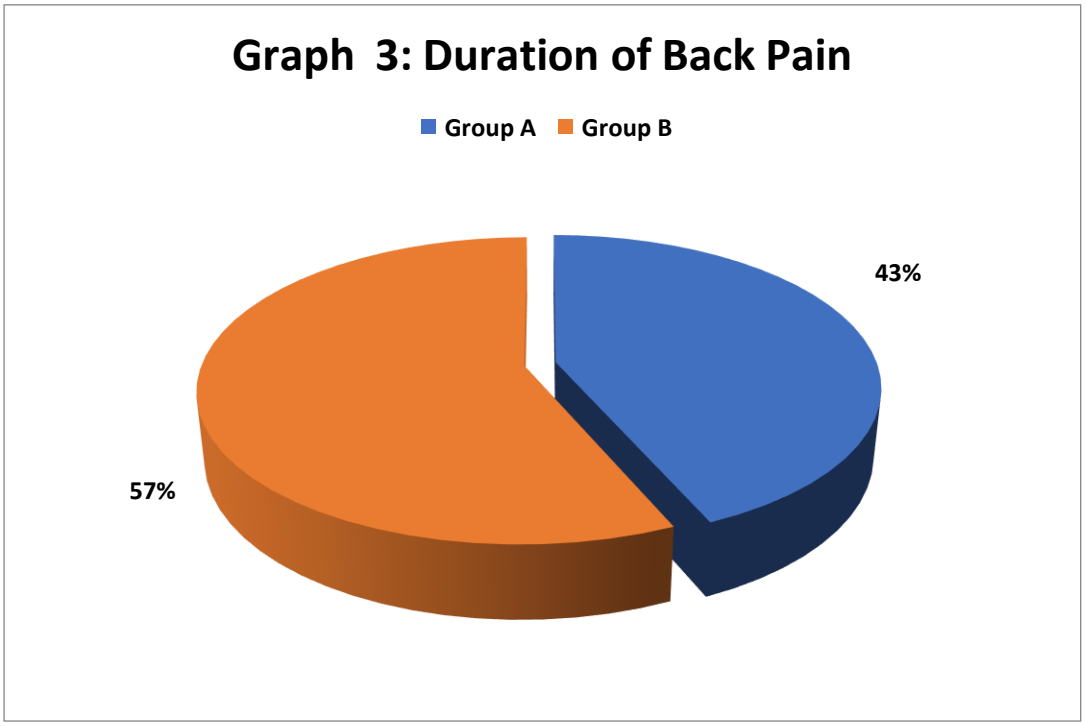

Graph No. 3 : Duration of Back Pain (Years)

Duration of pain relief mean value of Group A patients were (3.29±0.89) months while that of Group B patients were (5.03±0.71) months. (Table no.4)

Duration of Pain Relief	Mean	SD	p value
Group A	3.29	0.89	< 0.0001
Group B	5.03	0.71	

Table No. 4 : Duration of Pain Relief (Months)

Vas scoring before procedure in Group A patients was (4.72±1.15) and Group B was (4.83±0.99). This was found to be not significant. But vas scoring at 6 months after procedure in Group A (3.82±0.97) and Group B (2.27±0.88) was found to be very highly significant. (Table no.5 and Graph no.4)

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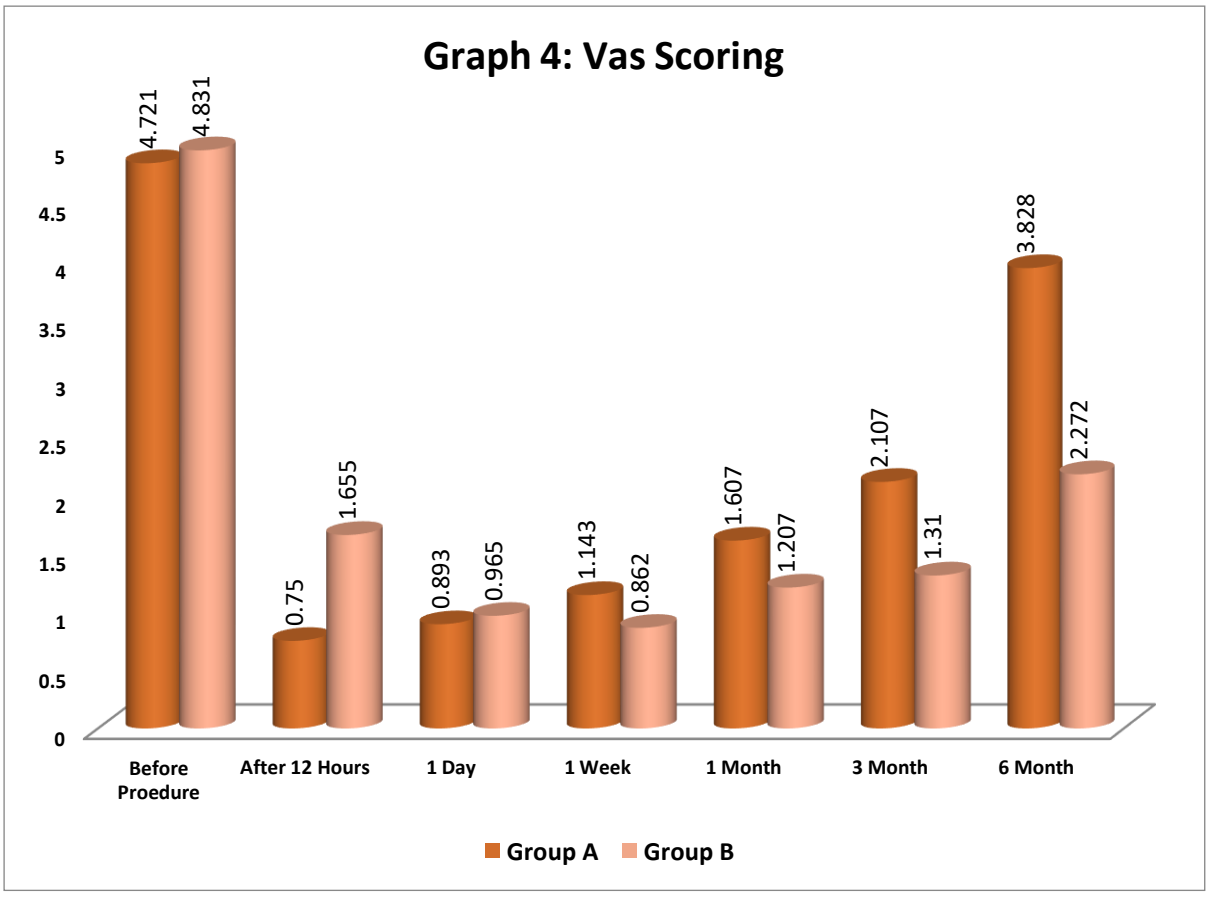
Time Duration	Group A	Group B	p value
Before Procedure	4.721 ± 1.156	4.831 ± 0.997	0.7029
After 12 Hours	0.75 ± 1.143	1.655 ± 0.897	0.0015
1 Day	0.893 ± 1.133	0.965 ± 0.778	0.7782
1 Week	1.143 ± 1.208	0.862 ± 0.693	0.2845
1 Month	1.607 ± 1.227	1.207 ± 0.774	0.1450
3 Months	2.107 ± 1.397	1.310 ± 0.967	0.0150
6 Months	3.828 ± 0.979	2.272 ± 0.889	< 0.0001

Table No. 5 : Vas Scoring (Mean ± SD)



Graph No. 4 : Vas Scoring (Mean ± SD)

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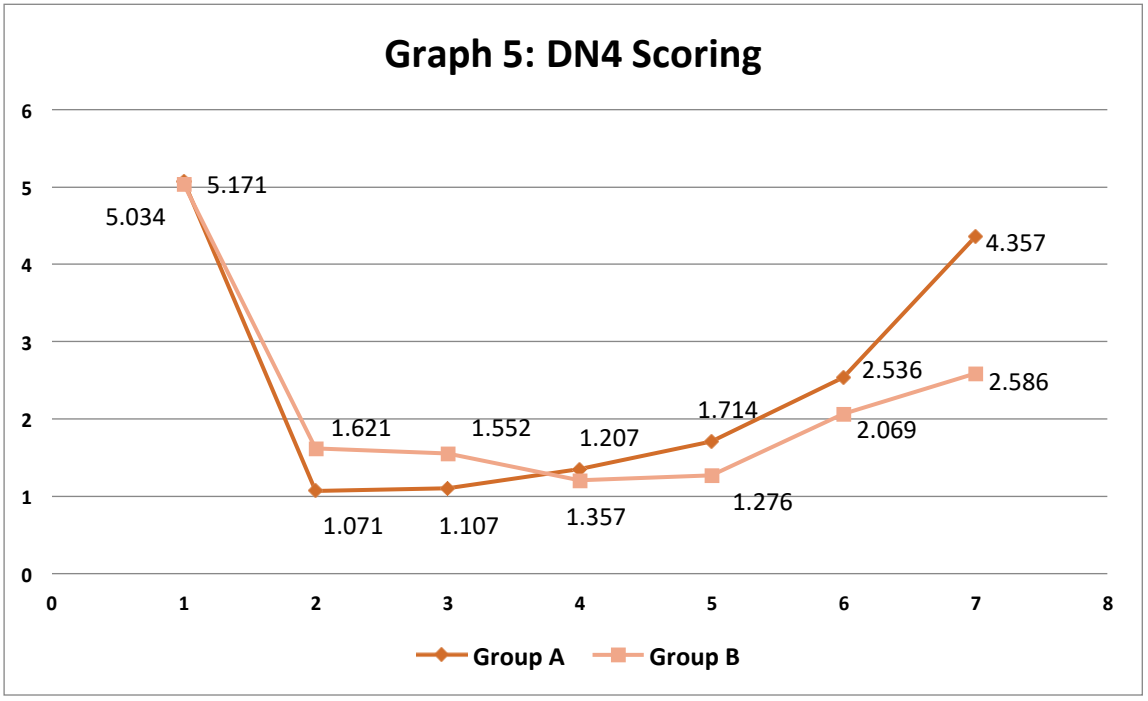
In DN4 Scoring before procedure in both groups was not significant but at 6 months was found to be highly significant. (Table no.6 and Graph no.5)

Time Duration	Group A	Group B	p value
Before Procedure	5.171 ± 1.086	5.034 ± 0.944	0.8915
After 12 Hours	1.071 ± 0.604	1.621 ± 0.677	0.021
1 Day	1.107 ± 0.567	1.552 ± 0.632	0.0072
1 Week	1.357 ± 0.559	1.207 ± 0.620	0.3412
1 Month	1.714 ± 0.762	1.276 ± 0.751	0.0331
3 Months	2.536 ± 0.1290	2.069 ± 0.961	0.1263
6 Months	4.357 ± 1.062	2.586 ± 0.628	< 0.0001

Table No. 6 : DN4 Scoring (Out of 10) (Mean ± SD)



Graph No. 5 : DN4 Scoring (Out of 10) (Mean ± SD)

In our study in Group A patients before procedure RMQ was 12.12 which reduced to 8.41, 6 months after procedure. While in Group B before procedure RMQ was 11.62 which reduced to 6.10, 6 months after procedure. This shows that Group B patients showed more improvement in pain as compared to Group A. Rolland Morris questionnaire before procedure in both the

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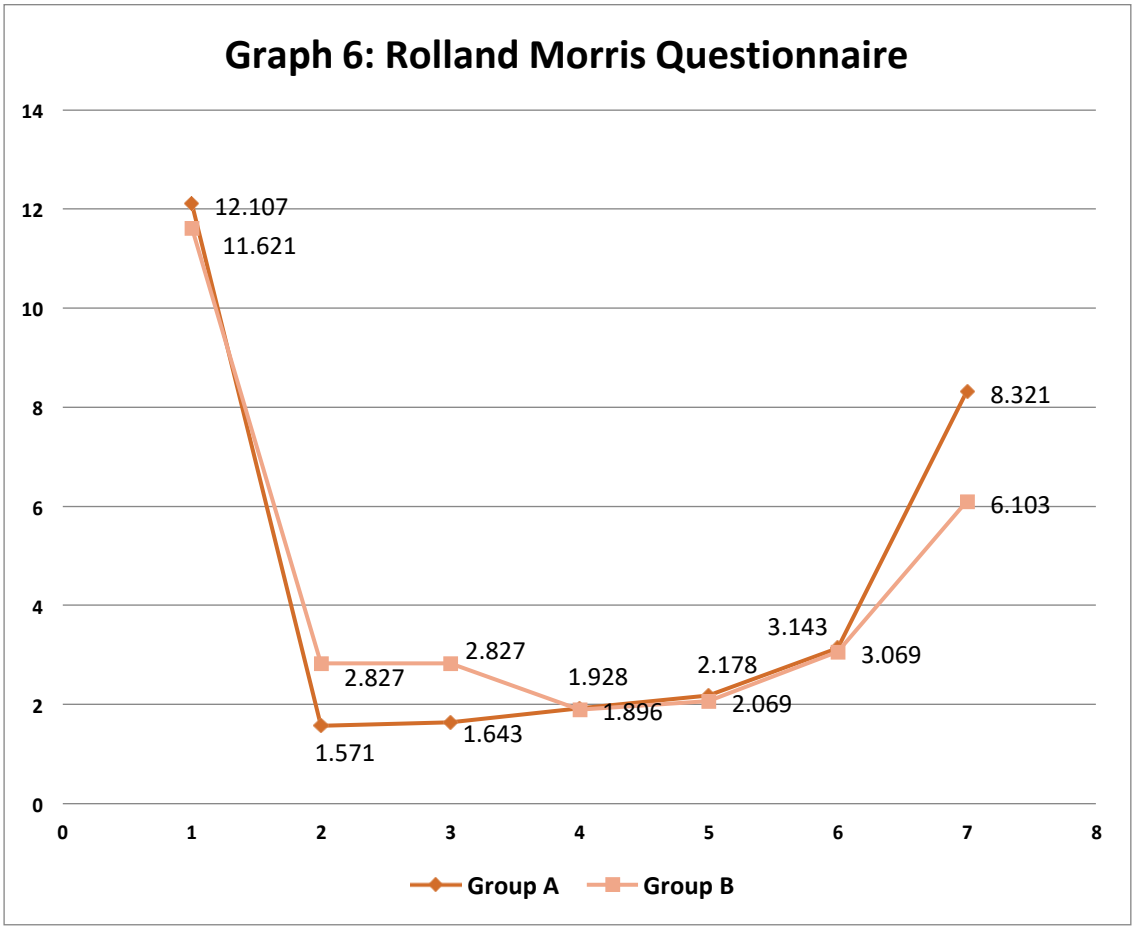
groups was found to be insignificant.But at 6 months after procedure between both groups was found to be highly significant. (Table no.7 and Graph no.6).

Time Duration	Group A	Group B	p value
Before Procedure	12.127± 2.644	11.621 ± 2.290	0.4604
After 12 Hours	1.571 ± 0.634	2.827 ± 0.805	< 0.0001
1 Day	1.643 ± 0.621	2.827 ± 0.805	< 0.0001
1 Week	1.928 ± 0.539	1.896 ± 0.489	0.8151
1 Month	2.178 ± 0.945	2.069 ± 0.884	0.6527
3 Months	3.143 ± 1.113	3.069 ± 1.223	0.8125
6 Months	8.421 ± 2.074	6.103 ± 1.655	< 0.0001

Table No. 7 : Rolland Morris Questionnaire (Out of 24 Points) (Mean ± SD)



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Graph no 6: Rolland Morris Questionnaire (Out of 24 Points) (Mean ± SD)

In the present study comparison of two groups in Nottingham health profile p value was not found to be significant post procedure in terms of energy, social isolation, physical abilities. While p value was found to be significant in both groups in terms of pain, emotional reaction and sleep post procedure. (Table no.8 and Graph no.7)

Nottingham Health Profile		**Group A**	**Group B**	**p value**
Energy	Before	60.46 ± 11.467	60.556 ± 11.272	0.8750
	After	12.34 ± 16.221	8.469 ± 14.421	0.3444
Pain	Before	55.56 ± 12.572	55.453 ± 12.391	0.9744
	After	9.76 ± 10.185	4.501 ± 8.427	0.0378
Emotional Reaction	Before	51.54 ± 14.336	50.262 ± 14.526	0.6404
	After	7.53 ± 3.492	3.809 ± 4.32	0.0008
Sleep	Before	49.81 ± 22.847	47.994 ± 24.905	0.7755
	After	13.49 ± 8.032	7.494 ± 8.955	0.01
Social Isolation	Before	61.46 ± 8.372	60.486 ± 6.998	0.7353
	After	14.73 ± 8.797	12.477 ± 9.99	0.3713
Physical Abilities	Before	58.45 ± 10.818	55.961 ± 10.328	0.3785
	After	7.25 ± 5.175	6.188 ± 4.962	0.4314

Table No. 8 : Nottingham Health Profile (0 to 1) (Mean ± SD)

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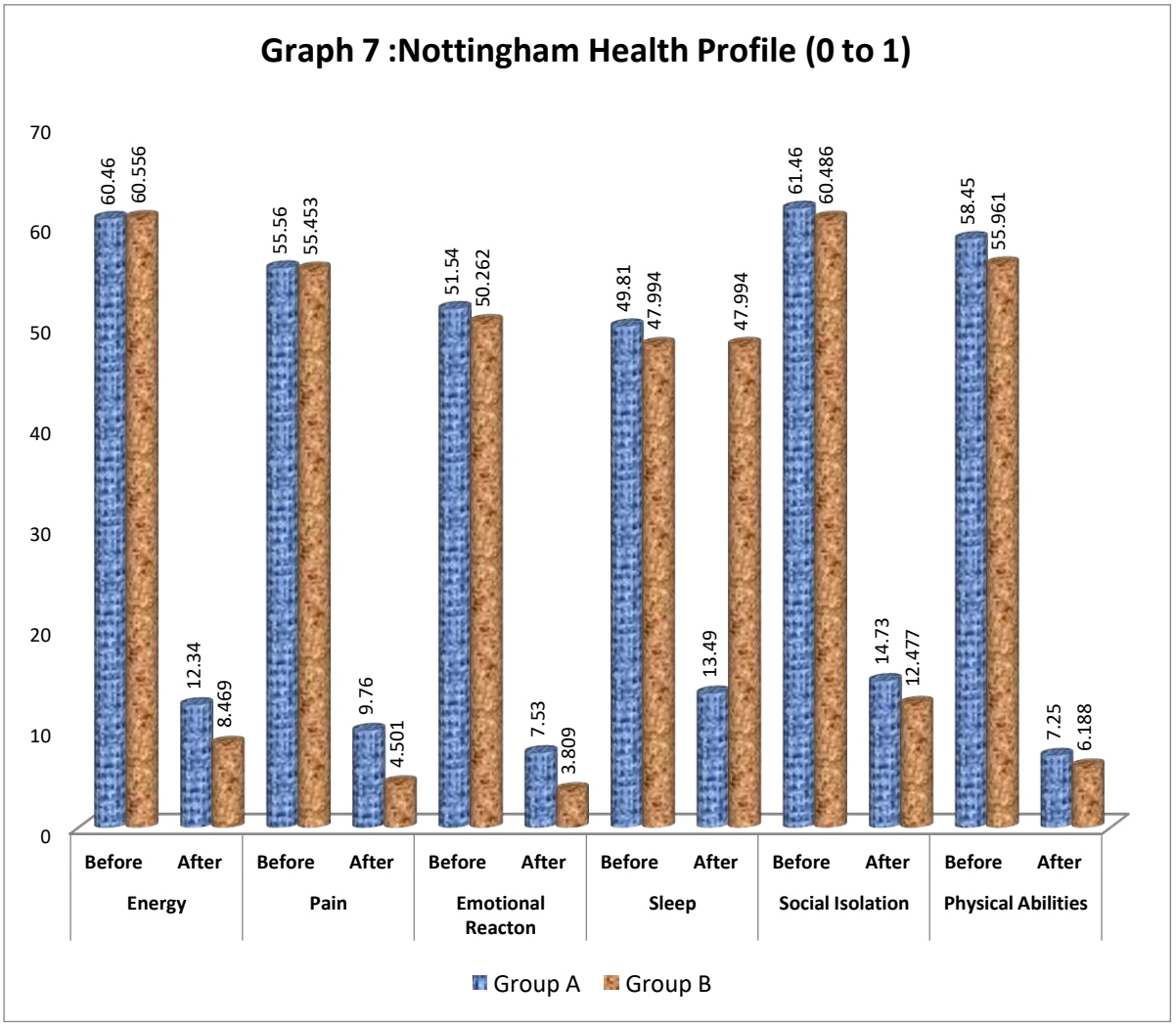

Graph No. 7: Nottingham Health Profile (0 to 1) (Mean ± SD)

DISCUSSION

Radiofrequency Ablation is emerging treatment for patients suffering from lumbar facet syndrome refractory to conservative management; it is aimed to interrupt pain signals in spinal nerves using heat. Multiple researches performed to evaluate the efficacy of radiofrequency ablation intervention to denervated the facet joint in patients with chronic low-back pain; it mentioned different procedural techniques which included conventional, pulsed and cooled RFA [27,28].

Lumbar facet joint syndrome can be defined as LBP originating from the lumbar facet joints, which has a strong impact on daily activities. At present, different studies have described multiple therapeutic techniques to manage lumbar facet joint syndrome, and intra-articular injection is one of the most important methods.

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In our study, the Mean age of Group A patients was observed to be (62.26 ± 11.56) years and Group B patients was (55.75±10.25) years. In the present study , among a total 57 patients , 30 patients were males and 27 patients were females . This study was in support to the study performed by the other research investigator A.A.Elsayed et al in 2018 [29] in which the the mean age of participants was 46.5 years and 55.5%were males. Eight patients (44.5%) were females and ten (55.5%) were males respectively. Similar studies by Girish K et al in 2023 [30] was in accordance to the current study in which the mean age of Group 1 patients was 46.71±10.52 years and Group 2 patients was 42.52±11.38 years and males was predominately more than females. Other similar study by Yasar Dagistan et al 2018 [31] in which the mean age of Group 1 patients was 43.1±8.35years and Group 2 patients was 47.4±11.1 years and males was predominately more than females respectively.

In our study the Group A mean duration of pain was for 1.7 years and pain relief duration after steroid injection at facet joint remain for mean of 3.19 months. While in Group B mean duration of pain was for 2.25 years and duration of pain relief was 5.03 months. This finding was in accordance with the study conducted by Jaspal R. Singh et al in 2019 [32] , Alaa Abd-Elsayed et al in 2020[33] and Wake T et al in 2023 [34] in which there was no statistically significant difference in the incidence in neuritis between individuals taking neuropathic agents and individuals not taking neuropathic agents. This was found against our study in terms of pain relief in patients receiving steroid injections.

In our study,VAS scoring in Group A patients preinjection was 4.72 then 12 hrs post procedure was 0.75 then at 1 day was 0.89, at 1 week was 1.14, at 1 month was 1.60, at 3 months was 2.1 and at 6 months was 3.82. VAS score pre injection and 6 months post injection was almost same in Group A patients. This shows that duration of pain relief was around 3 months in Group A patients. VAS scoring in Group B patients pre injection was 4.83 then 12 hrs post procedure was 1.65 then at 1 day was 0.96 at 1 week was 0.86 at 1 month was 1.20 at 3 months was 1.31 and at 6 months was 2.27.This finding was similar to other study by Abdurrahman Çetin et al 2018 [35] in which the preoperation Visual Analogue Scale values and postoperation 1st, 3rd, and 6th month and 1st and 2nd year Visual Analogue Scale values were compared in Group 1 and Group 2, and there was a statistically significant difference between preoperation Visual Analogue Scale values and postoperation 1st, 3rd, and 6th month and 1st and 2nd year Visual Analogue Scale values in both groups. Other similar finding by A.A.Elsayed et al 2018 [29] in which the mean VAS pain score for back pain after the procedure were 3.0±1.2

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compared with pre procedural score of 7.1±1.4. There was a statistically significant relief of pain after the intervention at 12 month follow up.(P=0.01).

In our study, In DN4 Scoring before procedure in both groups was not significant but at 6 months was found to be highly significant. This finding was in support to the other studies conducted by Pasquale et al 2020 [36].

In our study in Group A patients before procedure RMQ was 12.12 which reduced to 8.41, 6 months after procedure. While in Group B before procedure RMQ was 11.62 which reduced to 6.10, 6 months after procedure. This shows that Group B patients showed more improvement in pain as compared to Group A. Rolland morris questionnaire before procedure in both the groups was found to be insignificant. But at 6 months after procedure between both groups was found to be highly significant. This finding was similar to the study conducted by Natália Teixeira et al 2022[37] ,R F M R et al 2021 [38],Al-Najjim, Munnan et al 2017[39] and Lakemeier, Stefan MD et al 2013[40]. The RMQ improved in both groups; however, there was no significant (P = 0.90; 95% CI, −3 to 4) difference between the 2 groups.

In our study comparison of two groups in Nottingham health profile p value was not found to be significant post procedure in terms of energy, social isolation, physical abilities. While p value was found to be significant in both groups in terms of pain, emotional reaction and sleep post procedure. In other studies, there were no major adverse events reported during the observation period of 6 months.

Lower back pain is a significant cause of morbidity, and despite a range of interventions available, there is a lack of consensus on the most efficacious treatments [41].

CONCLUSION

In the present study we demonstrate that facet-related Lower pain can be treated with intraarticular steroid injections or RF denervation with appropriate pain relief and functional improvement over a period of at least 6 months, with no differences between treatments.

Declarations:

Conflicts of interest: There is not any conflict of interest associated with this study

Consent to participate: There is consent to participate.

Consent for publication: There is consent for the publication of this paper.

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Authors' contributions: Author equally contributed the work.

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