Original Article

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Physical Medicine and Rehabilitation Section

# Efficacy between Ultrasound Therapy and Fluoroscopy-guided Intra-articular Steroid Injection in L3-L4 and L4-L5 Facet Arthropathy: An Interventional Cohort Study

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## ABSTRACT

**Introduction:** Lumbar facet joint or Zygapophyseal Joint (ZJ) arthropathy is one of the common causes of low back pain, particularly prevalent at the L3-L4 and L4-L5 levels. Evidence shows the efficacy of Ultrasound Therapy (UST) and intra-articular steroid injections in lumbar facet arthropathy, but there is a paucity of data regarding the comparative efficacy between the two.

**Aim:** To compare the efficacy of fluoroscopy-guided corticosteroid and local anaesthetic injection in the facet joint with UST in cases of L3-L4 and L4-L5 facet arthropathy.

**Materials and Methods:** An interventional cohort study was conducted in the Department of Physical Medicine and Rehabilitation, Institute of Postgraduate Medical Education and Research (IPGMER), Kolkata, West Bengal, India, for 18 months, from April 2017 to September 2018. Participants aged between 18 and 70 years with unilateral chronic low back pain due to L3-L4 and L4-L5 facet arthropathy of more than six months duration were included in the study. A total of 17 participants in Group 1 received fluoroscopy-guided corticosteroid and local anaesthetic injections, while Group 2 (also consisting of 17 participants) received UST. Demographic variables such as age and gender, as well as clinical parameters including Visual Analogue Scale (VAS), Oswestry Disability Index (ODI) and lumbar range of motion (flexion), were assessed. UST was delivered over the L3-L4 and L4-L5 regions in continuous mode using a frequency of 3.0 MHz at 0.5 W/cm$^2$, covering an area of approximately 100 cm$^2$ and lasting for 5-10 minutes per session over six continuous days. Comparisons between groups were made using Student's unpaired t-test, while within-group comparisons were analysed using repeated measures Analysis of Variance (ANOVA) for continuous variables. Fisher's-exact test was used for categorical variables. A two-tailed p-value of <0.05 was considered statistically significant.

**Results:** The groups were comparable in terms of age and gender distribution. The average ages were 47.76±11.06 years for Group 1 (intra-articular injection) and 48.12±11.35 years for Group 2 (UST). In Group 2, there were statistically significant changes in VAS, ODI and lumbar flexion scores from baseline to two weeks, four weeks and 12 weeks, but not from four weeks to 12 weeks. In the intergroup comparison, a significant improvement in VAS was observed at 12 weeks of follow-up. There was a statistically significant difference in ODI at only 12 weeks (p-value <0.001) of follow-up. A statistically significant difference in lumbar flexion measurements was found at only six weeks of follow-up.

**Conclusion:** Both treatments are efficacious for short-term pain relief (up to four weeks). However, intra-articular facet joint injection demonstrates greater efficacy for long-term pain relief (up to 12 weeks).

**Keywords:** Fluoroscopy-guided joint injections, Intra-articular facet joint injections, Lumbar facet joint arthropathy, Oswestry disability index, Ultrasound therapy, Visual analogue scale, Zygapophyseal joint

## INTRODUCTION

Low back pain is a very common clinical issue encountered in day-to-day practice, especially among patients attending the Outpatient Department (OPD) of the facility. Lumbar facet joint or zygapophyseal joint (ZJ) arthropathy is one of the common causes of low back pain. It is a source of pain in 45% of patients suffering from chronic low back pain in an interventional pain management setting in private practice [1]. Chronic low back pain affects 15% of younger individuals and up to 40% of older individuals, with higher incidence rates at the L3-L4, L4-L5 and L5-S1 levels [2]. Schwarzer AC et al., demonstrated that the vast majority of lumbar ZJ pain originates from the L3-L4, L4-L5 and L5-S1 joints [3].

Patients with lumbar facet joint or ZJ arthropathy may be neurologically intact, yet they can report subjective non dermatomal sensory loss and other sensory complaints as far distal as the foot. The pain is typically dull and aching in character and can be classified as somatic or somatic-referred pain. Somatic pain due to lumbar ZJ dysfunction occurs in an adjacent zone, characterised by paramedian low back pain that radiates laterally to the joint and from about one spinal segment higher to one segment lower, with somatic referred pain extending down to the back of the leg. The pain patterns overlap considerably, with each joint generating pain that tends to be slightly lower than that of the joint above it. This overlap makes it difficult to accurately delineate individual pain maps [4-7].

Patients often complain of paramedian low back pain that increases with lumbar rotation and extension due to increased forces placed upon the posterior ZJs (as assessed by the Quadrant Loading test or Kemp's test). This specific manoeuvre serves as a screening test but is not a definitive diagnostic test [2,8,9].

No other radiologic appearances other than those seen on plain radiography and Magnetic Resonance Imaging (MRI) have been shown to correlate with ZJ pain [10,11].

Conservative management, including analgesics, exercise therapy, modalities, avoidance of exacerbating activities, lifestyle modifications and the use of lumbar corsets, can reduce low back pain due to facet arthropathy in many cases. If conservative treatment is ineffective, invasive procedures such as fluoroscopy-guided contrast-enhanced intra-articular facet joint injection with corticosteroids and local anaesthetic agents are viable options for providing pain relief in chronic cases [4]. Ultrasound therapy (UST) is another treatment option for alleviating pain associated with chronic facet arthropathy.

Literature provides evidence regarding the efficacy of UST and intra-articular steroid injection in lumbar facet arthropathy. The benefits of both procedures include relief of posterior thigh pain and low back pain, improved quality of life, reduced analgesic consumption, better maintenance of work status and decreased need for hospitalisation [3,12]. However, there is a lack of data regarding the comparative efficacy of these two treatments. The present study aimed to compare the efficacy of UST and intra-articular steroid injection in L3-L4 and L4-L5 facet arthropathy associated with chronic low back pain.

## MATERIALS AND METHODS

This interventional cohort study was conducted in the Department of Physical Medicine and Rehabilitation, IPGMER, Kolkata, West Bengal, India, over a period of 18 months from April 2017 to September 2018. Approval from the Institutional Ethics Committee was obtained (Institutional Ethics Committee Memo No. IPGME&R/IEC/2017/051, dated 04.02.2017). Informed consent was obtained from the study participants in regional languages.

**Sample size calculation:** The Sample Size (SS) for the study was calculated on the basis of a formula: n (for each group)=$\{(Z_\alpha+Z_\beta)^2*P'Q'\}/d^2$, where $Z_\alpha$=1.96 (two tailed) at 95% Confidence Interval (CI), $Z_\beta$=0.84 at 80% power of test, P'=$(p_0+p_1)/2$ and Q'=100-P', $p_0$ and $p_1$ are the proportions of participants sustaining the outcome of interest (here it was pain free interval after the conventional treatment and treatment of interest/intervention) and d=effect size i.e., the difference in outcome of treatment across the groups for getting discernible clinical effect. Considering the $p_0$=30.3% (as reported in previous research and assuming $p_1$ (improvement among the participants sustaining the intervention of interest, here it's US therapy)=65.0%, the P' was calculated to be 47.65% and thereby the Q'=52.35% and d=34.7. Putting all these values into the formula, the SS for the study was estimated to be 17. Assuming 10% loss to follow-up, the revised SS was found to be 19 in each arm of the study [13].

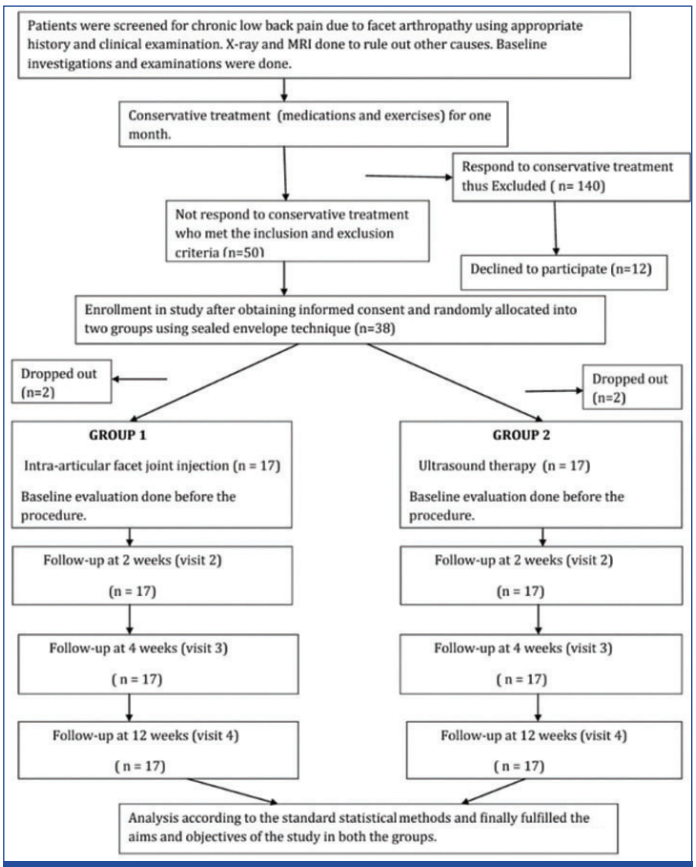
**Inclusion criteria:** Participants were included if they met the following criteria:

- Diagnosed through clinical examination (positive Quadrant Loading Test or Kemp's Test) [14].
- Confirmed by MRI scan as having L3-L4 and L4-L5 facet arthropathy.
- Aged between 18 and 70 years.
- Experiencing chronic low back pain for more than six months.
- Having symptomatic L3-L4 and L4-L5 facet arthropathy.
- Unilateral involvement diagnosed clinically and confirmed by MRI scan.
- Having a Visual Analogue Scale (VAS) score >5/10 (the investigators categorized participants based on a VAS scale of 0-10: 1 to 4 as mild pain, 5 to 6 as moderate pain and 7 to 10 as severe pain) [14-17].
- Not having responded to pharmacological treatment and exercise therapy.

**Exclusion criteria:** Participants were excluded if they met any of the following criteria:

- Patients who did not provide consent or were uncooperative.
- Those with inflammatory low back pain, active infections, malignancy, pregnancy, uncontrolled hypertension, diabetes mellitus, bronchial asthma, unstable angina, immunocompromised status, blood coagulation disorders, or those taking oral anticoagulants and those with known allergies to the medications to be injected (e.g., contrast agents, local anaesthetics and corticosteroids).
- Patients with low back pain due to facet joint subluxation, nerve root compression, spinal canal stenosis, neural foraminal narrowing, or bilateral L3-L4 and L4-L5 facet arthropathy.
- Patients who underwent UST or intra-articular facet joint injections within the last six months or had low back surgery in the last six months were also excluded.

The participants were randomly allocated using a process called "randomisation by pair," where one member of an age- and sex-matched pair was assigned to either one arm using a lottery, while the other member was placed into the alternative arm of the study. Thus, an equal number of participants (n=17) was included in each arm. The study flowchart has been presented in [Table/Fig-1].




**[Table/Fig-1]:** Study flowchart.

### Study Procedure

The study groups were as follows:

- Group 1 received intra-articular facet joint injections under fluoroscopic guidance by a single practitioner.
- Group 2 received UST from the same practitioner.

Outcome study variables included:

- Pain intensity: Measured by the Visual Analogue Scale (VAS) (score range 0-10).
- Level of function (Disability): Assessed using the Oswestry Disability Index (ODI) (score range 0-100%).
- Lumbar flexion: Evaluated for spinal mobility (FLEX) (score range 0-600).

Assessments were conducted at baseline and post-procedure: at two weeks, four weeks and 12 weeks after the procedure.

A. **Visual Analogue Scale (VAS):** The intensity of low back pain was measured using the VAS, which is a subjective response scale. It ranges from 0 to 10, where 0 indicates no pain and 10 indicates the worst possible pain [16,17].

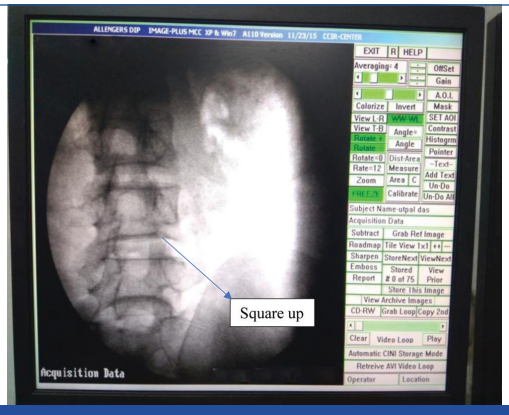
B. **Oswestry Disability Index (ODI):** The ODI is a patient-completed questionnaire that provides a subjective percentage score reflecting the level of function (disability) in daily living activities for those rehabilitating from low back pain [18]. The ODI consists of 10 items, each with associated statements from which patients select options that best represent their ability to manage everyday life while dealing with their pain. If a patient was uncomfortable with English or was illiterate, the questionnaire was translated and read aloud to them, with their choices recorded by the operator. Each of the ten items offers six statements, allowing a scoring range from 0 to 5 for each item. Therefore, the maximum possible score is 50, which can be multiplied by two to provide a percentage, resulting in ODI scores ranging from 0% to 100% [18,19].

C. **Lumbar range of motion (Lumbar flexion):** The facet orientation of the lumbar spine facilitates more flexion and extension than rotation. Axial rotation and lateral bending in the lumbar spine are very limited and nearly equal among each segment. The L3-L4 and L4-L5 joints offer more flexion and extension motion than any other lumbar segments. Lumbar flexion is a main concern in assessing basic parameters, as it is most commonly affected in lumbar facet arthropathy. The normal range of lumbar flexion is 400 to 600 [20-23].

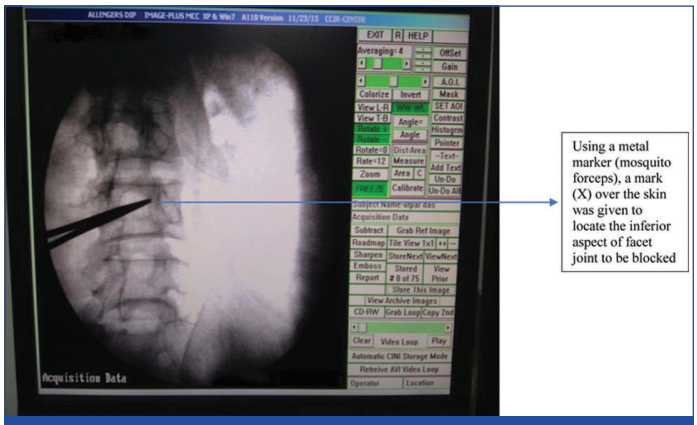
**Study follow-up:** This was an interventional cohort study with a follow-up of 12 weeks after the intervention, conducted in the Department of Physical Medicine and Rehabilitation at IPGMER, Kolkata, over a duration of 1.5 years.

**Study techniques:** A total of 38 patients who were not responding to conservative treatment (which included analgesics, muscle relaxants, exercises, lumbar corsets, lifestyle modification and activity limitation) and who met the inclusion and exclusion criteria were enrolled in the study after obtaining informed consent. Participants were randomly allocated into two groups using the "Randomisation by Pair" method. Group 1 ($n_1$=17) received intra-articular facet joint injections, while Group 2 ($n_2$=17) received UST. Baseline evaluations were conducted before the procedure. Interventions were administered in each group as planned, with follow-up assessments occurring at two-weeks, four-weeks and 12-weeks intervals after the start of the intervention.

**Intra-articular facet joint injection:** The participant was positioned in a prone stance, with a pillow placed under the abdomen to enhance access to the lumbar facet joints. Antiseptic dressing and draping were performed. The "square up" technique was used to align the endplates of the vertebral bodies [Table/Fig-2] and obtain the "Scottie Dog" view. Using a metal marker (mosquito forceps) and a marking pen, an "X" was marked on the inferior aspect of the facet joint to be blocked [Table/Fig-3]. The area was anaesthetised with an infiltration of 2% lignocaine using a 2 mL syringe. A 3.5-inch, 22-gauge spinal needle was inserted at the marked point, positioned perpendicularly to the skin and parallel to the fluoroscope [Table/Fig-4,5]. A 0.2 mL dose of contrast material (300 mg/mL Iohexole) dissolved in normal saline was injected to confirm the depth [Table/Fig-6]. Following this,

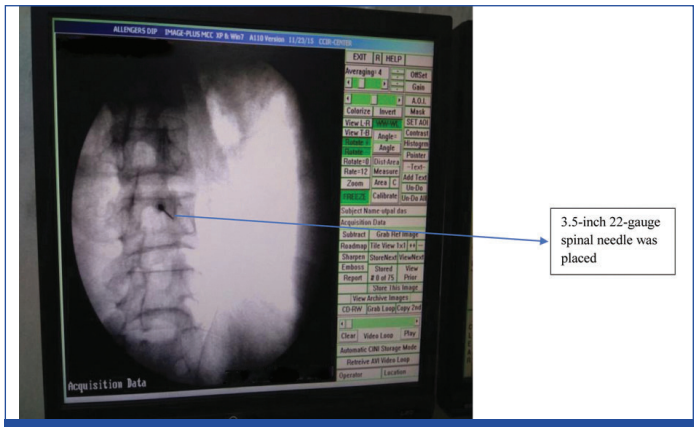



**[Table/Fig-2]:** "Square up" the endplates of the vertebral bodies.

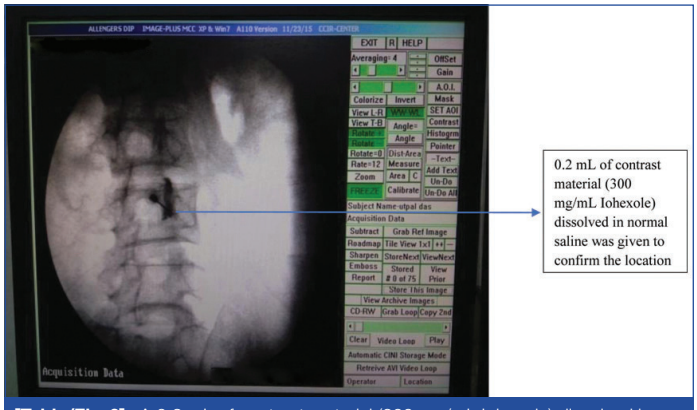



**[Table/Fig-3]:** Using a metal marker (mosquito forceps), a mark (X) over the skin was given to locate the inferior aspect of facet joint to be blocked.


**[Table/Fig-4]:** Area anaesthetised with infiltration of 2% lignocaine using a 2 mL syringe.




**[Table/Fig-5]:** A 3.5-inch 22-gauge spinal needle was placed.

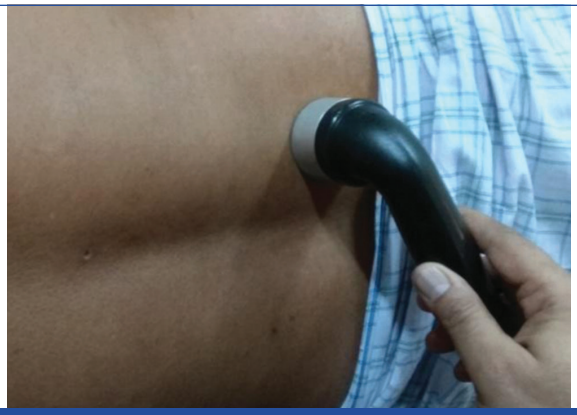



**[Table/Fig-6]:** A 0.2 mL of contrast material (300 mg/mL Iohexole) dissolved in normal saline was given to confirm the location.

a 0.9 mL mixed solution containing 0.5 mL of methylprednisolone acetate (20 mg) and 0.4 mL of 2% lignocaine was injected into the intra-articular facet joint [Table/Fig-7]. The participant was then taken to the postoperative recovery room for observation of any major complications and was discharged the following day.

**[Table/Fig-7]:** A 0.9 mL of mixed solution containing 0.5 mL of methyl prednisolone acetate (20 mg) and 0.4 mL of 2% lignocaine (20 mg) and 0.4 mL of 2% lignocaine was delivered in the intra-articular facet joint.

**Ultrasound Therapy (UST):** UST was administered to the patient in the electrotherapy room while lying on a firm mattress continuously for 10 days. The UST was delivered by moving the transducer or applicator over the L3-L4 and L4-L5 regions in slow (1-2 cm/s) overlapping strokes in continuous mode, using a frequency of 3.0 MHz at 0.5 W/cm$^2$. The treatment area covered approximately 100 cm$^2$ for 10 minutes at a time, using coupling media for better impedance and therapeutic effect [Table/Fig-8].



**[Table/Fig-8]:** UST was given to the patient in electrotherapy room.

**Post-procedure rehabilitation programme:** The program included education and counselling regarding the avoidance of strenuous activities while the block was in effect to prevent the rebound effect, along with exercise programs designed to improve postural control.

## STATISTICAL ANALYSIS

Data were summarised using means and standard deviations (SD) for numerical variables and percentages for categorical variables. The normality of all numerical variables was assessed with the Shapiro-Wilk normality test. Comparisons across groups were made using the Student's t-test, while within-group analyses were conducted using repeated measures Analysis of Variance (ANOVA), followed by Tukey's multiple comparison test for post-hoc comparisons between individual time points. Fisher's-exact test was used for intergroup comparisons of categorical variables. All analyses were two-tailed, with a p-value of <0.05 considered statistically significant. The statistical software used for analysis included: 1) Statistica version 6 (Tulsa, Oklahoma: StatSoft Inc., 2001); and 2) GraphPad Prism version 5 (San Diego, California: GraphPad Software Inc., 2007).

## RESULTS

Two participants from each group, totalling four participants, were dropped out of the study. Therefore, the analysis was conducted for a total of 34 participants, divided equally into two groups, with 17 participants in each group. The analysis revealed that the groups were comparable in regard to age {47.76±11.06 vs 48.12±11.35 (mean±SD), t=0.0918 and p=0.927 at df=32}. There was a slight male preponderance in both groups, with no statistically significant difference across the groups (p=1.000, based on Fisher's-exact test).

Analyses indicated that the groups were similar concerning the baseline measures of VAS, ODI and lumbar flexion [Table/Fig-9].

| Variables | Groups | | t value | df | p-value |
|---|---|---|---|---|---|
| | Group 1 (Mean±SD) | Group 2 (Mean±SD) | | | |
| VAS | 7.47±0.874 | 7.47±1.007 | 0.0000 | 32 | 1.000 |
| ODI | 32.65±3.334 | 31.65±3.605 | 0.8397 | 32 | 0.407 |
| Lumbar flexion | 34.0±5.799 | 35.76±5.166 | 0.9369 | 32 | 0.356 |

**[Table/Fig-9]:** Distribution of participants according to their measures of baseline outcome variables ($n_1$=17 and $n_2$=17).

Repeated measures ANOVA with Tukey's post-hoc test was used to compare individual time points for assessing VAS, ODI and lumbar flexion over time. The changes in VAS, ODI and lumbar flexion over time were statistically significant, indicating improvement from baseline up to the three-month period [Table/Fig-10].

| Variables with level of assessment | Tukey's multiple comparison test | | | |
|---|---|---|---|---|
| | Mean Diff. | q value | p-value | 95% CI of diff |
| VAS B vs VAS 1 | 3.294 | 26.46 | <0.001 | 2.825 to 3.763 |
| VAS B vs VAS 2 | 4.412 | 35.44 | <0.001 | 3.942 to 4.881 |
| VAS B vs VAS 3 | 5.706 | 45.83 | <0.001 | 5.237 to 6.175 |
| VAS 1 vs VAS 2 | 1.118 | 8.977 | <0.001 | 0.6484 to 1.587 |
| VAS 1 vs VAS 3 | 2.412 | 19.37 | <0.001 | 1.942 to 2.881 |
| VAS 2 vs VAS 3 | 1.294 | 10.39 | <0.001 | 0.8248 to 1.763 |
| ODI B vs ODI 1 | 17.35 | 45.09 | <0.001 | 15.90 to 18.80 |
| ODI B vs ODI 2 | 21.18 | 55.03 | <0.001 | 19.73 to 22.63 |
| ODI B vs ODI 3 | 24.53 | 63.74 | <0.001 | 23.08 to 25.98 |
| ODI 1 vs ODI 2 | 3.824 | 9.935 | <0.001 | 2.373 to 5.274 |
| ODI 1 vs ODI 3 | 7.176 | 18.65 | <0.001 | 5.726 to 8.627 |
| ODI 2 vs ODI 3 | 3.353 | 8.713 | <0.001 | 1.902 to 4.804 |
| FLEX B vs FLEX 1 | -6.471 | 17.87 | <0.001 | -7.835 to -5.106 |
| FLEX B vs FLEX 2 | -12.65 | 34.94 | <0.001 | -14.01 to -11.28 |
| FLEX B vs FLEX 3 | -18.35 | 50.70 | <0.001 | -19.72 to -16.99 |
| FLEX 1 vs FLEX 2 | -6.176 | 17.06 | <0.001 | -7.541 to -4.812 |
| FLEX 1 vs FLEX 3 | -11.88 | 32.82 | <0.001 | -13.25 to -10.52 |
| FLEX 2 vs FLEX 3 | -5.706 | 15.76 | <0.001 | -7.070 to -4.341 |

**[Table/Fig-10]:** Distribution of participants according to their outcome parameters at different levels of assessment.

The changes in VAS from baseline to two weeks, four weeks and 12 weeks were statistically significant, but the changes from four weeks to 12 weeks were not statistically significant. Therefore, improvement in VAS primarily occurred during the 2$^{nd}$ and 4$^{th}$ weeks of the follow-up period. The results for ODI scores and lumbar flexion reflected a similar trend [Table/Fig-11]. A statistically significant higher VAS score was found in Group 2 only at the 12-weeks comparison level. A similar finding was observed for ODI scores. However, for lumbar flexion, a statistically significant difference was found at the four-weeks assessment level [Table/Fig-12].

| Levels of assessment | Tukey's multiple comparison test | | | |
|---|---|---|---|---|
| | Mean Diff. | q value | p-value | 95% CI of diff |
| VAS B vs VAS 1 | 3.4706 | 25.134 | <0.001 | 2.9501 to 3.9911 |
| VAS B vs VAS 2 | 4.5882 | 33.228 | <0.001 | 4.0677 to 5.1087 |
| VAS B vs VAS 3 | 4.5294 | 32.802 | <0.001 | 4.0089 to 5.0499 |

| | | | | |
|---|---|---|---|---|
| VAS 1 vs VAS 2 | 1.1176 | 8.0940 | <0.001 | 0.59715 to 1.6381 |
| VAS 1 vs VAS 3 | 1.0588 | 7.6680 | <0.001 | 0.53833 to 1.5793 |
| VAS 2 vs VAS 3 | -0.058824 | 0.42600 | ns* | -0.57932 to 0.46167 |
| ODI B vs ODI 1 | 16.294 | 45.468 | <0.001 | 14.943 to 17.645 |
| ODI B vs ODI 2 | 20.176 | 56.302 | <0.001 | 18.826 to 21.527 |
| ODI B vs ODI 3 | 19.765 | 55.153 | <0.001 | 18.414 to 21.116 |
| ODI 1 vs ODI 2 | 3.8824 | 10.834 | <0.001 | 2.5315 to 5.2332 |
| ODI 1 vs ODI 3 | 3.4706 | 9.6845 | <0.001 | 2.1198 to 4.8214 |
| ODI 2 vs ODI 3 | -0.41176 | 1.1490 | ns | -1.7626 to 0.93905 |
| FLEX B vs FLEX 1 | -8.0588 | 18.038 | <0.001 | -9.7429 to -6.3747 |
| FLEX B vs FLEX 2 | -14.941 | 33.442 | <0.001 | -16.625 to -13.257 |
| FLEX B vs FLEX 3 | -14.000 | 31.335 | <0.001 | -15.684 to -12.316 |
| FLEX 1 vs FLEX 2 | -6.8824 | 15.404 | <0.001 | -8.5664 to -5.1983 |
| FLEX 1 vs FLEX 3 | -5.9412 | 13.298 | <0.001 | -7.6253 to -4.2571 |
| FLEX 2 vs FLEX 3 | 0.94118 | 2.1066 | ns | -0.74291 to 2.6253 |

**[Table/Fig-11]:** Distribution of participants according to the changes of their outcome parameters at various levels of assessment ($n_2$=17).
*Not significant=ns

| Levels of assessment | Group 1 (Mean±SD) | Group 2 (Mean±SD) | p-value |
|---|---|---|---|
| VAS 1 | 4.18±0.809 | 4.00±0.791 | 0.525 |
| VAS 2 | 3.06±0.659 | 2.88±0.600 | 0.420 |
| VAS 3 | 1.76±0.664 | 2.94±0.748 | 0.000 |
| ODI 1 | 15.29±1.312 | 15.35±1.730 | 0.912 |
| ODI 2 | 11.47±1.231 | 11.47±1.231 | 1.000 |
| ODI 3 | 8.12±1.054 | 11.88±0.928 | 0.000 |
| FLEX 1 | 40.47±5.778 | 43.82±5.457 | 0.092 |
| FLEX 2 | 46.65±5.776 | 50.71±5.072 | 0.037 |
| FLEX 3 | 52.35±0.664 | 49.76±6.732 | 0.236 |

**[Table/Fig-12]:** Distribution of participants according to the changes in variables across the groups. ($n_1$=17 and $n_2$=17).
1, 2 and 3=Follow-up at 2 weeks, 6 weeks and 12 weeks after the intervention

None of the patients experienced any major complications post-intervention in the present study.

## DISCUSSION

In the present study, the mean age was 47.76 in Group 1 and 48.12 in Group 2. Out of the total 34 patients, there were 19 males (55.88%) and 15 females (44.12%). However, a study conducted by Taheri A et al., on the prevalence of chronic facet arthropathy reported a mean age of 52 years [24].

In the present study, the total sample included 19 males (55.88%) and 15 females (44.12%). Both groups displayed a male predominance, with 58.82% in Group 1 and 52.94% in Group 2, respectively. This higher proportion of males might be attributed to recurrent forward bending and lifting of heavy objects during daily activities. A study conducted by Thipse J et al., also reported a male preponderance [25].

At the 1st and 2nd follow-ups, the mean pain intensity in Group 1 and Group 2 was statistically insignificant. However, at the 3rd follow-up at 12 weeks, a statistically significant difference (p<0.001) in pain intensity was observed in this study. Shih C et al., demonstrated a good response at three weeks (72.1%), after six weeks (40.7%) and 31.4% of patients after 12 weeks [15]. Manchikanti L et al., showed 92% pain relief at three months, 82% at six months and 56% at 12 months [26]. Watson T and Young S reported improvement in pain intensity with UST on a short-term basis, which corroborated our findings [27].

Similarly, disability, as measured by the ODI, showed a statistically significant difference between the two groups (p<0.001) at the 12-week follow-up. Dreyfuss PH and Dreyer SJ found improvement in ODI mainly for the short-term and limited long-term benefits [28]. Nussbaum EL found short-term and intermediate-term functional improvement with UST in terms of ODI [29].

For lumbar range of motion (lumbar flexion), a statistically significant difference (p=0.037) was revealed only at the 2nd follow-up at four weeks. An Randomised Controlled Trial (RCT) conducted by Mayer T et al., showed improvement in injection patients (87-95%) compared to exercise patients (64-79%) [30]. Cohen SP and Raja SN also found improvements in both the short-term and long-term following intra-articular steroid injections [31]. Morishita K et al., observed improvements in spinal range of motion, especially spinal flexion, in both the short-term and intermediate-term, but not in long-term follow-up with UST [32]. An RCT done by Carette S et al., reported significant improvements up to six months concerning pain relief, functional status and back flexion after receiving facet joint injections with methylprednisolone acetate [33]. Lynch MC and Taylor TF reported both initial and long-term pain relief with intra-articular steroids [34]. Destouet JM et al., and Murtagh FR reported similar findings [35,36], while Lippitt AB reported greater initial relief [37].

Thus, in the present study, Group 1 exhibited statistically significant improvements in VAS, ODI and lumbar flexion up to 12 weeks. In Group 2, statistically significant improvements in VAS, ODI score and lumbar flexion were observed from baseline to 2, 4 and 12 weeks. Comparatively, statistically significant differences in VAS and ODI were noted at the 4th and 12th weeks, but not in lumbar flexion at the 2nd and 12th weeks.

The results of the present study can be incorporated into the treatment policy of the Institute for the sake of better patient care. For more reliable, valid and authentic results, a large-scale multicentric study may be conducted to extrapolate the findings to a wider audience.

### Limitation(s)

Long-term follow-ups were not assessed and psychological and biomechanical parameters were not included.

## CONCLUSION(S)

A statistically significant difference was found at the 3rd follow-up (12 weeks) in terms of mean pain intensity (VAS) and ODI between the two groups (p<0.001). However, for lumbar range of motion (flexion) measurement, a statistically significant difference was found only at the 2nd follow-up (4 weeks) between the groups. There was statistically significant intra-group improvement regarding pain intensity, disability and lumbar range of motion for both intra-articular steroid injection and UST. Statistically significant differences were observed between the two groups concerning pain intensity and disability at the 12-weeks follow-up; however, significant differences in lumbar range of motion (lumbar flexion) were found across the groups at the 4-weeks follow-up. Therefore, the present study concludes that both intra-articular facet joint injection and UST are efficacious for short-term pain relief, but UST was statistically superior. In contrast, intra-articular facet joint injection was more effective for long-term pain relief compared to UST.

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