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Steroid vs. Platelet-Rich Plasma in Fluoroscopy-Guided Sacroiliac Joint Injection for Chronic Low Back Pain

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Abstract:

Background: ache below the L5 vertebra in the lower back is frequently caused by the sacroiliac joint (SIJ), which is implicated in up to 27% of such cases. However, treating SIJ pain is a significant therapeutic challenge. Platelet-rich plasma (PRP) is a blood-derived product that can be applied to tissues and release growth factors, accelerating the body's natural healing response. **Aim and objectives:** To compare the efficacy of intra-articular injection of steroid and platelet rich plasma PRP in treatment of sacroiliac joint pain. **Results:** There was a statistically significant difference between steroid and PRP groups regarding VAS scores after one week and after 3 months (p-values= 0.009 and 0.039 respectively). The short-term effect of steroid was significantly better than PRP, but the long-term effect of PRP was significantly better than steroid. Steroid had faster improvement with 55.2% improvement after one week of injection compared to 46.4% in case of PRP injection (p-value= 0.009). As regards the long term effect, PRP had better improvement after 3 months with 42.9% compared to only 24.4% after steroid injection (p-value=0.039). **Conclusion:** The short-term effect of steroid was significantly better than PRP after

week, but the long-term effect of PRP was significantly better than steroid after three months.

1. Introduction

Mechanical low back pain below the L5 vertebra is frequently caused by the sacroiliac joint (SIJ), which is implicated in up to 27% of such cases. However, treating SIJ pain is a significant therapeutic challenge. The joint is a weight-bearing diarthrodial joint that is typically stabilized by ligaments, including the sacrospinal, sacrotuberous, iliosacral, and iliolumbar ligaments, limiting its motion. The link between low back pain and increased SIJ motion was first noted more than a century ago in pregnant women[1].

Low back pain due to SI joint inflammation is worsened by prolonged periods of sitting or inactivity, is felt on one side of the lower back and can travel down the back of the thigh. Although several treatment options exist, they are frequently ineffective. Treatment plans can range from conservative approaches and the use of non-steroidal anti-inflammatory drugs (NSAIDs) and opioids to more advanced treatments such as corticosteroid injections, botulinum-toxin injections, prolotherapy, radiofrequency denervation and surgical stabilization[2].

Platelet-rich plasma (PRP) is a blood-derived product that can be applied to tissues and release growth factors, accelerating the body's natural healing response[3]. In additionally, it has antimicrobial characteristics that might help protect against infections[3].

The aim of this study:

was to compare between platelet-rich plasma & steroid in fluoroscopy-guided sacroiliac joint injection (25 patients in each group) for chronic low back pain.

2. Patients and Methods:

From October 2022 to March 2023, fifty patients with chronic low back pain were included in this prospective comparison study, which was carried out at the Neurosurgery Department at Beni-Suef University Hospital. Two groups of patients were formed. Twenty-five cases in Group (1) received steroid injections, and twenty-five cases in Group (2) received platelet-rich plasma injections.

Inclusion criteria:

Sacroiliac pain patients include people who are between the ages of 18 and 65, have a history of chronic low back pain that remains for longer than three months, are not improving with conventional treatment (medication and physical therapy), have tenderness over the sacroiliac joint(s), or have responded favorably to three or more provocative clinical tests as (FABER Test, Gaenslen's Test, Thigh thrust

test, Gillet Test, Compression & Distraction Tests) also Visual Analogue Scale score >3.

Exclusion criteria:

Infections at the anticipated introducer entry site or systemic infection (chills, fever, and/or night sweats), active radicular pain, pregnancy, medication allergies, & contra-indications to platelet concentrate (such as a history of thrombocytopenia, active infection, anticoagulant therapy, tumor, or metastatic disease) are all potential complications that could arise during the procedure.

Methods:

The following tests were performed on all patients: a thorough history taking; a comprehensive clinical examination; assessment of vital signs; testing for the presence of sphincteric manifestations, motor weakness, & other focal neurological signs; testing to determine whether the pain is spontaneous or preceded by trauma or previous lumbar surgery & testing to evaluate sacroiliac joint pain using these tests (FABER Test, Gaenslen's Test, Thigh Thrust Test, Gillet Test, and Compression & Distraction tests).

Investigations:

- **Routine laboratory investigations:** All patients underwent comprehensive blood tests.
- **Radiological investigations:** Plain X-ray of the lumbosacral spine (Anteroposterior view: This view revealed degenerative changes and Lateral view: This view identified the presence of spondylolisthesis).

Magnetic resonance imaging (MRI):

This imaging technique was performed to accomplish the following: Rule out any neurological compression, identify degenerative changes, evaluate facet joints for any abnormalities, and assess nerve structures.

Using fluoroscopy, the SIJ injection was administered with all aseptic precautions. The patient was positioned on an examination table, typically lying face down. The SI joint area was cleaned and sterilized, and a sterile drape was placed to maintain a sterile environment.

In the AP fluoroscopic projection, the posterior joint articulation contributes to the formation of the medial SI joint line. Then, the C-arm was rotated in the opposite direction until the focus was on the medial cortical line of the posterior articulation. Occasionally, tilting the C-arm longitudinally with respect to the patient (cephalo-caudally) can assist the clinician in distinguishing between the anterior and posterior articulations.

Local Anesthesia: The skin and underlying tissues near the SI joint were anesthetized with local anesthesia(5 ml of 2% lidocaine). This ensures that the patient experienced minimal discomfort during the procedure. Needle Placement: under the guidance of fluoroscopy, a specialized needle, such as spinal needle (its gauge was 22), was inserted into the SI joint. Injection of Contrast Medium: Only a small

amount of contrast medium (iohexol), a visible dye, was injected after the needle tip had been correctly positioned inside the SI joint. Medication Injection: Depending on the patient's group assignment, Group 1 received 1.5 mL of methyl-prednisolone (40 mg/mL) and 1.5 mL of 2% lidocaine with 0.5 mL of saline, Group 2 received 3 mL of leukocyte-free PRP with 0.5 mL of calcium chloride (total volume 3.5 mL in both groups) this mixture was administered into the SI joint after the needle's insertion was confirmed. After the injection, the patient was kept in the supine position for a thirty-minute period while blood pressure, oxygen saturation, heart rate, and any side effects were noted.

Preparation of Platelet-Rich Plasma:

On the day of the planned intervention, approximately 30 milliliters of the patient's blood were extracted & collected in a blood bag containing citrate phosphate dextrose and adenine (CPD-A1). Leukocytes were filtered out of the PRP to produce the final 3 milliliters of leukocyte-free PRP within a biosafety cabinet after the PRP was isolated from the whole blood by centrifugation for fifteen minutes at 720 grams.

Follow-up:

The patient was checked on at one week, four weeks, two months, and three months to determine the degree of pain, functional disabilities, and any undesirable events. Applying the VAS (score range = 0 to 10; less than 4, 4 to 6, and more than 6 for mild, moderate, and severe pain, respectively), the pain was evaluated. Patients didn't receive any extra medical therapy or physiotherapy during the trial; all pain medications, including NSAIDs, were stopped at the start of the trial. Throughout the research period, patients with ankylosing spondylitis (AS) continued to receive sulfasalazine.

Ethical considerations:

The Beni-Suef University faculty of medicine's local Research & Ethical Committee granted approval. Approval No: FMBSUREC/02102022/ Ali Before the patients were enrolled in the trial, informed consensus was acquired; all information was kept private; and each participant was free to leave the study at any time without it having an impact on their care.

Statistical Analysis:

The SPSS program (SPSS 25.0 Version) was used for data entry and analysis. We calculated the proportion, percentage, & mean. In order to establish an association, the chi square test was performed. The SPSS application (Version 25) for Windows was used to process, code & analyze the data that was gathered. Calculations of standard deviations, means, ranges, medians, and % were done using descriptive statistics. Independent t-tests were used to compare the means of regularly distributed data for continuous variables, chi-square tests were used for categorical data, and Mann-Whitney U tests were used for comparing the median differences of data that

were not normally distributed. In dependent groups, the t-test and the Wilcoxon test were applied. A p-value of less than 0.05 is regarded as significant in statistics.

3. Results:

51.46±7.8 was the average age of the agents that took part. Male participants made up around forty percent of the total, whereas female participants made up around sixty percent. In terms of BMI, the subjects' average BMI was 27.42 ±2.97. (Table 1)

Table 1: Characteristics of the study participants

		Number (percent)
Age	Mean	18 to 65 year
	±S.D	51.46 years
Sex	Males	19 (38%)
	Females	1 (62%
BMI	Mean	27.42

Of the twenty-five patients in Group A, 9 patients (36%) were male & sixteen patients (64%) were female 51.6 is their average age. Of the 25 patients in Group B, 15 (or sixty percent) were female and 10 (or forty percent) were male. They are 51.32 years old on average. The mean BMI for Group A is 27.89, while the mean BMI for Group B is 26.95. Out of 25 patients, or sixty percent, in Group A had lumber fixation, both with & without S1 fixation. Of the patients in Group B, 14 out of 25 (56%) had lumber fixation, both with & without S1 fixation. In Group A the number of patients who underwent S1 fixation are 8 out of 25 (32%). In Group B the number of patients who underwent S1 fixation are 12 out of 25 (48%). (Table 2)

Table 2: Comparison between Steroid group and Platelet rich plasma group

		Steroid	PRP	p-value
Age	Mean	51.60 year	51.32 year	0.771
Sex	Males	9(36%)	10(40%)	0.755
	Females	16(64%)	15 60%)	
BMI	±S.D	27.89	26.95	0.466
Previous lumber fixation	Yes	15(60%)	14(56%)	0.781
	No	10(40%)	11(44%)	
Previous S1 fixation	Yes	8(32%)	12(48%)	0.248
	No	17(68%)	13(52%)	

Our study showed that there was a statistically significant relationship between steroid and PRP groups regarding VAS scores after one-week and after 3 months (p-values= 0.009 and 0.039 respectively). The short-term effect of steroid was significantly better than PRP, but the long-term effect of PRP was significantly better than steroid. Steroid had faster improvement with 55.2% improvement after one-week of injection compared to 46.4% in case of PRP injection (p-value=0.009). As regards the long term effect, PRP had better improvement after 3 months with 42.9% compared to only 24.4% after steroid injection (p-value=0.039). (Table 3)

Table 3: Comparison between study groups regarding visual analogue scale results

	Steroid	PRP	p-value
Pre-injection	6.88	7.00	0.655
At day 0 after injection	3.56(48.3%)	3.85(45%)	0.296
After 1 -week	3.08(55.2%)	3.75)46.4%)	0.009*
After 1-month	3.96(42.4%)	3.90(44.2%)	0.932
After 3-month	5.20(24.4%)	4.00(42.9%)	0.039*

4. Discussion:

In our study, the mean age for patients presented with Sacroiliac joint pain in group A (steroid group) was 51.6 years while in group B (PRP group) mean was 51.32 years, greater than the study of **Roche et al.**[4] who reported 37 years in PRP group and 35 years in steroid group & lower than **Liliang et al.**[5] who reported mean age of 63 years.

Regarding sex distribution in our study, out of total 50 patients in this study, 31 of them were female (60 percent) in the order of 16 females at group A out of 25 patients and 15 females at group B out of 25 patients. **Cher D et al. (2014)** reported that out of 198 patients with sacroiliac joint pain 134 patients (67.7%) were females and 64patients (32.3%) were males (82).

Muhlner et al.[6] reported that out of 215 patients with sacroiliac joint pain 85 patients (39.5%) were males & 130 females (60.4%) (83).

In our study, the mean of BMI in group A was 27.89 & in group B the mean of BMI was 26.95, compared to **Depalma et al.**[7] who reported BMI was 30 (more than our study), and the study of **Singla, V et al.**[9] who reported 23.69 in PRP group and 22.41 in steroid group.

In our study there are 29 patients out of 50 with previous lumber fixation (58%), 20 of them including S1 fixation (40%).

The study conducted by **Ahmed et al.**[8] demonstrated that among the patients involved, 20 patients (43%) had a previous L5-S1 fixation, 10 patients (22%) had L4-5 fixation, 11 patients (24%) had L5-S1 discectomy, and 5 patients (11%) had no history of previous lumbar surgery.

These findings indicated a higher incidence of occurrence with lumbosacral fixation compared to lumbar fixation or lumbar discectomy. However, it should be noted that these results were slightly lower than those reported by **Depalma et al.**[7] who found that 58.8% of patients with sacral fusion and 18.2% of patients without sacral fusion experienced sacroiliac joint dysfunction.

In our study, we evaluated patients using the visual analogue scale (VAS) before the procedures and at specific time intervals post-procedure, which included 0 days, 1 week, 2 weeks, 1 month, and 3 months.

In Our study there was a statistically significant relationship between steroid and PRP groups regarding VAS scores after one-week and after 3 months (p-values= 0.009 and 0.039 respectively). The short-term effect of steroid was significantly better than PRP after 1 week, but the long term effect of PRP was significantly better than steroid after 3 months. Steroid had faster improvement with 55.2% improvement after one-week of injection compared to 46.4% in case of PRP injection (p-value= 0.009). As regards the long term effect, PRP had better improvement after 3 months

with 42.9% compared to only 24.4% after steroid injection (p-value=0.039).

In **Singla et al.**[9] in comparison to patients receiving steroids, the study found that those getting PRP had a greater & more sustained improvement in their level of pain and functional impairment. While patients receiving steroids had a decrease of their initially improved VAS score after three months, the effects of PRP were maintained. In addition, more PRP patients had pain reduction. At two weeks and three months, PRP worked for sixty percent and ninety percent of patients, respectively, while steroids worked for 75% & 25% of patients. This is in line with our research, which showed more enhancement than Singla's study did.

In Soliman et al.[10] study, which involved seventy patients divided into two groups, gave group I one milliliter of intra-articular SIJ injection containing two percent lidocaine & 40 mg of triamcinolone acetonide, while group II received two to three milliliters of PRP & 1 milliliter of the same injection containing 2% lidocaine, both under US guidance. At four weeks following injection, the study revealed a statistically significant difference in the VAS and MODQ (Modified Oswestry Disability Questionnaire) scores between the two groups (groups I and II). When compared to patients receiving steroids, those getting PRP showed longer-lasting improvements in functional limitation (MODQ) and pain intensity (VAS). While patients receiving steroids experienced a decrease of their initially improved VAS score after eight weeks, the effects of PRP were maintained.

Althoff et al.[11] demonstrated the long-lasting effects of cortico-steroids. Their trial involved twenty-nine patients (11 males and18 females) who had sacroiliitis and were given 40 or 60 mg of triamcinolone acetonide per joint under CT guidance. A VAS was used to assess the intervention's clinical result on days 1 through 7, as well as after 1, 3, & 6 months. The intra-articular (n=22) and periarticular (n=7) placements of the puncture needle tip were used to categorize the patients. Their findings showed that in patients with active sacroiliitis, intra-articular CT-guided steroid injection can provide sufficient pain and symptom control for six months. In our investigation, steroid treatment was effective in the short run but less so in the long term.

In group A, we administered 1.5 milliliters of methylprednisolone (40 mg/mL) injection in our trial. Previous research showed that the SIJ steroid injection produced varying levels of pain relief, but not PRP injection. After steroid injections (40 mg methyl-prednisolone) intra-articularly in 12.50 & 31.25% of patients, respectively, **Borowsky et al**. found a reduction in the VAS score of higher than or equal to fifty percent after three months.

Hawkins et al.[12] additionally, it was discovered that a single steroid (betamethasone/ dexamethasone) SIJ injection only resulted in a reduction in the VAS score

of greater than or equal to fifty percent in 40 out of 118 cases (33.9%).

5. Conclusion:

The short-term effect of steroid was significantly better than PRP after week, but the long-term effect of PRP was significantly better than steroid after 3 months.

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