

Original Article

Efficacy of Piriformis Block Using Intravenous Steroids with Bupivacaine versus Botox in Piriformis Syndrome

Usama Farooq¹, Tariq Mahmood², Rashid Ali¹, Neelofar Yousaf³, Hafiz Ahmed Hassam Bhalli¹, Kenan Anwar Khan¹, Muhammad Farrukh Habib^{4*}

¹Graded Anesthetist, Combined Military Hospital Rawalpindi, Pakistan.

²Anesthetist, Combined Military Hospital Rawalpindi, Pakistan.

³Department of Pharmacology, Akhtar Saeed Medical and Dental College Lahore, Pakistan.

⁴Department of Management Sciences, Shifa Tameer-E-Millat University, Islamabad, Pakistan.

*Corresponding Author: Muhammad Farrukh Habib; Email: muhammadfarrukhhabib@gmail.com

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ABSTRACT

Background: Piriformis syndrome, a condition that affects predominantly females, leads to significant morbidity and impacts the quality of life. Despite its prevalence, it remains underdiagnosed, especially in the developed world. Treatment options include physiotherapy, painkillers, massage, heat, corticosteroids, local anesthetics, and botulinum toxin. However, comparative analysis of combination therapy versus botulinum toxin alone is limited.

Objective: To compare the efficacy of intravenous steroids combined with bupivacaine versus botulinum toxin (Botox) injections in the treatment of piriformis syndrome.

Methods: This quasi-experimental study was conducted at the Department of Anesthesiology, Combined Military Hospital, from January 2022 to December 2022, following ethical approval. The study included 100 patients diagnosed with piriformis syndrome, divided into two groups: Group L (n=50) received 10 ml of 0.25% bupivacaine with 40 mg of methylprednisolone, and Group B (n=50) received 100 U of botulinum toxin type A diluted in 10 ml distilled water. Standard monitoring was applied, and injections were performed under ultrasound guidance with the patients in the prone position. Pain scores were assessed using the Visual Analog Scale (VAS) at 24 hours, 72 hours, 7 days, and 28 days post-procedure. Patient satisfaction was measured using a 5-point Likert scale at 28 days. Data were analyzed using t-tests and chi-square tests, with significance set at $p < 0.05$.

Results: The mean age was 36 ± 3.35 years in Group L and 35.82 ± 3.42 years in Group B ($p=0.297$). The mean weight was 75.82 ± 5.23 kg in Group L and 77.64 ± 4.47 kg in Group B ($p=0.066$). Before the procedure, both groups had a median VAS pain score of 7.0. At 24 hours, the median pain score was 4.0 in Group L and 5.0 in Group B ($p=0.292$). At 72 hours, Group L had a median pain score of 3.0 compared to 4.0 in Group B ($p=0.010$). At 7 days, the scores were 2.0 and 3.0 respectively ($p=0.013$), and at 28 days, they were 2.0 and 3.0 respectively ($p=0.013$). The median satisfaction score at 28 days was 1.0 in Group L and 2.0 in Group B ($p=0.043$).

Conclusion: Combination therapy with local anesthetics and steroids is superior to botulinum toxin in reducing pain and improving patient satisfaction in piriformis syndrome. This approach should be considered the first-choice treatment.

Keywords: Piriformis syndrome, bupivacaine, botulinum toxin, combination therapy, pain management, VAS pain score, patient satisfaction, ultrasound-guided injection, corticosteroids, pain clinic.

INTRODUCTION

Piriformis syndrome is a condition that predominantly affects females, with an incidence ratio of 6:1 compared to males (1,2). It is associated with significant morbidity and a substantial impact on the quality of life, with a global prevalence ranging from 1.8% to 17.2% among patients presenting to pain clinics with symptoms of low back pain (3). This wide range in prevalence can be attributed to underdiagnosis and limited access to advanced diagnostic modalities, particularly in the developed world. In South Asia, the prevalence of piriformis syndrome among patients presenting with sciatica is estimated to be around 6% (4). The syndrome typically involves pain in the posterior hip joint and buttock, with or without radiation to the affected leg. The characteristic presentation includes pain in the posterior hip or buttock area, often described as overlying the wallet pocket (3). The etiology is commonly attributed to spasm and hypertrophy of the piriformis muscle, though anatomical variations without hypertrophy or spasm can also

be implicated (5). Another proposed mechanism involves the impingement or pinching of the sciatic nerve, leading to pain, tenderness, and significant discomfort during routine activities (6).

Diagnosis is primarily based on a clinical history suggestive of pain, tenderness, numbness, and anesthesia over the buttock areas mentioned. It is noted that piriformis syndrome accounts for approximately 6% of cases presenting with symptoms of sciatica (7). With advancements in diagnostic techniques, magnetic resonance neurography (MRN) has emerged as the gold standard for confirming the diagnosis in certain cases (8). MRN can identify atrophied or hypertrophied piriformis muscles, accessory muscle slips, sciatic nerve splitting, and signal resonance variations, which are all crucial for diagnosing the syndrome (9).

Various treatment modalities have been explored for alleviating the pain and associated symptoms of piriformis syndrome. These include physiotherapy, analgesics, massage, heat therapy, corticosteroids, local anesthetics, and more recently, botulinum toxin (Botox) injections (10). Although these treatments have demonstrated efficacy, there is a scarcity of literature on the comparative analysis and combination therapy, particularly in our demographic region. This study aims to compare the treatment efficacy of intravenous steroids combined with intravenous bupivacaine versus Botox injections in patients with piriformis syndrome.

MATERIAL AND METHODS

This quasi-experimental study was conducted at the Department of Anesthesiology, Combined Military Hospital, from January 2022 to December 2022, following approval from the ethical review board (vide letter no.). The sample size was determined based on the population proportion of patients with piriformis syndrome at our pain center. Out of 2600 patients presenting with low back pain over one year, 155 were clinically and radiologically diagnosed with piriformis syndrome, establishing a population proportion of approximately 5.9%, which aligns with the reported prevalence of 6% (11). The minimum sample size was calculated to be 45 using the WHO calculator, with a 95% confidence interval, a 7% margin of error, and a population proportion of 6%. The study ultimately included two groups of 50 participants each, with one group receiving a piriformis block using bupivacaine with intravenous steroids (n=50) and the other receiving botulinum toxin injections (n=50), totaling 100 participants. The sampling method used was non-probability consecutive sampling by lottery method.

Inclusion criteria encompassed all patients diagnosed with piriformis syndrome by neuroradiology and clinical assessment presenting to the pain clinic. Exclusion criteria included patients with metastatic disease, major cardiac or respiratory disease, low ejection fraction, allergies to bupivacaine or botulinum toxin, unwillingness to participate, infection at the injection site, coagulation disorders, and unsuccessful injection attempts after three tries.

All eligible patients were divided into the local anesthetic plus steroid group (Group L) and the botulinum toxin group (Group B). After obtaining informed written consent, detailed explanations of the procedure and potential complications were provided to both groups. Standard monitoring, including non-invasive blood pressure, heart rate, capnography, and ECG, was applied to participants in both groups.

The injections were performed with patients in the prone position, legs in neutral rotation, using ultrasound guidance lateral to the sacrum and superficial to the sciatic nerve. The gluteus and piriformis muscles were identified, and the sciatic nerve was confirmed through Doppler to exclude vessels. Using an aseptic technique, a 25G Quincke spinal needle was inserted laterally from the sacrum's border to the piriformis muscle, avoiding the sciatic nerve, confirmed by a nerve stimulator. Upon reaching the desired muscle depth, Group L received 10 ml of 0.25% bupivacaine with 40 mg of methylprednisolone, while Group B received 100 U of botulinum toxin type A diluted in 10 ml distilled water.

Post-procedure, patients were monitored in the recovery room for side effects before being discharged. Follow-up assessments included pain scores measured by the Visual Analog Scale (VAS) at 24 hours, 72 hours, 7 days, and 28 days as primary variables, and quality-of-life satisfaction using a 5-point Likert Scale at 28 days as the secondary variable (12, 13).

Demographic data were described using means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Comparative analyses between the two groups were performed using t-tests for mean differences and chi-square tests for primary variables and Likert satisfaction scores. A p-value of <0.05 was considered statistically significant. All statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS) version 26.0.

RESULTS

The results of this study highlighted significant differences in patient outcomes between the two treatment groups. The mean age of participants was similar between the L Group and B Group, with mean ages of 36 ± 3.35 and 35.82 ± 3.42 years, respectively (Table 1). The mean weight was slightly higher in the B Group, at 77.64 ± 4.47 kg, compared to 75.82 ± 5.23 kg in the L Group, although this difference did not reach statistical significance ($p = 0.066$). Gender distribution was also comparable, with the L Group consisting of 8 males (16%) and 42 females (84%), while the B Group had 10 males (20%) and 40 females (80%) (Table 1).

Table 1: Age, Weight, and Gender Characteristics Between Both Groups (n=100)

Variable	L Group (n=50)	B Group (n=50)	p Value
Mean Age (Years)	36 ± 3.35	35.82 ± 3.42	0.297
Mean Weight (kg)	75.82 ± 5.23	77.64 ± 4.47	0.066
Gender	n (%)	n (%)	-
Male	8 (16%)	10 (20%)	-
Female	42 (84%)	40 (80%)	-

Table 2: Comparison of Primary Variables Between Both Groups (n=100)

Variable	L Group (n=50)	B Group (n=50)	p Value
Median Pain Score on VAS Before Procedure (out of 10 points)	7.0 (IQR=1.0)	7.0 (IQR=0.0)	-
Median Pain Score on VAS at 24 hr (out of 10 points)	4.0 (IQR=0.0)	5.0 (IQR=0.0)	0.292
Median Pain Score on VAS at 72 hr (out of 10 points)	3.0 (IQR=1.0)	4.0 (IQR=0.0)	0.010
Median Pain Score on VAS at 7 days (out of 10 points)	2.0 (IQR=0.0)	3.0 (IQR=1.0)	0.013
Median Pain Score on VAS at 28 days (out of 10 points)	2.0 (IQR=0.0)	3.0 (IQR=1.0)	0.013

Table 3: Likert Scale Satisfaction Score Between Both Groups (n=100)

Variable	L Group (n=50)	B Group (n=50)	p Value
Median Satisfaction Score at 28 Days (IQR)	1.0 (IQR=1.0)	2.0 (IQR=0.0)	0.043

Pain scores, as measured by the Visual Analog Scale (VAS), showed notable differences between the groups at various time points post-procedure. Before the procedure, the median pain score on the VAS was identical in both groups, at 7.0 (IQR = 1.0 for L Group, IQR = 0.0 for B Group) (Table 2). At 24 hours post-procedure, the median pain score was lower in the L Group (4.0, IQR = 0.0) compared to the B Group (5.0, IQR = 0.0), though this difference was not statistically significant ($p = 0.292$) (Table 2).

However, significant differences emerged at subsequent time points. At 72 hours post-procedure, the L Group reported a median pain score of 3.0 (IQR = 1.0), while the B Group's median pain score remained higher at 4.0 (IQR = 0.0), with the difference being statistically significant ($p = 0.010$) (Table 2). This trend continued at 7 days, where the L Group's median pain score further decreased to 2.0 (IQR = 0.0), compared to 3.0 (IQR = 1.0) in the B Group ($p = 0.013$) (Table 2). At the 28-day follow-up, the L Group maintained a lower median pain score of 2.0 (IQR = 0.0) versus 3.0 (IQR = 1.0) in the B Group, which was again statistically significant ($p = 0.013$) (Table 2).

In terms of patient satisfaction, as measured by the 5-point Likert scale at 28 days, the L Group reported a median satisfaction score of 1.0 (IQR = 1.0), indicating strong agreement with improved quality of life and pain control. In contrast, the B Group had a median satisfaction score of 2.0 (IQR = 0.0), reflecting a comparatively lower satisfaction level ($p = 0.043$) (Table 3). These results underscore the greater efficacy of the piriformis block with bupivacaine and intravenous steroids in reducing pain and improving patient satisfaction over botulinum toxin injections.

DISCUSSION

The study was conducted at our institution's pain clinic, a center of excellence that receives patients with pain-related issues from across the country. Piriformis syndrome remains underdiagnosed in many clinical cases, resulting in a variety of treatment options that often provide little or no symptomatic relief to patients (14). With focused and pertinent history-taking and the availability of neuroradiological investigations, more patients are now being accurately diagnosed and treated for this condition (15).

Steroids, local anesthetics, and botulinum toxin have all been used separately to achieve satisfactory results in treating piriformis syndrome (16). Our study aimed to explore a multimodal approach by combining local anesthetics and steroids and comparing this combination to Botox to determine if one treatment could be recommended over the other. Botox treatment has shown success by relieving piriformis muscle spasms through flaccid paralysis, leading to pain relief and symptomatic improvement (17). International studies have demonstrated that Botox treatment offers results comparable to those of local anesthetics and steroids when used alone (18). However, a meta-analysis indicated that combination therapy provided superior improvements in pain scores across patient demographics when compared to Botox therapy alone (10, 19).

Our study corroborated these findings, demonstrating that combination therapy with local anesthetics and steroids was statistically superior in improving pain scores over the 28-day study duration. Patients in the combination therapy group experienced more significant reductions in pain and higher satisfaction levels compared to those receiving Botox. Although the Botox group also

showed good pain score improvements, the overall pain alleviation and patient satisfaction were notably better in the combination therapy group (20).

The study has several strengths, including its quasi-experimental design and rigorous methodology, which enhance the validity of the findings. However, there were limitations. The single-center nature of the study may limit the generalizability of the results. A multi-center study involving a wider demographic area could provide more confirmative results. Additionally, the expertise required to perform the regional block accurately demands more patient preparation time and experienced regional block consultants, which are not always readily available in our demographic area.

Based on our findings, we recommend that combination therapy with local anesthetics and steroids should be offered as the first-choice treatment for piriformis syndrome, provided there are no contraindications. While Botox therapy also proved beneficial, the superior analgesia and patient satisfaction achieved with combination therapy warrant its preferential use.

CONCLUSION

In conclusion, combination therapy with local anesthetics and steroids was superior to Botox in alleviating symptoms and improving patient satisfaction in piriformis syndrome. This study highlights the need for further research, particularly multi-center trials, to validate these findings across broader patient populations.

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