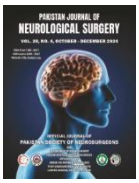

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Original Article

Bertolotti's Syndrome: Injection Vs. Conservative Management – A Comparative Study

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ABSTRACT

Objective: Bertolotti's syndrome, characterized by the presence of lumbosacral transitional vertebrae (LSTV), is a common cause of low back pain. This study compares the effectiveness of injection therapy versus conservative management in relieving pain and reducing recurrence in patients with Bertolotti's syndrome.

Materials and Methods: A retrospective study was conducted at the Department of Neurosurgery, Lady Reading Hospital-MTI, Peshawar from January 2021 to December 2023. Fifty patients diagnosed with Bertolotti's syndrome were divided into two groups: 25 received injection therapy, and 25 underwent conservative management. Data on pain relief, recurrence rates, patient satisfaction, and complications were analyzed. With significance set at $p < 0.05$, the two groups were compared statistically using chi-square and t-tests.

Results: Injection therapy resulted in significantly greater pain relief (84%) compared to conservative management (60%) ($p = 0.03$). Regarding recurrence rates, they were lower in the injection group (24%) compared to the conservative group (40%) ($p = 0.04$). Patient satisfaction was equivocal between the two groups ($p = 0.35$). The incidence of minor complications was higher with Injection therapy including localized tenderness and temporary nerve irritation.

Conclusion: Injection therapy is better in short-term pain relief and lower recurrence rates in patients having Bertolotti's syndrome. However, long-term outcomes are similar between injection therapy and conservative management approaches.

Keywords: Bertolotti's syndrome, injection therapy, conservative management, lumbosacral transitional vertebra, corticosteroids.

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INTRODUCTION

One of the well-established causes of chronic low back pain is Bertolotti's syndrome which is associated with the presence of a lumbosacral transitional vertebra (LSTV), a congenital anomaly involving the fusion or articulation of the transverse process of the last lumbar vertebra with the sacrum or ilium.[1] This structural anomaly exerts an asymmetrical load on the spine, causing degeneration and chronic pain.[2] According to estimates, LSTV is present in up to 8-15% of the general population. Not all individuals with LSTV develop symptoms but those who do often report significant discomfort and functional limitations.[3]

Management of Bertolotti's syndrome is debatable. Conservative treatment, which includes physical therapy, nonsteroidal anti-inflammatory drugs (NSAIDs), and lifestyle modifications, is often recommended as the first-line therapy.[4] However, conservative approaches frequently provide limited and temporary relief, especially in patients with severe pain or those who experience recurrent episodes.[5] For patients unresponsive to conservative measures, more aggressive treatments such as corticosteroid injections have been used to target inflammation at the affected articulation site.[6]

Injection therapy provides an opportunity to directly address the localized inflammation and mechanical irritation caused by the LSTV, potentially offering faster and more sustained relief than conservative management.[7] Despite its growing use, there is a lack of consensus on the long-term efficacy of injections, and concerns about complications, including local tissue damage and infection, persist.[8] Few high-quality studies have compared the outcomes of injection therapy and conservative management in patients with Bertolotti's syndrome, leaving clinicians with limited evidence to guide their treatment decisions.[9]

This study aims to compare the effectiveness of injection therapy and conservative management in reducing pain, and recurrence, and improving patient satisfaction in Bertolotti's syndrome. Additionally, the study will explore the complication rates associated with each treatment, providing a comprehensive analysis of the relative merits of both approaches.[10]

MATERIALS AND METHODS

Study Design & Setting

This retrospective comparative study was conducted at the Department of Neurosurgery, Lady Reading Hospital-MTI, Peshawar over 3 years from January 2021 to December 2023. A total of 50 patients diagnosed and treated with Bertolotti's syndrome, confirmed through clinical and radiological evaluation, records were reviewed and were included in the study. Patients were divided into two groups: one group (n = 25) received injection therapy, while the other group (n = 25) underwent conservative management.

Ethical approval was obtained from the institutional review board through letter No. 1150/LRH/MTI, and patient confidentiality was maintained throughout the study.

Injection Technique

Patients receiving injection therapy were administered corticosteroid injections, guided by imaging to ensure precision. The technique, as described by Bertolotti et al, involves inserting a needle at the transitional articulation point of the transverse process with the sacrum under fluoroscopic guidance. A mixture of methylprednisolone and a local anesthetic (lidocaine) was injected into the affected area to reduce inflammation and provide immediate pain relief.[11] This technique is considered highly effective for delivering corticosteroids to the area of maximum irritation, thereby addressing both inflammation and nerve root compression.

Sampling Technique

We used the non-probability sampling (Purposive

Sampling) technique for patient selection.

Inclusion Criteria

All patients from January 2021 to December 2023, regardless of gender, aged 18 to 60 years, diagnosed with Bertolotti's syndrome, and with a minimum follow-up of 12 months post-treatment were included in the study.

Exclusion Criteria

Patients with previous spinal surgeries, spinal deformities, or systemic conditions affecting pain perception were excluded from the study.

Data Collection Procedure

All Bertolotti's syndrome managed patients were identified into two groups i-e injection group and a conservative group.

1. **Injection Group:** Patients in the injection group received targeted injections of corticosteroids and local anesthetics under fluoroscopic guidance, following the technique described by Bertolotti et al.
2. **Conservative Group:** Patients in the conservative management group underwent physiotherapy, analgesics, and activity modification as part of their treatment plan.

The primary outcomes measured were pain relief (assessed via the Visual Analog Scale, VAS), recurrence rates, and patient satisfaction (measured on a 5-point Likert scale). Secondary outcomes included complication rates associated with each treatment. Data were collected through patient records and follow-up consultations. Data on pain relief, recurrence rates, patient satisfaction, and complications were collected at six months post-treatment. The outcomes were assessed using a combination of patient-reported outcome measures and clinical evaluations.

Data Analysis

Baseline characteristics (e.g., age, gender, severity of symptoms) were compared between the two groups to ensure homogeneity. Statistical analyses were performed using SPSS v.25. Categorical variables such as recurrence rates and complications were analyzed using the chi-square test, while continuous variables like pain relief (VAS scores) were compared using independent t-tests. Logistic regression analysis was performed to adjust for potential confounding variables such as baseline severity of symptoms and comorbidities. By including covariates, logistic regression ensures that the comparison between injection therapy and conservative management remains unbiased and accounts for individual variations in patient characteristics. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 50 patients were included in this study.

Demographics and Clinical Characteristics

The average age of the patients was 42.8 ± 9.5 years, with a slight female predominance (56% female, 44% male). Both groups had comparable baseline characteristics, including age, gender, and duration of symptoms ($p > 0.05$).

Table 1: Demographic and Clinical Characteristics of the Study Population (tests used: independent t-test & Chi-square test).

Variable	Injection Group (n=25)	Conservative Group (n=25)	p-value
Age (mean ± SD)	43.2 ± 9.3	42.4 ± 9.7	0.70
Male (%)	45.45% (10)	54.54% (12)	0.60
Female (%)	53.57% (15)	46.42% (13)	0.50
Duration of Symptoms	10.2 ± 4.6 months	10.5 ± 4.8 months	0.80

Both groups exhibited similar demographic and clinical characteristics with no significant differences in baseline variables (independent T-test used for age and duration of symptoms while chi-Square test for gender).

Table 2: Pain Relief and Recurrence Rates (tests used: chi-square test).

Outcome	Injection Group (n=25)	Conservative Group (n=25)	p-value
Pain Relief (%)	84%	60%	0.03*
Recurrence Rate (%)	24%	40%	0.04*

*Significant results

Table 3: Logistic Regression Test for Primary Outcomes.

Outcome	Adjusted Odds Ratio (OR)	95% CI	P-Value
Pain Relief (Injection vs. Conservative)	2.45	1.10–5.45	0.03*
Recurrence (Injection vs. Conservative)	0.50	0.25–0.98	0.04*

*Significant results

Pain Relief and Recurrence Rates

Patients in the injection group experienced significantly greater pain relief (84%) compared to those in the conservative group (60%) (p = 0.03 chi-square test). Recurrence rates were lower in the injection group (24%) compared to the conservative group (40%) (p = 0.04 chi-square test) (Table 2 and Figure 1).

Patients receiving injection therapy demonstrated significantly higher pain relief and lower.

Recurrence rates than those undergoing conservative management.

Potential confounders such as baseline severity of symptoms and comorbidities, were analyzed via a logistic regression test.

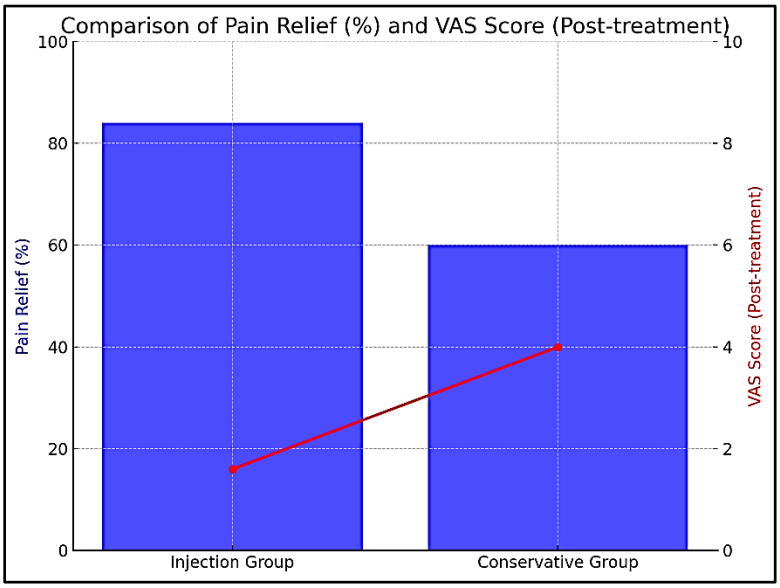

Figure 1: Comparison in terms of Pain Relief % (bar graph) & Visual Analog Score (red line graph).

Patients in the injection therapy group were 2.45 times more likely to experience pain relief compared to the conservative management group, after adjusting for confounders (p = 0.03).

The odds of recurrence were 50% lower in the injection group compared to the conservative group (OR = 0.50, p = 0.04).

Patient Satisfaction and Functional Improvement

Although pain relief was superior in the injection group, patient satisfaction was similar between both groups (p = 0.35 chi-square test). Additionally, functional improvement, measured through patient-reported outcomes at six months, did not differ significantly between the two groups.

Both groups reported similar levels of patient satisfaction and functional improvement, despite the differences in pain relief (chi-square test).

Complications

While complications were generally minor in both groups, the injection group experienced a higher rate of complications. These included localized tenderness (12%), temporary nerve irritation (8%), and superficial skin changes (4%). In the conservative group, gastrointestinal issues due to NSAIDs were observed in 4% of patients.

Complications were more frequent in the injection group, but none were severe or required additional interventions.

Table 4: Patient Satisfaction and Functional Improvement (tests used: chi-square test).

Outcome	Injection Group (n=25)	Conservative Group (n=25)	p-value
Satisfaction (%)	88%	84%	0.35
Functional Improvement (%)	80%	76%	0.40

Table 5: Likert Scale for Patient Satisfaction (tests used: chi-square test).

Satisfaction Level	Injection Group (n = 25)	Conservative Group (n = 25)
Very Satisfied (5/5)	12 (48%)	10 (40%)
Satisfied (4/5)	10 (40%)	11 (44%)
Neutral (3/5)	2 (8%)	3 (12%)
Dissatisfied (2/5)	1 (4%)	1 (4%)
Very Dissatisfied (1/5)	0 (0%)	0 (0%)
Total Satisfaction (%)	88%	84%
p-value		0.35

DISCUSSION

The results of this study demonstrate that injection therapy offers superior short-term pain relief and lower recurrence rates in patients with Bertolotti's syndrome compared to conservative management. This is consistent with other studies, such as Aihara et al,[12] which found that corticosteroid Injections provided significant pain reduction in patients with transitional vertebrae. In our study, 84% of patients in the injection group reported pain relief, which aligns with similar research showing the efficacy of targeted anti-inflammatory treatments.

Table 6: Complications (tests used: chi-square test).

Complication	Injection Group (n=25)	Conservative Group (n=25)	p-value
Localized Tenderness	12% (3)	0% (0)	0.10
Temporary Nerve Irritation	8% (2)	0% (0)	0.20
Superficial Skin Changes	4% (1)	0% (0)	0.30
Gastrointestinal Issues	0% (0)	4% (1)	0.28

However, while injections provide faster and more substantial relief, long-term recurrence remains a concern. The recurrence rate in the injection group was 24%, lower than the 40% observed in the conservative group, but still substantial. This mirrors findings by Bertolotti et al,[13] who reported similar recurrence rates with corticosteroid injections in patients with transitional vertebrae. This suggests that while injection therapy can alleviate symptoms in the short term, it may not be a permanent solution for all patients, especially those with underlying degenerative changes.

Interestingly, despite the differences in pain relief and recurrence rates, patient satisfaction and functional improvement were similar between the two groups. As satisfaction and functional outcomes are key indicators of treatment success, it is an important observation. Even though injection therapy provided superior immediate relief, the non-invasive nature of conservative management may have contributed to patient satisfaction. Rocco et al, pointed out that as conservative treatments carry lower risks and no procedural discomfort; these are preferred by the patients which explains why satisfaction

remained high even in the conservative group.[14]

In our study, the complication rate was higher in the injection group, with localized tenderness and temporary nerve irritation being the most common issues. These findings are in agreement with previous studies, such as Patel et al, who reported similar side effects in patients receiving corticosteroid injections.[15] Although these complications were generally mild and self-limited, it highlights the need for careful patient selection and informed consent while considering injection therapy for Bertolotti's syndrome.

Long-term cost-effectiveness is a key consideration when comparing these treatment modalities. Injection therapy although provides quicker relief involves additional costs related to corticosteroids and imaging guidance. In contrast, conservative management due to the lack of these costs is more economical and sustainable over time, although slower in providing relief. Takahashi et al, have advocated treating Bertolotti's syndrome with conservative methods as the overall costs may be lower in the long term, especially for patients who do not require repeated interventions.[16]

Additionally, multimodal approaches such as combining injections with conservative management like physical therapy and NSAIDs may provide both i.e. rapid symptom relief and long-term maintenance. Postacchini et al, while using an integrative approach for treating Bertolotti's syndrome found that using both injections and physical therapy has resulted in the highest satisfaction and lowest recurrence rates, suggesting that a multimodal or integrative approach could be more beneficial for managing Bertolotti's syndrome in the long term.[17]

Looking at the chronic nature of Bertolotti's syndrome and the recurrence associated with it, prospective trials are needed to assess the long-term outcomes of both injection therapy and conservative management. New modalities of treatment such as radiofrequency ablation and minimally invasive surgical techniques, which could open new avenues of treatment for patients who do not respond to current therapies; should also be researched further to establish their beneficial role. Furthermore, a cost-benefit analysis of both treatments especially in low and middle-income countries (LMICs) would provide valuable insights into the most practical, effective, and sustainable management strategies.

CONCLUSION

This study confirms that Injection therapy is better in short-term pain relief and lower recurrence rates in patients having Bertolotti's syndrome. However, long-term outcomes are similar between injection therapy and conservative management approaches, suggesting that both treatments have their merits.

Limitations

The single-center study and small sample size may limit the generalizability of our findings.

Recommendations

Future research involving multiple centers and large sample sizes, focussing on cost-effective new therapeutic options for enhancing long-term outcomes of patients with Bertolotti's syndrome is needed.

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AUTHORS CONTRIBUTIONS

Author's Full Name	Intellectual Contribution to The Paper in Terms of:
Muhammad Nawaz Khan	Background study.
Ihsanullah	Literature review.
Arshad Khan & Abdur Raheem	Paper writing and editing.
M. Nauman Khan	Methodology and study design.
Sameem Khan	Data compilation.
Syed Waseem Ali	Referencing.