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EFFICACY OF TARGETED VS STANDARD SPERMATIC CORD DENERVATION IN THE MANAGEMENT OF CHRONIC ORCHIALGIA: A COMPARATIVE STUDY

Original Research

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ABSTRACT

Background: Chronic orchialgia, defined as testicular or scrotal pain persisting for more than three months, remains a challenging condition to treat, often leading to significant impairment in quality of life. While conservative management including pharmacotherapy and nerve blocks offers initial relief, many patients experience persistent symptoms requiring surgical intervention. Microsurgical spermatic cord denervation (MSCD) has emerged as an effective technique; however, the comparative efficacy of targeted versus complete MSCD remains inadequately explored.

Objective: To evaluate and compare the clinical outcomes of targeted versus complete spermatic cord denervation in patients with chronic orchialgia unresponsive to conservative treatment.

Methods: This comparative study was conducted over two years at a tertiary care hospital and included 50 male patients aged 18–55 years with chronic orchialgia lasting more than three months. After diagnosis confirmation via clinical evaluation and spermatic cord block using 5 mL of 1% lidocaine with 40 mg triamcinolone, patients were randomly allocated into two equal groups. Group A (n=25) underwent complete MSCD involving skeletonization of the spermatic cord, while Group B (n=25) underwent targeted MSCD focusing on the cremasteric muscle, peri-vasal sheath, and posterior lipomatous tissues. Pain outcomes were assessed using the Visual Analog Scale (VAS) at baseline and 6-month follow-up.

Results: In the complete denervation group, 19 patients (76%) experienced complete pain resolution, 2 (8%) had partial relief, and 4 (16%) showed no improvement. In the targeted group, 18 patients (72%) achieved complete resolution, 1 (4%) had partial relief, and 6 (24%) reported no improvement. Statistical analysis revealed no significant difference between groups ($p > 0.05$).

Conclusion: Both targeted and complete MSCD are effective for treating chronic orchialgia. Given its less invasive nature, targeted denervation may be a suitable alternative in appropriately selected patients.

Keywords: Chronic Orchialgia, Denervation, Microsurgery, Pain Management, Spermatic Cord, Surgical Treatment, Testicular Pain.

INTRODUCTION

Chronic orchialgia, defined as persistent testicular or scrotal pain lasting longer than three months, is a distressing condition that significantly impairs the quality of life in affected individuals (1). Its presentation is often variable—ranging from intermittent to continuous discomfort, with pain that may be dull or sharp in nature and radiating to adjacent areas such as the groin, lower abdomen, inner thigh, or perineum. This complex symptomatology frequently obscures the underlying diagnosis, making clinical evaluation and management particularly challenging (2). Although relatively prevalent in urological practice, the condition continues to frustrate both patients and clinicians due to its multifactorial etiology. Identifiable causes may include prior surgical interventions (such as vasectomy or herniorrhaphy), infections, traumatic injuries, varicocele, or, in a considerable number of cases, idiopathic origins where no obvious pathology can be found (3,4). The initial management strategy typically involves conservative measures including pharmacological therapy and peripheral nerve blocks. However, these approaches often provide only partial or temporary relief, with a significant proportion of patients remaining refractory to non-surgical treatment modalities. For such individuals, surgical intervention becomes a necessary consideration. In recent years, microsurgical spermatic cord denervation (MSCD) has gained recognition as a promising option with high success rates in alleviating chronic testicular pain (5,6). This technique focuses on disrupting the nociceptive pathways within the spermatic cord while carefully preserving critical anatomical structures necessary for normal testicular function.

Two distinct surgical techniques have been developed within the MSCD framework: the traditional or standard approach, which involves comprehensive skeletonization of the spermatic cord, and a more focused method known as targeted denervation. The latter confines dissection to three key anatomical zones—the cremasteric muscle fibers, peri-vasal sheath, and posterior lipomatous tissues—believed to be the principal contributors to pain transmission (7,8). While targeted denervation has been suggested to offer comparable pain relief with reduced invasiveness, shorter operative times, and faster recovery, there remains a paucity of comparative data evaluating its true efficacy relative to the standard method. Recognizing this gap in the literature, the present study aims to compare the clinical outcomes of targeted versus standard microsurgical spermatic cord denervation in patients with chronic orchialgia unresponsive to conservative therapy. By delineating the relative effectiveness of both techniques, this investigation seeks to provide evidence-based guidance for optimizing surgical management in this challenging and often under-addressed patient population.

METHODS

This comparative study was conducted at a tertiary care hospital over a period of two years, from September 2022 to September 2024. A total of 50 male patients aged 18 to 55 years, presenting with a clinical diagnosis of chronic orchialgia—defined as unilateral or bilateral testicular or scrotal pain persisting for more than three months—were recruited. Diagnosis was established through detailed clinical history, physical examination, and confirmation of pain relief following a diagnostic spermatic cord block using 5 mL of 1% lidocaine combined with 40 mg of triamcinolone. Patients were excluded if they had a history of orchiectomy, active genitourinary infection, malignancy, unresolved psychiatric illness, or incomplete follow-up (9). Written informed consent was obtained from all participants, and the study was approved by the Institutional Review Board (IRB). Participants were randomly assigned into two equal groups using computer-generated random numbers. Group A (n=25) underwent *targeted* microsurgical spermatic cord denervation (MSCD), while Group B (n=25) received the *standard* (complete) MSCD procedure. All surgeries were performed by experienced urologists proficient in microsurgical techniques to maintain consistency and reduce operator-related bias.

In the standard MSCD group, complete skeletonization of the spermatic cord was performed under an operating microscope, including ligation and excision of all visible neural and vascular structures except for the testicular artery, vas deferens, and lymphatics. In contrast, the targeted MSCD group underwent selective transection of only three anatomical sites—cremasteric muscle fibers, peri-vasal sheath with surrounding tissues, and posterior cord lipomatous tissues—while preserving the vas deferens, vasal vessels, testicular artery, and lymphatic structures. Pain was assessed using the Visual Analog Scale (VAS), ranging from 0 (no pain) to 10 (worst possible pain). VAS scores were recorded preoperatively and at follow-up visits scheduled at 1 month, 3 months, and 6 months postoperatively. Pain outcomes were categorized as *complete resolution* (VAS 0), *partial relief* (≥50% reduction in VAS score), or *no improvement* (<50% reduction) (10-12). Data were analyzed using SPSS version XX. Descriptive statistics were used for demographic and clinical variables.

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Chi-square or Fisher's exact test was applied for categorical data, while independent t-tests were used for continuous variables. A p-value <0.05 was considered statistically significant.

RESULTS

The study enrolled 50 patients with chronic orchialgia who underwent either standard or targeted microsurgical spermatic cord denervation. Both groups were comparable at baseline, demonstrating no statistically significant differences in key demographic or clinical variables. The mean age in the standard denervation group was 34.6 ± 6.2 years, while in the targeted group it was 35.2 ± 5.8 years (p = 0.68). The average duration of testicular pain before intervention was also similar, recorded as 14.3 ± 3.7 months in the standard group and 13.9 ± 4.1 months in the targeted group (p = 0.75). Pain laterality showed a nearly equal distribution, with right-sided testicular pain being slightly more common in both cohorts: 52% in the standard group and 56% in the targeted group (p = 0.78). Additionally, a history of prior genitourinary surgery was reported in 24% of standard group participants and 28% of those in the targeted group, showing no statistically significant difference (p = 0.74). In terms of treatment efficacy, complete pain resolution was achieved in 19 out of 25 patients (76%) in the standard denervation group. Partial pain relief, defined as a ≥50% reduction in VAS score, was reported by 2 patients (8%), whereas 4 patients (16%) experienced no significant improvement in their pain levels. In the targeted denervation group, complete pain resolution was observed in 18 patients (72%). Only 1 patient (4%) reported partial relief, and 6 patients (24%) had no improvement in symptoms. Statistical comparison of these outcomes revealed no significant difference between the two surgical approaches, suggesting that both techniques offer comparable effectiveness in the management of chronic orchialgia in appropriately selected patients. Quantitative analysis of pain reduction using the Visual Analog Scale (VAS) revealed a progressive decline in mean pain scores across all follow-up intervals in both surgical groups. The pre-operative mean VAS score was 8.2 in the standard denervation group and 8.3 in the targeted group, reflecting comparable baseline pain intensity. At 1 month postoperatively, mean VAS scores decreased to 3.6 in the standard group and 4.0 in the targeted group. This downward trend continued at 3 months, with scores of 2.8 and 3.1, respectively, and further improved at 6 months, reaching 1.7 in the standard group and 2.0 in the targeted group. Although both groups demonstrated substantial pain relief over time, the standard denervation group showed slightly greater mean reduction at each follow-up point. However, the differences were not statistically significant, indicating that both surgical techniques offer comparable efficacy in reducing chronic testicular pain when assessed objectively through serial VAS measurements.

Table 1: Demographic Characteristics of Study Participants (n = 50)

Variable	Standard Denervation (n=25)	Targeted Denervation (n=25)	p-value
Mean Age (years ± SD)	34.6 ± 6.2	35.2 ± 5.8	0.68
Duration of Pain (months)	14.3 ± 3.7	13.9 ± 4.1	0.75
Side of Pain			
Right	13 (52%)	14 (56%)	0.78
Left	12 (48%)	11 (44%)	
History of Surgery			
Yes	6 (24%)	7 (28%)	0.74
No	19 (76%)	18 (72%)	

Table 2: Comparative Pain Relief Outcomes (Frequency and Percentage)

Outcome	Standard Denervation (n=25)	Targeted Denervation (n=25)
Complete Pain Resolution	19 (76%)	18 (72%)
Partial Pain Relief	2 (8%)	1 (4%)
No Improvement	4 (16%)	6 (24%)

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Table 3: VAS Score Comparison Over Time (Mean ± SD)

Time Point	Standard Denervation	Targeted Denervation
Pre-Operative	8.2	8.3
1 Month	3.6	4.0
3 Months	2.8	3.1
6 Months	1.7	2.0

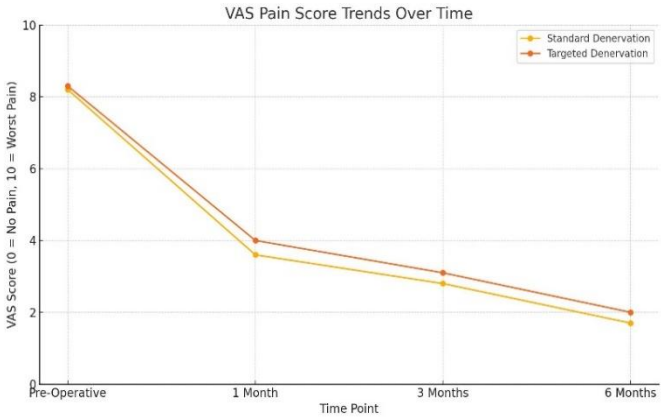

Figure 1 VAS Pain Score Trends Over Time

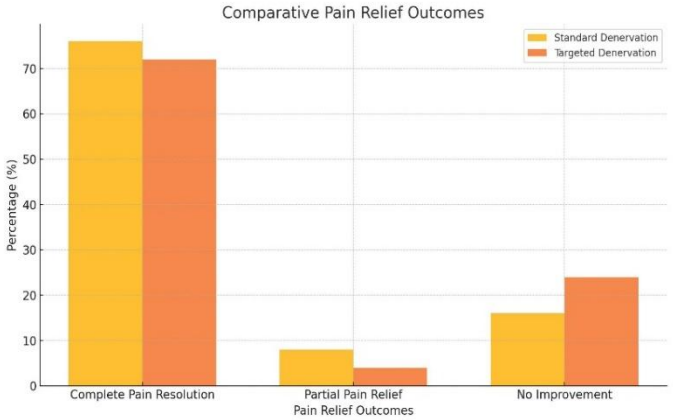

Figure 2 Comparative Pain Relief Outcomes

DISCUSSION

This comparative study evaluated the clinical outcomes of targeted versus standard microsurgical spermatic cord denervation in patients with chronic orchialgia, a condition known for its complex pathophysiology and significant impact on quality of life (13). Both techniques were found to yield comparable pain relief outcomes, reinforcing their role as effective surgical options for patients unresponsive to conservative management. Complete pain resolution was observed in 76% of patients in the standard denervation group and 72% in the targeted group, while partial relief was reported in 8% and 4% respectively. Although the standard group exhibited a marginally higher rate of complete resolution and a lower rate of persistent pain (16% vs. 24%), these differences were not statistically significant, suggesting therapeutic equivalence between the two approaches (14,15). These findings are in line with earlier studies that reported success rates between 70% and 80% for microsurgical spermatic cord denervation, particularly in patients with well-defined nociceptive foci confirmed through diagnostic nerve blocks (16,17). The targeted approach, which confines dissection to the cremasteric muscle fibers, peri-vasal sheath, and posterior cord lipomatous tissues, has been increasingly recognized for its potential to deliver similar outcomes with reduced operative trauma (18,19). Preservation of vascular and lymphatic structures may confer advantages in terms of faster recovery, minimized postoperative complications, and decreased risk of testicular atrophy. However, the slightly elevated rate of treatment failure in the targeted group raises important considerations regarding its applicability in patients with diffuse or multifocal pain syndromes, underscoring the need for individualized surgical planning guided by detailed preoperative evaluation (20,21).

An important strength of this study lies in its comparative analysis of two distinct surgical strategies under similar operative conditions by experienced urologists, allowing for meaningful assessment of procedural efficacy. Moreover, the use of diagnostic spermatic cord block prior to surgery strengthened the case definition and optimized patient selection. Nonetheless, the study has several limitations. The relatively small sample size may have reduced the power to detect subtle differences in outcomes, and the non-randomized design introduced potential selection bias. The follow-up period, limited to six months, restricts insights into long-term durability of pain relief and recurrence. In addition, the reliance on patient-reported pain outcomes without incorporating quality-of-life metrics or objective functional assessments limits the comprehensiveness of evaluation. Further research involving larger, randomized controlled trials with extended follow-up is essential to validate these findings. Future studies should also integrate standardized tools such as the Chronic Orchialgia Symptom Index and patient-reported outcome measures to provide a more nuanced understanding of therapeutic benefit (22).

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Comparative cost-effectiveness analysis may further clarify the relative advantages of targeted denervation in resource-constrained settings. Ultimately, while both techniques appear effective in appropriately selected patients, the choice between standard and targeted approaches should be guided by individualized pain patterns, intraoperative findings, and surgical expertise.

CONCLUSION

In conclusion, this study demonstrated that both targeted and complete microsurgical spermatic cord denervation are effective surgical strategies for managing chronic orchialgia in patients unresponsive to conservative treatment. While both techniques achieved meaningful pain relief, the targeted approach offers a less invasive alternative that may be preferable in selected cases without compromising efficacy. These findings support the inclusion of targeted denervation as a viable option in the surgical management of orchialgia, highlighting the importance of individualized treatment planning. Ongoing research is essential to further refine surgical indications and enhance long-term outcomes for this challenging condition.

AUTHOR CONTRIBUTION

Author	Contribution
Mir Abid Jan	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Naveed Ahmad Khan*	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Khalil Ur Rehman	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Spogmai	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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