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Research Article

Efficacy of Targeted vs Standard Spermatic Cord Denervation in the Management of Chronic Orchialgia: A Comparative Study

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Abstract

Objective: To evaluate and compare the outcomes of targeted versus complete spermatic cord denervation in patients suffering from chronic orchialgia.

Methods: A total of 50 patients presenting with chronic testicular or scrotal pain (>3 months duration) were enrolled. Diagnosis was confirmed through clinical evaluation and diagnostic nerve block using local anesthetic and corticosteroid. Twenty-five patients underwent targeted denervation, while the remaining 25 underwent complete spermatic cord denervation.

Results: In the standard denervation group, 19 patients (76%) reported complete resolution of pain, 2 (8%) reported partial relief, and 4 (16%) experienced no improvement. The targeted denervation group demonstrated complete resolution of pain 18 patients, and 6 patients has no improvement while one patient has partial pain, indicating no significant difference in outcomes between the two approaches.

Conclusion: Both targeted and complete denervation are effective strategies for management of chronic orchialgia. Denervation should be considered a viable treatment option for patients with persistent orchialgia unresponsive to medical therapies and nerve block.

Introduction

Chronic orchialgia characterized by persistent testicular or scrotal pain lasting for more than three months, represents a distressing and often debilitating condition that can severely affect a patient's quality of life [1]. The pain may be constant or intermittent, dull or sharp, and frequently radiates to the groin, lower abdomen, inner thigh, or perineum—making diagnosis and management particularly complex. Despite being relatively common in urological practice, chronic orchialgia remains a therapeutic challenge due to its multifactorial etiology, which may include prior surgeries (such as vasectomy or hernia repair), infections, trauma, varicocele, or idiopathic causes where no identifiable source is found [2].

Initial management typically involves a combination of pharmacological therapy and nerve blocks. However, a significant subset of patients fails to achieve adequate relief with conservative measures, prompting the consideration of surgical intervention. Microsurgical spermatic cord denervation (MSCD) has emerged as a well-established surgical technique with encouraging success rates [1,2]. It targets the disruption of pain-transmitting nerve fibers within the spermatic cord while preserving key anatomical structures essential for testicular function. Over time, two main approaches to this procedure have been developed: standard (complete) spermatic cord denervation, which involves wide dissection and skeletonization of the cord, and targeted spermatic cord denervation, which focuses only on three primary anatomical sites believed to be responsible for most pain transmission—namely, the cremasteric muscle fibers, perivasal tissues, and posterior cord lipomatous tissues [3].

Although both approaches aim to achieve pain relief, targeted denervation has been proposed as a less invasive alternative that may offer similar outcomes with potentially fewer risks and shorter recovery times. Nevertheless, data directly comparing the effectiveness of these two techniques remain limited. This study aims to fill that gap by evaluating and comparing the efficacy of targeted versus standard spermatic cord denervation in patients with chronic orchialgia who have failed conservative therapy. By analyzing the outcomes of both approaches, we hope to provide clearer guidance for clinicians in selecting the most appropriate surgical strategy for managing this challenging condition.

Methods

This comparative study enrolled 50 patients with chronic testicular or scrotal pain was conducted in tertiary care hospital from September 2022 to September 2024. The diagnosis was confirmed through clinical evaluation and a diagnostic nerve block using local anesthetic and corticosteroid (triamcelone). Patients were divided into

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two groups: 25 underwent targeted denervation, and 25 underwent standard spermatic cord denervation. Outcomes were assessed based on pain resolution, partial relief, or no improvement.

Spermatic Cord Denervation Techniques

The following procedures outline the surgical approaches to spermatic cord denervation, used in the management of chronic orchialgia.

A. Standard Denervation

This procedure involves complete skeletonization and meticulous dissection of the entire spermatic cord. The following anatomical structures are preserved:

- Gonadal arteries: internal spermatic and external spermatic (cremasteric) arteries
- Lymphatic vessels
- Vas deferens

All other structures, including:

- All veins
- Microscopically identifiable nerves throughout the spermatic cord are carefully ligated and divided to achieve maximal denervation.

B. Targeted Denervation

This selective approach focuses on preserving key anatomical structures while denervating specific pain-contributing elements. The following steps are undertaken:

- Ligation and division of:
  - o Cremaster muscle fibers
  - o Peri-vasal tissues and vasal sheath
  - o Posterior lipomatous peri-vasal tissues
  - o All veins, excluding the vasal veins
- Preservation of:
  - o Gonadal arteries: internal spermatic and external spermatic (cremasteric) arteries
  - o Lymphatic vessels

Result

In patients with standard denervation complete pain resolution was reported by 19 patients (76%), indicating a high success rate with complete resolution of pain in testis. Partial pain relief was observed in 2 patients (8%). And no improvement was noted in 4 patients (16%), suggesting persistent pain despite the procedure (Table 1). In patients with partial denervation complete pain resolution was achieved by 18 patients (72%). Partial pain relief occurred in 1 patient (4%) and No improvement was experienced by 6 patients (24%). Statistical analysis indicated no significant difference in pain relief outcomes between the two groups, suggesting that both approaches may be comparably effective for selected patients.

Table 1: Standard denervation complete pain resolution.

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%)

Discussion

This comparative study aimed to evaluate the efficacy of targeted spermatic cord denervation (tSCD) versus standard spermatic cord denervation (SCD) in the management of chronic orchialgia, a condition that poses significant therapeutic challenges due to its complex and often multifactorial etiology [4]. The findings of our study demonstrated that both surgical approaches resulted in notable rates of pain relief, with no statistically significant difference between the two techniques [5,6].

In our cohort, the standard SCD group showed a complete pain resolution in 76% of patients, partial relief in 8%, and no improvement in 16%. Similarly, the targeted SCD group achieved complete resolution in 72%, partial relief in 4%, and no improvement in 24% of cases. These results indicate that while standard SCD had a slightly higher absolute rate of complete resolution, the overall outcomes were not significantly different from the targeted approach.

These findings are consistent with prior studies demonstrating the utility of microsurgical denervation of the spermatic cord in treating chronic orchialgia, where success rates have typically ranged from 70–80% in terms of complete or significant pain relief [7,8]. The comparable efficacy of targeted denervation aligns with the growing interest in minimizing surgical dissection and preserving structures not implicated in pain transmission [9]. By focusing on key pain-generating components—namely, the cremasteric muscle fibers, peri-vasal tissues, and posterior cord lipomatous tissues—targeted SCD aims to reduce surgical morbidity while maintaining therapeutic benefit [10].

The slightly higher rate of persistent pain in the targeted group (24% vs 16% in standard SCD) may reflect the limitations of a selective approach in certain patients, especially those with more diffuse or multifocal pain sources. This underlines the importance of careful patient selection and comprehensive preoperative evaluation, including diagnostic spermatic cord blocks, to guide the choice of surgical technique [11].

While the lack of statistical significance suggests clinical equipoise between the two methods, it is worth considering that targeted SCD may offer additional advantages, such as reduced operative time, potentially faster recovery, and lower risk of complications related to extensive dissection. These benefits, however, require further validation in larger, multicentre trials with longer follow-up periods to assess durability of pain relief and patient satisfaction. Limitations of this study include the relatively small sample size, lack of randomization, and short-term follow-up. Additionally, the subjective nature of pain assessment and potential placebo effects must be considered when interpreting surgical outcomes. Future studies should incorporate standardized pain scoring systems, quality-of-life assessments, and cost-effectiveness analyses to better define the role of targeted versus standard denervation in the algorithm of orchialgia management.

Conclusion

In conclusion, both targeted and complete spermatic cord denervation are effective in managing chronic orchialgia, offering substantial pain relief to most patients. Given the comparable pain relief outcomes, targeted denervation may serve as a less invasive alternative in appropriately selected cases. Further research is warranted to refine patient selection criteria and optimize surgical techniques for improved long-term outcomes.

Authors Contribution

1. NAQIB ULLAH supervisor and design of study,
2. MUHAMMAD IZHAR Data collection,
3. ZAKIR KHAN Data collection and analysis,
4. NAVID KHAN Data Collection,
5. FAHIM ULLAH Computer work and references writing,
6. SAJID SHAKEEL References writing.

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