Targeted Robotic Assisted Microsurgical Denervation of the Spermatic Cord for the Treatment of Chronic Orchialgia or Groin Pain: A Single Center, Large Series Review

Nahomy Calixte, Bayo Tojuola, Ibrahim Kartal, Ahmet Gudeloglu, Matthew Hirsch, Mohamed Etafy, Richard Mendelson, Borivoje Djokic, Sarah Sherba, Kunal Shah, Jamin Brahmbhatt and Sijo Parekattil*

From the PUR Clinic and South Lake Hospital, Clermont and Keiser University Graduate School (RM, BD), Fort Lauderdale, Florida

Purpose: Microsurgical denervation of the spermatic cord is a treatment option for chronic orchialgia refractory to conservative treatment. A recent study showed specific nerve fibers as the possible cause of chronic orchialgia. Our goal was to present the outcomes of ligation of these nerves using a technique of targeted robotic assisted microsurgical denervation of the spermatic cord.

Materials and Methods: We retrospectively reviewed the records of 772 patients who underwent targeted robotic assisted microsurgical denervation of the spermatic cord from October 2007 to July 2016. Selection criteria were chronic testicular pain more than 3 months in duration, failed conservative treatments, negative neurological and urological workup, and temporary resolution of pain with a local anesthetic spermatic cord block. Targeted robotic assisted microsurgical denervation of the spermatic cord was performed. Pain was assessed preoperatively and postoperatively using a subjective visual analog scale and objectively with the standardized and validated PIQ-6 (Pain Impact Questionnaire-6) score.

Results: Followup data were available on 860 cases. During a median followup of 24 months (range 1 to 70) 718 cases (83%) showed a significant reduction in pain and 142 (17%) had no change in pain by subjective visual analog scale scoring. Of cases with a significant reduction in pain 426 (49%) had complete resolution and 292 (34%) had a 50% or greater reduction. Objective PIQ-6 analysis showed a significant reduction in pain in 67% of patients 6 months postoperatively, in 68% at 1 year, in 77% at 2 years, in 86% at 3 years and in 83% at 4 years.

Conclusions: Targeted robotic assisted microsurgical denervation of the spermatic cord is an effective, minimally invasive approach with potential long-term durability in patients with refractory chronic orchialgia.

Key Words: testis, pain, denervation, robotics, microsurgery

Abbreviations and Acronyms

MDSC = microsurgical denervation of spermatic cord

PIQ-6 = Pain Impact Questionnaire-6

SCP = scrotal contents pain

TRMDSC = targeted robotic assisted MDSC

VAS = visual analog scale

Accepted for publication October 18, 2017.

No direct or indirect commercial incentive associated with publishing this article.

The corresponding author certifies that, when applicable, a statement(s) has been included in the manuscript documenting institutional review board, ethics committee or ethical review board study approval; principles of Helsinki Declaration were followed in lieu of formal ethics committee approval; institutional animal care and use committee approval; all human subjects provided written informed consent with guarantees of confidentiality; IRB approved protocol number; animal approved project number.

* Correspondence: The PUR Clinic and South Lake Hospital, 1900 Don Wickham Dr., Clermont, Florida 34711 (telephone: 352-536-8761; FAX: 321-843-2120; e-mail: sijo@orlandohealth.com).

Chronic orchialgia or SCP is a difficult medical condition for patients and physicians alike.[1] SCP is defined as intermittent or constant unilateral or bilateral testicular pain more than 3 months in duration.[2,3] This pain may be a result of prior vasectomy, inguinal hernia surgery, scrotal surgery and recurrent epididymitis or it may be idiopathic.[3–9] The exact mechanism for SCP is not well understood but it is thought to possibly represent neural changes to the peripheral and central nervous

0022-5347/18/1994-1015/0
THE JOURNAL OF UROLOGY®

https://doi.org/10.1016/j.juro.2017.10.030
Vol. 199, 1015-1022, April 2018
Printed in U.S.A.

system which enables persistent stimulation of pain receptors without inhibitory feedback.[10,11] There may be an underlying issue causing the testicular pain in some men. Men in whom no other cause can be identified may have Wallerian degeneration.

Conservative treatments such as analgesics, anti-inflammatory agents, antidepressants, antibiotics, physical therapy, biofeedback, acupuncture, local nerve blocks, regional nerve blocks and psychotherapy should be tried as first line therapy. However, these treatments are frequently ineffective.[2,12] There are surgical options for men in whom conservative management fails and the most aggressive surgical treatment is orchiectomy with varying results.[2,13] Chen and Ball performed epididymectomy to treat SCP with a 50% success rate.[7] Vasectomy reversal is another surgical option for post-vasectomy chronic orchialgia. The pain relief rate has ranged from 69% in the study by Nangia et al[4] to 84% in the series by Myers et al.[6]

A less aggressive form of surgical treatment is MDSC, which was introduced in 1978 by Devine and Schellhammer.[12] A number of groups have further developed and refined the technique with promising results.[13,14] Levine et al initially described total pain relief following MDSC in 6 of 7 patients with chronic orchialgia.[15] An international, multi-institutional study by Oliveira et al in 60 men showed complete resolution of pain in 70% and partial resolution in 20%.[16]

Standard MDSC involves 1) identification of the testicular, cremasteric and deferential arteries, 2) ligation of the internal spermatic veins, 3) division of all cremasteric musculature and spermatic cord fascia, and 4) preservation of a few lymphatics.[17] The entire spermatic cord is skeletonized, which is quite aggressive and could potentially lead to lymphocele, seroma and hematoma formation. There was a lack of data on the exact nerves that may be denervated in MDSC and even less data on whether all of these tissues need to be ligated. Thus, Parekattil et al performed a study comparing men with SCP to men without SCP.[18] They found that in 84% of men with SCP there were 3 specific locations in the spermatic cord that harbored nerves with Wallerian degeneration compared to only 20% of healthy nonSCP controls. The 3 primary locations were the cremasteric muscle fibers, the perivasal sheath and the posterior lipomatous tissue. Ligation of this trifecta nerve complex was postulated as the possible anatomical basis for the success of MDSC in the management of SCP.

Thus, a more targeted approach of nerve ligation was developed, namely TRMDSC. In this approach the inner spermatic sheath is completely spared so that only 5% to 10% of the spermatic cord is ligated without any risk of injury to the testicular artery and the vasal artery. Our study presents long-term outcomes of this less aggressive and more targeted technique.

To our knowledge there are no data on the effect of MDSC on the long-term postoperative function of the testicle (sperm and testosterone production). A subset analysis of patients with SCP and a varicocele who underwent combined TRMDSC and varicocelectomy was also performed to assess long-term functional testicular outcomes. The purpose was merely to assess whether TRMDSC negatively impacts testicular function in the long term.

MATERIALS AND METHODS

Patient Population

Two fellowship trained microsurgeons retrospectively analyzed 872 TRMDSC cases (772 patients) from October 2008 to July 2016. Charts were reviewed to obtain pertinent information. Institutional review board approval was acquired for this study.

Patient selection was based on certain criteria, including chronic testicular pain (more than 3 months in duration), failed standard pain management treatments, negative neurological workup (negative lumbar spine magnetic resonance imaging if there was any back pain), negative urological workup (negative scrotal ultrasound and upper tract study) and complete temporary resolution of pain with a local anesthetic spermatic cord block. TRMDSC was only offered after other conservative treatment modalities had been considered or attempted and any other functional abnormality was corrected. For example, if inguinal hernia was present, it was repaired first. A total of 12 cases were excluded from study due to lack of followup data.

Of the 772 patients 100 (13%) underwent bilateral TRMDSC. If patients had bilateral pain, we recommended performing 1 side at a time to determine whether the procedure was successful on the more painful side first. Most of these patients underwent sequential surgery with a good response on 1 side and then a later return for surgery on the contralateral side.

Surgical Approach

A 1 to 2 cm transverse subinguinal incision was made. The spermatic cord was dissected, the ilioinguinal nerve was cauterized and transected medially, and the genital branch of the genitofemoral nerve was cauterized and transected laterally. These nerve branches are difficult to visualize. We tend to ligate the perispermatic cord lipomatous tissues medial and lateral to the spermatic cord that contains these nerve branches based on cadaver dissections that we performed previously.[18]

The robotic surgical platform was then brought into the field. The spermatic cord was elevated on a Penrose drain and then dissected (fig. 1). The cremasteric fibers, perivasal tissues (preserving the vasal artery) and the posterior lipomatous tissues were transected. The internal spermatic sheath was preserved. The vasal sheath was hydrodissected to ensure the ligation of neural tissue