# Techniques – Tension-relieving microdot vasovasostomies and longitudinal intussuscepted vasoepididymostomy vasectomy reversals: A first report

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## ABSTRACT

**Introduction:** Tension and malalignment of vasectomy reversal (VR) anastomoses are hypothesized to contribute to failure. We report VR outcomes using a novel technique introducing a tension-reliving hitch in the multi-layer microdot vasovasostomy (VV) and longitudinal intussuscepted vasoepididymostomy (LIVE; VE).

**Methods:** All vasectomy reversal patients between May 2019 and September 2023 from a single surgeon were reviewed. Patients were included if they underwent a VR, with at least one semen analysis within six months of surgery and a

**KEY MESSAGES**

- Vasectomy reversals commonly require vasoepididymostomy anastomoses with longer intervals of obstruction; however, 15% of individual will still require a vasoepididymostomy with obstructive intervals <5 years.
- Using a microdot surgical technique to promote symmetrical and precise stitch placement in addition to tension-relieving hitch stitches results in high patency rates.
- Longitudinal intussuscepted vasoepididymostomy technique with three tension-relieving sutures promotes high patency rates.
- More work is required to define standardized patency and late failure definitions.

minimum of six months of followup after the surgery to deem a failure. The primary outcome was patency, which was defined as 1) any sperm in the ejaculate; and B) functionally as at least two million motile sperm. Late failure was defined as an azoospermic semen analysis result after previously documented presence of sperm.

**Results:** A total of 159 patients were evaluated, of which 136 patients met the inclusion criteria. The patency rate among all VRs was 97.7 %, with an overall functional patency rate of 93.1%. One hundred and one patients underwent bilateral VVs, with a 99% patency rate and 95.5% functional patency rate. Twenty-three patients underwent a mixed VV/VE with a patency rate of 100% and a functional patency rate of 88.8%. Finally, 12 patients underwent bilateral VE, with a patency rate of 83.3% and a functional patency rate of 77.7%. Among these patients, four VV patients were identified to have a late failure.

**Conclusions:** The combination of tension-relieving stitches for VVs and VEs, along with attention to symmetrical and precise stitch placement, results in high patency rates.



## INTRODUCTION

Vasectomy reversal VR is achieved via vasovasostomy VV or vasoepididymostomy VE. The definition of patency is heterogeneous. Several studies have defined patency as the presence of motile sperm, with patency ranging 84% to 88%.[1-3]Other studies have described patency as any sperm in the ejaculate with a success rate ranging 89% to 98%.[4,5]

Epididymal obstruction following vasectomy necessitates the use of a VE anastomosis. A meta-analysis involving 42 studies of bilateral vasoepididymostomies revealed an overall mean patency rate of 64.1%.[6]

One of the post-reversal risks is late failure, which is defined as the onset of azoospermia or having nonmotile sperm after previously demonstrating motile sperm.[7]

We hypothesized that high patency rates could be achieved by adding tension-relieving sutures to the vasal adventitia and precisely placing 10-0 and 9-0 sutures to form the anastomosis. This study reports our technical patency and late failure rates.

## METHODS

After clinical research ethics board approval, a retrospective review was performed on all VRs conducted between May 2018 and September 2023. Two independent reviewers were utilized for chart review and data extraction.

### Surgical technique

Depending on the microscopic examination of the testicular vasal fluid, If the microscopic fluid examination revealed motile sperm, nonmotile sperm, sperm with short tails or sperm heads, the surgical team proceeded with VV, as previously reported.[8] The microdot two-layer anastomotic

technique was utilized as described by Goldstein [9] with minor modifications. Transection of the vas deferens deviates from Goldstein's reports, where we use a 15-blade scalpel due to a lack of availability of the described beaver blade in Canada. We use six interrupted 10-0 Nylon sutures for the mucosal layer and 12 interrupted 9-0 Nylon sutures for the muscularis, with small modifications to 9-0 placement. We systematize 9-0 placement by placing the 9-0 sutures superficial to the 10-0 sutures. The 9-0 sutures placed between the 10-0s were intended to be precise in depth and distance between the suture placement's entrance and exit sites. Figure 1. A single 5-0 Prolene stitch was added through the vasal adventitia to achieve a tension-free anastomosis Figure 1.

If no sperm or sperm parts were detected, or no sperm were seen even after gentle barbotage or in the presence of copious clear fluid, a VE was performed. The LIVE technique was used. The abdominal vas was tunneled through the tunica vaginalis and secured by three 5-0 prolene 'hitch stitches'. After Confirmation of sperm through puncture of an epididymal tubule, an anastomotic site will be chosen proximally toward the testis. Three 9-0 Nylon sutures are placed between the vasal muscularis and the tunica vaginalis posteriorly. Two parallel double-arm 10-0 sutures are placed in the chosen epididymal tubule oriented longitudinal to the vas deferens; however, the needles were only partially pulled through. A small incision is made between the two needles with a triangular ophthalmic Beaver Mini-Blade. Once the epididymal fluid releases from the tubule, confirming that it has been cut, both needles are pulled through, and all four needles are placed through the vasal lumen from inside to out for the respective positions. Six to ten 9-0 sutures are applied between the epididymal tunica and the vasal muscularis to reduce the tension over the anastomoses and create a watertight connection Figure 2.

**Followup**

Patients perform first semen analysis between 6-8 weeks postoperatively, then every 2-3 months until normalization of semen analysis parameters or pregnancy is achieved.

**Inclusion criteria**

Patients who pursued a VR for fertility purposes were included. Patients need at least one semen analysis within six months of surgery and a minimum of six months of follow-up.

**Primary outcomes**

Patency rate after VR defined as any sperm in the ejaculate. We also include a second functional definition of patency, which is at least two million total motile sperm (TMS), which is reported to be the lowest threshold for intrauterine insemination.[10]

Secondary outcomes: late failure rate, which was defined as the development of azoospermia after the previously documented presence of sperm following VR.

## RESULTS

159 patients underwent VR, and 136 met the criteria. The mean time since vasectomy was eight years (Standard Deviation SD 5.50), The mean patient age was 41 (SD 6.17), and the mean partner's age was 34 (SD 4.63). Table 1 reports patient characteristics.

The overall patency rate for all vasectomies (VVs, VEs, and mixed VV/VE) was 97.7% for finding sperm and 93.1% for at least two million TMS. 101 patients had bilateral VVs; patency rate was 99% for any sperm and 95.5% for at least two million TMS. The post-operative semen analysis for the singular failure reported abundant sperm heads, which was the same finding during microscopic fluid examination intra-operatively. In this case, the anastomosis was found to be patent on one of the two sides during revision surgery where bilateral VEs were successfully performed. Of note, the sperm heads were shrivelled in appearance and without short tails. After this early failure, we performed VVs with a minimum criterion of sperm heads with short tails. Following this decision-making, 76 VV's were performed with patency rates of 100% for any sperm and 97.3% for more than 2 million TMS. A total of four patients had a late failure following VV.

Twelve patients underwent bilateral VE's with an 83.3% patency rate for any sperm, and 77.7% for at least two million TMS, respectively. Twenty-three patients underwent mixed VV/VE anastomoses. The patency rate for any sperm was 100% and 88.8% for a minimum of 2 million TMS Figure 3. Anastomotic requirements with respect to bilateral VV, bilateral VE or mixed VV/VE, as a function of obstructive interval, are summarized in Figure 4.

## DISCUSSION

This study describes the outcomes of VVs, VEs, and mixed VV/VE with addition of tension-relieving sutures and attention to the symmetry of suture placement. The reported results were among the highest published in the literature. Our techniques aimed to build upon previous advancements from others in the field. Use of a multi-layer microscopic approach with the placement of microdots for systematizing precise equispaced sutures was introduced by Goldstein and led to a substantial improvement in patency rates among VVs reported a patency rate of 99.5%.[9] More recently, in an attempt to reduce the anastomotic tension, Savage et al. reported the ReVas technique, where they applied 5-10 interrupted sutures or one running suture through the vasal adventitia using a 9-0 nylon. In their study, a 93% success rate defined as >0 sperm/ml at any point was reported.[11] We conceptually combined the microdot multi-layer approach with a tension-relieving approach inspired by the ReVas technique. Differing from ReVas technique, instead of using numerous 9-0 nylon sutures, we aimed to reduce the number of stitches, improving time efficiency and establish a gentle arc surrounding the site of anastomosis for VVs rather than a tight arc seen with the ReVas. We applied a similar approach for VEs, where we utilized three 5-0 prolene sutures to secure the vasal adventitia to the tunica vaginalis, leaving enough length for the vas to have a gentle arc at the site of VE anastomosis.

We captured the frequency of anastomotic subtypes based on obstructive intervals. We found that obstructive intervals >16 years have a 54-83% chance of having at least one anastomosis being a VV, suggesting that epididymal obstruction is not linear as statistically depicted in previous studies.[3] Similarly, at least one of the anastomotic sides will require a VE in 15% of cases with 0-5 year obstructive intervals and 26% for 6-10 year obstructive intervals.

This study has several limitations; 23 participants were ultimately lost to follow-up, limited number of patients included. The study lacks a control group and live birth data.

## CONCLUSIONS

Tension-free anastomosis and precise, symmetrical suture placement are essential for successful anastomoses. We report a technique that achieves high patency rates.

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## FIGURES AND TABLES

**Figure 1.**

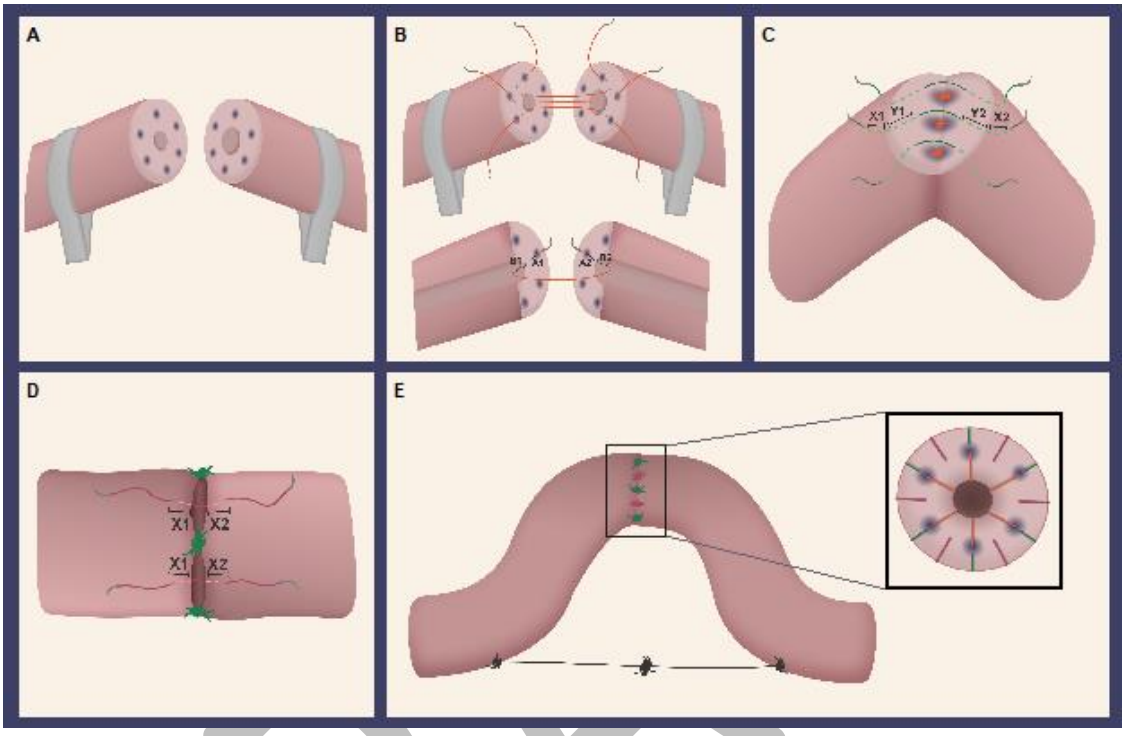

**Figure 2.**

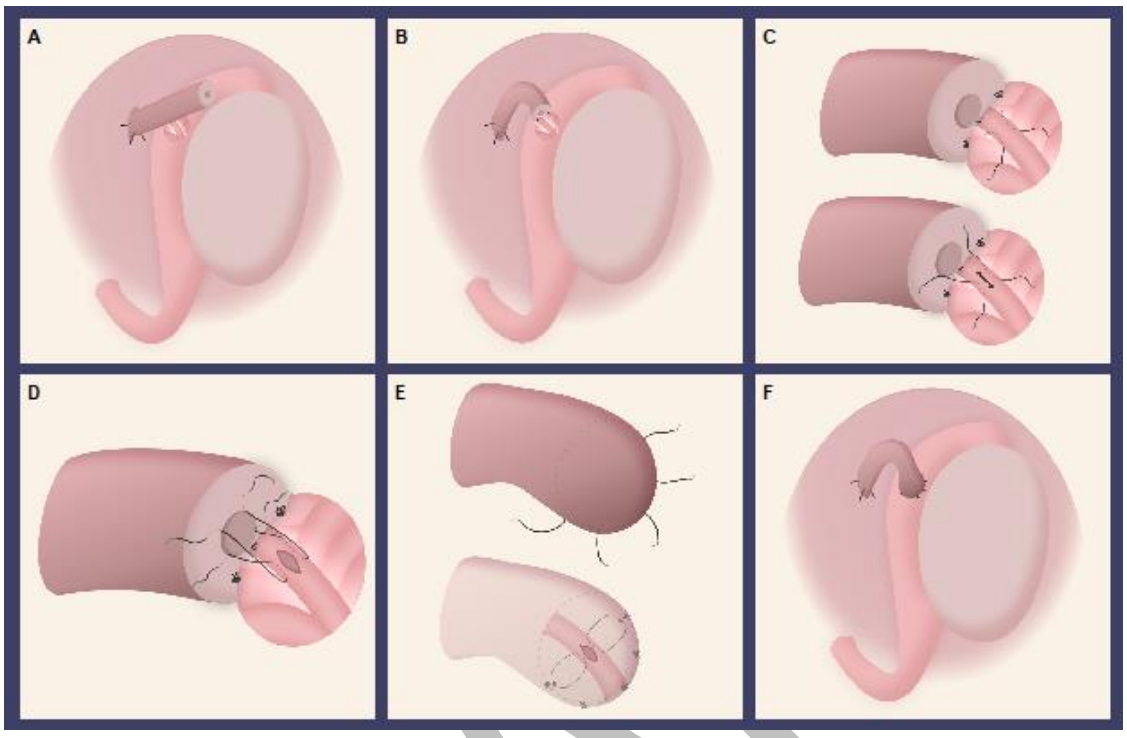


**Figure 3.**

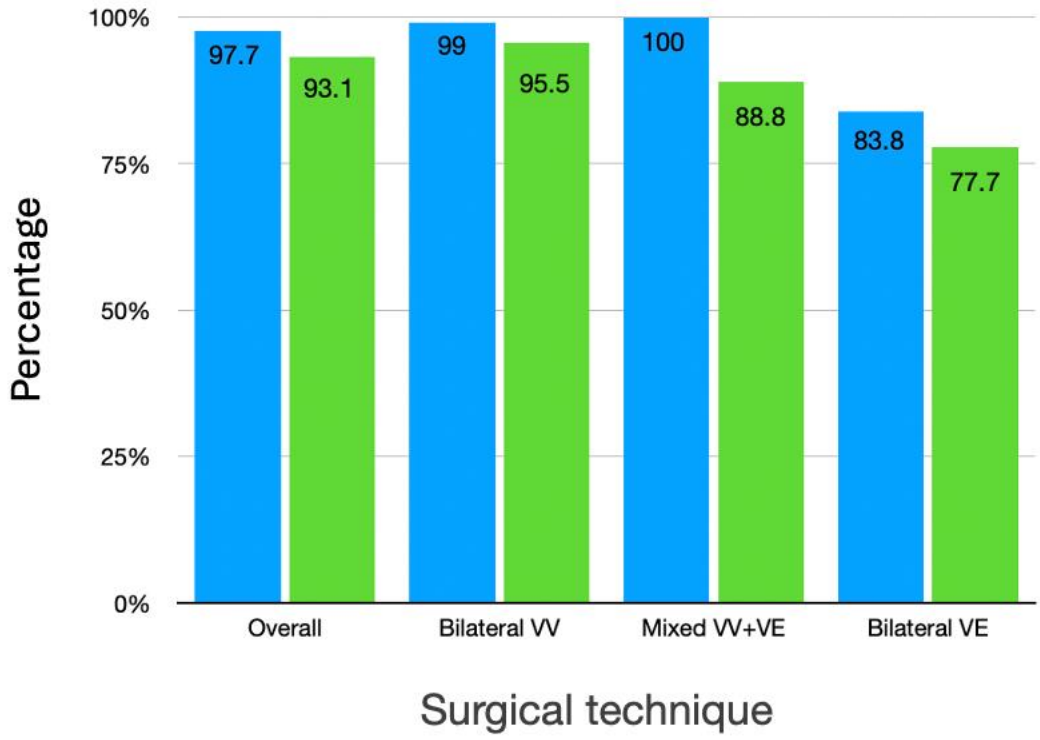

**Figure 4.**