Vasovasostomy: a review of technical considerations and evaluation of results in the Hospital General de México

Maldonado-Ávila M.

ABSTRACT

Vasectomy is a form of male contraception that consists of tying or removing a segment of each vas deferens so that sperm cannot pass from the testes to the ejaculatory ducts. Around 6% of vasectomy patients will ask for vasectomy reversal.

Objective: The purpose of this article is to know the perioperative evaluation of patients requesting vasovasostomy and to review the different microsurgical techniques that can be developed in this type of procedure as well as to provide specific results from the Hospital General de México.

Results: According to various reports by different authors in the medical literature, vasovasostomy is a feasible technique for re-establishing fertility in the male after vasectomy. Optimum results are obtained with microsurgical techniques and success prognosis is inversely proportional to the amount of time that has passed since vasectomy. The possibility of cryopreservation should be considered at the time of surgery. Regarding the results of the present article, mean time since vasectomy was 5.8 years. Spermatozoa

RESUMEN

La vasectomía constituye un método de anticoncepción electivo para el varón, que consiste en la ligadura o remoción de un segmento de ambos conductos deferentes, evitando así el paso de espermatozoides de los testículos a los conductos eyaculadores. Alrededor de 6% de los pacientes vasectomizados, solicitarán en el futuro la recanalización de la misma.

Objetivo: El propósito de este document es conocer la evaluación peri-operatoria de los pacientes que solicitan vaso-vasoanastomosis y revisar las diversas técnicas microquirúrgicas que se pueden desarrollar en este tipo de procedimiento, así como dar a conocer los resultados de nuestro hospital.

Resultados: De acuerdo a la revisión bibliográfica de diversos autores, la vaso-vasoanastomosis es una técnica factible para restablecer la fertilidad en el varón sometido a vasectomía. Los mejores resultados se obtienen con técnicas microquirúrgicas y el pronóstico de éxito es inversamente proporcional al tiempo transcurrido desde la vasectomía. Se debe considerar la posibilidad de criopreservación al momento de la cirugía. Con respecto a
were present in postoperative semen analysis in 82% of patients that underwent surgery.

**Key words:** vasovasostomy, vasectomy, male, infertility, Mexico.

- **INTRODUCTION**

Vasectomy is a contraceptive method for men and consists of tying or removing a segment of both vasa deferentia preventing the passage of spermatozoa from the testes to the ejaculatory ducts. Although initially it was conceived of as a definitive sterilization method, it can be reversed in the majority of cases, restoring fertility in patients who have decided they wish to have another child. It is estimated that more than 30 million couples worldwide have selected vasectomy as their contraceptive method of choice. Around 6% of vasectomy patients will ask for a future vasectomy reversal.1

In Mexico in 1999, the Dirección General de Salud Reproductiva reported a total of 37,331 vasectomies performed in its corresponding health institutions. This figure does not include procedures carried out in private health institutions.2

The purpose of the present article is to become familiar with perioperative evaluation of patients undergoing vasovasostomy (VV) and to review the different microsurgical techniques that can be developed in this type of procedure as well as reporting on the experience in the author’s hospital.

- **PATIENT EVALUATION**

Even though vasectomy reversal is feasible in the majority of cases, the state of fertility and ages of couples should be known because they have prognostic connotations for achieving pregnancy after surgery. Those patients requesting vasectomy reversal for reasons other than restoring fertility, for psychological reasons or because of presenting with postvasectomy pain syndrome should be given psychological assessment or more conservative treatments in pain management before proceeding to vasectomy reversal. Although pathogenesis of postvasectomy pain syndrome is not completely understood, rechannelization of the vasa deferentia can offer relief in carefully selected patients.3

The length of the removed vasa deferentia segments is evaluated through physical examination to identify those patients in whom it would be necessary to modify traditional incision. In the same manner, abnormalities or indurations in the epididymis are observed. Epididymal bulge suggests obstruction at this level but it does not infallibly predict which patients require vasoepididymostomy.4

It is important to identify the presence and extension of scrotal granuloma, particularly in Mexico, where silk is a widely used suturing material for this type of surgery, causing much granulomatous reaction.

- **PREOPERATIVE LABORATORY ANALYSIS**

There is no specific test that should be ordered before carrying out VV and therefore the usual preoperative tests are done. About 60% of patients will produce antisperm antibodies after vasectomy.5 Some researchers have suggested that those antibodies can reduce the possibility of pregnancy after reconnection. However, the reported 50–70% pregnancy percentage is relatively high. There is no close correlation between the presence of antisperm antibodies and postoperative fertilization.6 Thus the value of this test as part of preoperative procedure is controversial and not based on proven scientific evidence.7-10

Before proceeding to vasa deferentia rechannelization, reproductive potential of the couple should be evaluated. Alternatives to surgery should be discussed such as obtaining sperm through testicular or epididymal aspiration to be used in an assisted reproduction method like intracytoplasmic sperm injection. Whether a couple wishes to have only one
child or more than one should be taken into account since the cost of assisted reproduction methods is higher than that of VV.11

### SURGICAL CONSIDERATIONS

**Anesthesia:** This surgery can be carried out with local, regional or general anesthesia and the decision is totally dependent on what the anesthesiologist, surgeon and patient prefer.

**Incision type and localization:** Contrary to what is usually done in scrotal surgery, VV is performed by making a vertical incision on the anterior side of the scrotum, one on each side. If vasectomy was done at the highest portion of the spermatic cord, or a long segment of the vas deferens was extirpated, then it may be necessary to extend the incision to the inferior portion of the inguinal region or even make an infrapubic incision. This type of incision allows for easy and quick access to the high vasectomy site in the scrotum and to the abdominal portion of the vas deferens and so adequate dissection is carried out achieving tension-free anastomosis.12

### GENERAL INTRAOPERATIVE CONSIDERATIONS

If patient characteristics allow for adequate exposure of both ends of the vas deferens through a small incision of 2-3 cm, this will be sufficient so that anastomosis can be performed. However, in the majority of cases it is necessary to exteriorize the testis as well as the epididymis so that the site of vasectomy and granuloma can be identified. Tension-free dissection of both ends of the vas deferens is carried out and epididymis is explored for possible obstruction at that level making vasoepididymostomy necessary.

Once the tied ends of the vas deferens are resected then their permeability is verified by introducing sterile saline solution into the abdominal end with a 24- gauge endovenous catheter with no needle. The testicular portion should never be irrigated as this would cause severe damage to the epididymis.

Liquid is obtained when the testicular end is sectioned or through gentle pressing of the epididymis. This liquid is aspirated with the same endovenous catheter and a sample is obtained and then microscopically analyzed for spermatozoa. This liquid should be diluted with a few drops of saline solution which will facilitate its viewing by microscope since its consistency is often viscous.13 After detailed observation of the liquid, sperm quality is classified as follows:

- Grade 1: Principally normal mobile spermatozoa
- Grade 2: Principally normal non-mobile spermatozoa
- Grade 3: Principally spermatozoal heads
- Grade 4: Only spermatozoal heads
- Grade 5: Absence of spermatozoa

The two portions of the vasa deferentia, now freed, should be dissected with a minimum of skeletonization in order to prevent devascularization. This tension-free dissection allows for adequate anastomosis, with or without using approximating clamps specially designed for this purpose.

Sperm quality (Grades 1-5) observed in the obtained liquid influences procedure choice. VV is performed when Grade 1-4 spermatozoa are identified in the testicular end. Although VV results are good even with only spermatozoal heads (Grade 4), some surgeons that utilize the technique by means of a microscope prefer vasoepididymostomy under these circumstances.14 The majority of liquid obtained from the testicular vas deferens should be recovered by endovenous catheter aspiration because if rechannelization fails these cryopreserved spermatozoa can be used in a later in vitro fertilization method.15

When no spermatozoa are observed in the liquid, the time that has elapsed since vasectomy does not necessarily predict the probability of sperm production restoration. The probability that sperm production is restored and pregnancy is produced is greater in those patients that have a clear, transparent and colorless liquid and is lower in those patients with a cloudy, viscous liquid. The probability is even lower in those patients with a thick and creamy liquid.13 When this is the case, careful exploration of the epididymis is recommended. If a pale or hardened zone is found it usually indicates postvasectomy epididymal tubule rupture due to the increase in intraluminal pressure. Under these circumstances vasoepididymostomy should be performed, which requires greater microsurgical skill and experience.

### TYPES OF ANASTOMOSIS

In general it is accepted that microsurgical techniques offer the best results for this type of procedure, without ignoring the fact that some surgeons have obtained satisfactory results with macrosurgical or
teleloupe-assisted techniques. A Mexican study with a 10-patient sample employing modified Zhu Xie-Yeng macrosurgical technique with 3-0 nylon splint had good sperm analysis results at three months.\(^\text{16}\) Other studies in which macrosurgical techniques were employed have shown similar results.\(^\text{17}\) However, studies have shown procedures performed with microsurgical techniques to be moderately superior to those performed with teleloupes.\(^\text{18,20}\) Surgeons who decide to use microsurgical techniques should receive formal microsurgery training.

The majority of surgeons perform anastomosis with nylon monofilament. To prevent damage to the vas deferens only microbipolar tweezers such as are employed in ophthalmological surgery should be used, especially for cauterizing the small vessels that are attached to the adventitia of the vas deferens. These instruments produce a minimum of tissue damage compared with monopolar cauterization. The cut end of the vas deferens that is to be anastomosed should never be cauterized.

VV can be performed in one layer or in two, placing a total of 4-8 sutures with 9-0 nylon, followed by intermediate seromuscular sutures of the same material. There are studies that demonstrate that there are no significant differences between one technique and another.\(^\text{21,22}\) However, many surgeons prefer to perform VV in two layers, first placing 8 sutures with 10-0 nylon in the mucosa and then 7-10 seromuscular sutures with 9-0 nylon.\(^\text{23}\)

The microdot technique proposed by Dr. Marc Goldstein (6 dots made with blue methylene marker are placed) aims to provide better suture placement especially in those anastomoses where there are disparate anastomotic opening sizes.\(^\text{24}\)

Numerous attempts have been made to simplify anastomosis procedure and to shorten surgery duration through the use of fibrin glue\(^\text{25,26}\) and a non-absorbable polymer ministent. The stent is introduced into the anastomosis opening and a total of only three 8-0 prolene sutures are placed providing the same satisfactory results as the standard technique. This technique utilizes less time in surgery and there is no need for an operating microscope. The ministent has only been evaluated in animal models.\(^\text{27}\)

Robot-assisted VV has been shown to be feasible but implies longer time in surgery. It provides the same permeability results as standard surgery but it is an expensive procedure.\(^\text{28}\)

### POSTOPERATIVE CARE

The use of drains and antibiotics are decisions made by the surgeon. When vas deferens dissection has been large the present author usually places a small ¼ Penrose drain and uses ice in the immediate postoperative period and conventional analgesics together with antibiotic administration for 8 days. Physical activity should be avoided for 4 weeks and patients should not engage in sexual relations for at least 2 weeks after surgery.

### COMPLICATIONS

There are relatively few postoperative complications with VV. Scrotal hematoma as well as deep or superficial surgical wound infection is rare and can be managed conservatively in the majority of cases. Surgical intervention is rarely required.

### VV PATIENT FOLLOW-UP

Semen analysis should be ordered every two to three months after this procedure until sperm concentration and motility are normalized or pregnancy has been achieved. Once sperm analysis results are normal, patient should continue to be monitored every four months for the purpose of identifying any alteration suggesting new cicatrization-related obstruction in the anastomosis and acting upon it opportually.

The possibility of new postoperative obstruction is from 3-12%.\(^\text{29}\) The procedure is considered to be a failure if sperm count has not become normalized 6 months after surgery.

If sperm analysis is normal but there has been no pregnancy and couple evaluation is normal, antisperm antibody should be determined from the sperm surface (direct immunoassay test).\(^\text{30}\) Positive sperm analysis is observed in 80% of patients after VV and 20-40% of patients achieve pregnancy.\(^\text{6}\)

Sperm analysis will be positive in 85-90% of men after microsurgical technique and 50-70% of couples will achieve pregnancy.\(^\text{6}\)

Success prognosis after microsurgical VV is inversely proportional to the amount of time since vasectomy. A large number of patients evaluated in the VV study group showed there was reduction in permeability as well as in pregnancy rates when time since vasectomy was longer (Table 1).\(^\text{15}\)
HOSPITAL GENERAL DE MÉXICO

RESULTS

The case records of patients having undergone VV within the time frame of March 1999 - January 2009 were reviewed. The following variables were analyzed: age, time since vasectomy, type of operation, sperm analysis control and achievement of pregnancy. Microsurgery was employed in all cases with a Zeiss operating microscope (16x, 25x magnification). All surgeries were performed by the present author using the one-layer technique with 10-0 and 9-0 nylon sutures.

Splints were not used in any of the cases and ¼ Penrose drain was left in the majority of them. Patients were released the day after surgery. A total of 63 patients were operated on within the 10-year period analyzed. Follow-up was carried out in all cases with the exception of two cases. Mean age was 33.4 years with a 26-65 year range. Mean time since vasectomy was 5.8 years with a 2 month - 14 year range.

All patients had at least one control sperm analysis first ordered three months after procedure. Control sperm analysis presented with spermatozoa in 50 cases and was negative in 11 cases (Table 2). Overall success percentage was 82% (Image 1).

Immediate postoperative complications presented in 3 cases: 1 unilateral orchiepididymitis, 1 bilateral orchiepididymitis and 1 extensive scrotal hematoma that required surgical drain.

Number of achieved pregnancies has not been systematically obtained due to follow-up difficulties resulting from idiosyncratic characteristics of the patient population treated. Up to the present date there are 22 known pregnancies from the total of patients analyzed.

DISCUSSION

There has been an increase in VV demand in Mexican urology services associated with the number of divorces and new marriages that have taken place in the last years. For optimum success, it is important to take some technical considerations into account before carrying out the procedure.

The amount of time since vasectomy is the most important prognostic factor. Microsurgical techniques have been shown to be more efficacious in this procedure than macrosurgery. To perform these techniques it is necessary to have received formal training in microsurgery.

Table 1. Permeability and pregnancy rates after VV in relation to interval between vasectomy and rechannelization.13

<table>
<thead>
<tr>
<th>Interval between vasectomy and VV (years)</th>
<th>Permeability (%)</th>
<th>Pregnancy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3</td>
<td>97</td>
<td>76</td>
</tr>
<tr>
<td>3-8</td>
<td>88</td>
<td>53</td>
</tr>
<tr>
<td>9-14</td>
<td>79</td>
<td>44</td>
</tr>
<tr>
<td>&gt;15</td>
<td>71</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 2. Result comparison of different authors in relation to VV.31

<table>
<thead>
<tr>
<th>Authors</th>
<th>No. of cases</th>
<th>Positive spermatozoa</th>
<th>Pregnancies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthews 1995</td>
<td>100</td>
<td>99%</td>
<td>52%</td>
</tr>
<tr>
<td>Lee 1986</td>
<td>324</td>
<td>90%</td>
<td>51%</td>
</tr>
<tr>
<td>Alvarado 1994</td>
<td>60</td>
<td>86.7%</td>
<td>56.6%</td>
</tr>
<tr>
<td>Huang 2002</td>
<td>42</td>
<td>85.7%</td>
<td>40.6%</td>
</tr>
<tr>
<td>Fisher 2001</td>
<td>40</td>
<td>85%</td>
<td>--</td>
</tr>
<tr>
<td>Kolettis 2003</td>
<td>32</td>
<td>84%</td>
<td>46.8%</td>
</tr>
<tr>
<td>Ramada 2004</td>
<td>21</td>
<td>80%</td>
<td>33%</td>
</tr>
<tr>
<td>Silber 1989</td>
<td>326</td>
<td>79.1%</td>
<td>69.9%</td>
</tr>
<tr>
<td>Engellman 1990</td>
<td>859</td>
<td>73%</td>
<td>47%</td>
</tr>
<tr>
<td>Banerjee 1994</td>
<td>105</td>
<td>73%</td>
<td>--</td>
</tr>
<tr>
<td>Valdecilla 2005</td>
<td>42</td>
<td>71.2%</td>
<td>32.4%</td>
</tr>
<tr>
<td>Middleton 1980</td>
<td>139</td>
<td>66.9%</td>
<td>43%</td>
</tr>
<tr>
<td>Nalesnik 2003</td>
<td>39</td>
<td>60%</td>
<td>43.5%</td>
</tr>
<tr>
<td>Holman 2000</td>
<td>1817</td>
<td>--</td>
<td>53%</td>
</tr>
</tbody>
</table>

CONCLUSIONS

VV with microsurgical technique offers excellent rechannelization percentages and is the best alternative for the vasectomized man with non-satisfactory paternity. Success percentages obtained in the patient series from the author’s hospital are similar to those described earlier.
Maldonado-Ávila M. Vasovasostomy: a review of technical considerations and evaluation of results in the Hospital General de México

18% Positive
82% Negative

Image 1. Series results. Spermatozoa present in postoperative sample.

BIBLIOGRAPHY