Vasectomy reversal utilizing fibrin glue

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ABSTRACT

Over 500,000 men in America have a vasectomy annually; 2% to 6% of these individuals later elect to have a vasectomy reversal. Vasovasostomies are typically performed using a single- or double-layer closure, with no demonstrated difference between the two in terms of success rates. In 2005, Ho et al described a microscopic technique in which three full-thickness sutures are used and the anastomosis is reinforced with fibrin glue. At our institution, a similar technique has been used for >10 years. To describe our experience, a retrospective chart review was undertaken. Patient demographic information and operative characteristics were analyzed. In each case, fibrin glue was circumferentially applied to reinforce the anastomosis. The overall patency rate was 88.4%, and rates comparing individuals who had their vasectomy reversal within 10 years of vasectomy reached statistical significance with an odds ratio of 2.91 ($P=0.048$). Median operative time was 94 minutes. Other demographic variables analyzed did not have a correlation with patency. In conclusion, our technique provides acceptable patency rates, especially with obstructive intervals of 10 years or less, while likely resulting in cost savings given the decreased operating room time and suture used.

KEYWORDS Fibrin glue; male infertility; vasectomy reversal

More than 500,000 men in the USA have a vasectomy annually,¹ and around 2% to 6% of these individuals later elect to have a vasectomy reversal.² Over the last half century, the microsurgical approach to vasovasostomies has become the gold standard. Vasal anastomoses are typically performed using a single- or double-layer closure, with no difference demonstrated between the two in terms of success rates.³ Given the steep learning curve, long operative times, and frequent high cost of these operations, there have been attempts to increase efficiency, while still maintaining the success rates of traditional single- and double-layer anastomoses. One such example was described by Ho et al in 2005, in which they described a microscopic technique utilizing three full-thickness sutures and fibrin glue reinforcement for the anastomosis.⁴ At our institution, a similar technique has been used for >10 years. In this study, we describe our experience and results.

METHODS

After institutional review board approval was obtained, a retrospective chart review was undertaken from January 1, 2007, to December 31, 2016, utilizing Current Procedural

Terminology codes to identify men who had undergone vasovasostomies. For the purpose of this study, vasoepididymostomies were excluded. Additionally, men who had the procedure done for postvasectomy pain were excluded. Patient demographic information, including vasectomy obstructive interval (VOI), operative characteristics, and postoperative results, were analyzed.

In every case, a microscope was utilized, and a modified single-layer anastomosis was performed using 9-0 full-thickness sutures to reapproximate each vas. The anastomosis was then reinforced with several milliliters of fibrin glue applied in a circumferential fashion. For the purposes of this study, patency was defined as semen present in postoperative analysis and/or pregnancy.

Statistical analyses were two-sided at the $\alpha = 0.05$ significance level, and two-sided 95% confidence intervals were reported. Normally distributed variables were described as means with standard deviation, and those without normal distribution were reported with median and range. Patency rates were analyzed using a multiple logistic regression to assess odds ratios adjusting for age, operating room (OR) time, body mass index (BMI), and obstructive interval. All statistical analyses were performed using SAS 9.4 (SAS Institute Inc, Cary, NC).

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Received September 27, 2018; Accepted November 5, 2018.

Table 1. Patency results, using our modified single-layer anastomosis reinforced with fibrin glue, reported as a function of interval time after vasectomy

Vasectomy obstructive interval (years)	Patency
0–2	9/9 (100%)
3–8	75/83 (90.4%)
9–14	37/42 (88.1%)
≥15	8/12 (66.7%)
Overall	129/146 (88.3%)

RESULTS

Over a 10-year period, 314 vasovasostomies were performed. The mean patient age was 39.06 years (SD = 6.57), and the mean age of their partners at time of consultation was 32.19 years (SD = 5.22). Median BMI was 27.40 (range 19.00–46.00). The median obstructive interval after vasectomy was 7.0 years (range 1–22). The median OR time was 94 minutes (range 60–125). An average of 6.07 (SD = 1.10) sutures were used per side. Fibrin glue was used as a reinforcement layer in 100% of the cases.

Patency data were available on 150 patients. Of these, VOI was unavailable in 4 men, and these were excluded from the analysis. The overall patency rate was 88.3%. Patency rates based on obstructive interval were 100%, 90.4%, 88.1%, and 66.7% for 0–2 years, 3–8 years, 9–14 years, and ≥15 years, respectively (*Table 1*). The cumulative patency rate for VOI 10 years or less was 91.2% and 78.1% for VOI 11 years or greater. When comparing patency rates on univariate logistical regression, individuals who had their reversal within 10 years of vasectomy reached statistical significance with an odds ratio of 2.91 (*Table 2*). Patient age, BMI, and OR time did not have a statistically significant correlation with patency. When comparing VOI ≤10 years to >10 years, there was a statistically significant difference in OR time (92 vs 103 minutes, $P = 0.013$).

Postoperative semen analyses were available on 102 men who achieved patency. Of these individuals, mean sperm concentration was 25.55 million/mL (SD = 27.9). The mean percentages of motile and morphologically abnormal sperm were 25.4% (SD = 20.73) and 90.84% (SD = 15.12), respectively. These results were based on semen analyses obtained at an average of 7.02 months postoperatively.

DISCUSSION

In 2005, Ho et al demonstrated that a three-suture vasovasostomy using fibrin glue may be a feasible technique, especially with vas intervals of 8 years or less.⁴ This update to their technique demonstrates that by using approximately

Table 2. Univariate logistic regression analysis of the effect of age, operating room time, body mass index, and vasectomy obstructive interval on patency

Variable	Odds ratio (95% confidence interval)	P value
Age	1.02 (0.93, 1.11)	0.706
Operating room time	1.00 (0.97, 1.04)	0.844
Body mass index (kg/m ²)	0.96 (0.86, 1.07)	0.463
Vasectomy obstructive interval		0.048
≤10 years	2.91 (1.009, 8.405)	
>10 years	Reference	

six sutures with a reinforcement layer of fibrin glue, overall patency rates were 88.3%, including a 91.2% rate for obstructive intervals 10 years or less (odds ratio = 2.91; $P = 0.048$) (*Tables 1 and 2*). This compares favorably with results at other institutions. In 1991, the landmark Vasovasotomy Study Group paper was published, describing overall patency rates of 86% and patency rates of 97%, 88%, 79%, and 71% for obstructive intervals after vasectomy of <3 years, 3–8 years, 9–15 years, and >15 years, respectively.³ A more recent meta-analysis including 6633 patients found overall patency rates of 89.4%.⁵ Similar to our study, an odds ratio of 1.17 (95% confidence interval, 1.09–1.25) for postoperative patency when comparing obstructive intervals of <10 years and >10 years was found.⁵

Upon review of existing literature, it appears that interest in using fibrin glue for vasovasostomies first began in the 1980s. The first such report to apply this technology to the field of infertility was in 1980, when Bach et al described their experience using fibrin glue on rabbit vasectomy reversals.⁶ Silverstein and Mellinger described patency rates of 90% in rats using two transmurals sutures and sealing the anastomosis with fibrin glue,⁷ and several years later Vankemmel et al demonstrated higher patency rates using a similar technique with three transmurals sutures instead of two.⁸ The first known study to apply this technique in humans was published in 1994, when Wagenknecht described his experience fortifying epididymo-vasostomy anastomoses with fibrin glue.⁹ Ultimately, these studies led to the report by Ho et al, in which an 85% patency rate with a mean OR time of 79.4 minutes was achieved by using three transmurals sutures and fibrin glue fortification.⁴

In updating this method, our suture use was increased from three to approximately six sutures per anastomosis, because it was felt to add a more water-tight closure and to allow increased resident involvement in these cases. Though the mean OR time is somewhat longer (95.17 vs 79.4 minutes), this still compares very favorably with other

microsurgical OR times, which range from 106 to 165 minutes based on various reports.^{10–13}

Though specific financial data could not be obtained from our institution, the decreased OR time and low number of sutures used would likely confer a benefit on cost. In a report by Nyame et al from 2016 comparing two-layer to modified one-layer closures, the one-layer closure had a shorter operative time (120 vs 165 minutes) and decreased suture cost (\$42 vs \$632), leading to a total mean cost savings of \$1036.10 for a modified one-layer anastomosis.¹⁰ Additionally, there was no statistically significant difference in patency rates. Extrapolating these findings to our results, it is reasonable to conclude that with a mean OR time of 95 minutes and 6.07 sutures used per side, further cost savings would be incurred. One aspect to consider is the added cost of the fibrin glue itself—\$465 per 5 mL/case; however, it is felt that this would be more than counterbalanced by the savings from OR time and suture material.

It is interesting to briefly consider the semen analysis results postprocedurally. In a study from Majzoub et al, the distribution of values among semen parameters was reported in men who achieved pregnancy after vasectomy reversal. Specifically, the 50th percentile for sperm concentration was 23.7 million/mL, the percentage total motility was 25.5%, and the percentage morphologically abnormal was 97%.¹⁴ These are similar to our mean values of 25.55 million/mL, 25.4%, and 90.84%, respectively. However, a direct comparison is somewhat limited, because our study lacks information on pregnancy.

The limitations of this study include its retrospective nature and variable follow-up, including inconsistent recording of pregnancies occurring postprocedurally. It is possible that our patency rates would have been higher if more patients had consistent follow-up with semen analyses. Additionally, future studies could include a control group to more fully characterize the benefit of the fibrin glue.

In conclusion, microsurgical vasovasostomy utilizing fibrin glue reinforcement could provide cost savings through decreased OR time and suture utilization while still

maintaining patency rates comparable to those of traditional two-layer and modified one-layer repairs, particularly in VOI 10 years or less.

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