



Vasectomy under local anaesthesia performed free of charge as a family planning service: Complications and results

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Objective. To evaluate the safety and efficacy of vasectomy performed under local anaesthesia by junior doctors at a secondary level hospital as part of a free family planning service.

Method. Men requesting vasectomy were counselled and given written instructions to use alternative contraception until two semen analyses 3 and 4 months after vasectomy had confirmed azoospermia. Bilateral vasectomy was performed as an outpatient procedure under local anaesthesia by junior urology registrars. Statistical analysis was performed using the Mann-Whitney, Kruskal-Wallis, Fisher's exact or Spearman's rank correlation tests as appropriate.

Results. Between January 2004 and December 2005, 479 men underwent vasectomy at Karl Bremer Hospital, Western Cape, South Africa; their average age was 36.1 (range 21 - 66) years, they had a median of 2 (range 0 - 10) children, and only 19% had 4 or more children. The average operation time was 15.5 (range 5 - 53) minutes. Complications occurred in 12.9%; these were pain (7.3%), swelling (5.4%), haematoma (1.3%), sepsis (1%), difficulty locating the vas (1%), vasovagal

episode (0.6%), bleeding (0.6%), wound rupture (0.4%) and dysuria (0.2%) (some men had more than one complication). Of the men 63.3% returned for one semen analysis and 17.5% for a second. The vasectomy failure rate ranged from 0.4% (sperm persisting >365 days after vasectomy) to 2.3% (sperm seen >180 days after vasectomy and/or in the second semen specimen). No pregnancies were reported. The complication (5.6%) and failure rates (0%) were lowest for the registrar who had performed the smallest number of vasectomies and whose average operation time was longest. Comparing the first one-third of procedures performed by each of the doctors with the last one-third, there was a significant decrease in average operating times but not in complication rates.

Conclusions. Vasectomy can be performed safely and effectively by junior doctors as an outpatient procedure under local anaesthesia, and should be actively promoted in South Africa as a safe and effective form of male contraception.

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The link between global warming and unbridled population growth emphasises the urgent necessity for political action to promote effective forms of contraception.¹ Vasectomy is one of the most reliable family planning methods but is underutilised worldwide, accounting for only 5 - 10% of contraceptive methods, and in most African countries this figure is much lower.²

Pregnancy rates associated with vasectomy are in the range of 0 - 2%, with most series reporting <1%.³ In low-resource countries vasectomy failure rates may be higher than reported elsewhere, ranging from 3.2% to 5.2% at 36 months.^{4,5} Semen analysis after vasectomy is critical to establish the success of the procedure, but many men fail to return for semen analysis.⁶ As failure of vasectomy may result in litigation, couples must

be counselled to use alternative contraception until semen analysis has confirmed azoospermia.^{6,7}

We studied the complication rate, compliance with follow-up semen analysis and the success rate of vasectomy performed under local anaesthesia by junior doctors at a secondary level hospital (Karl Bremer Hospital) as part of family planning services in the Western Cape.

Materials and methods

Men requesting vasectomy were counselled by a registered nursing professional from the Family Planning Clinic at Tygerberg Hospital. Vasectomy was offered to the client free of charge in terms of a service sponsored by the Department of Health of the Western Cape Province and the Association for Voluntary Sterilization of South Africa (AVSSA). Details of the procedure and possible complications were discussed with the man and (if available) his spouse or partner, and written informed consent was obtained. Information regarding number of children and prior contraceptive use was also obtained.

The procedures were performed at a secondary level hospital (Karl Bremer Hospital) by junior urology registrars in their first to third year of training. All men received written instructions to use alternative contraception after vasectomy until two semen analyses at 3 and 4 months had confirmed azoospermia.

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Bilateral vasectomy was performed as an outpatient procedure under local anaesthesia (5 - 10 ml 2% lignocaine) without shaving of the scrotal skin. Bilateral scrotal incisions were used to locate the vasa, and a segment of each was excised and sent for histopathological examination. The ends of the vasa were ligated with chromic or polydioxanone 2/0 or 3/0 sutures and in most cases fascial interposition was used. The skin was closed with one or two absorbable sutures. At discharge on the same day the men were given oral analgesics, a specimen bottle and an appointment to return for semen analysis 3 months later. No prophylactic antibiotics were given.

The duration of the procedure and intra-operative complications were documented in the clinical records. The men were given the telephone number of the Family Planning Clinic to call in case of any complications, which were recorded in the clinical records. At follow-up visits to discuss the results of the semen analysis, the men were also asked to report any complications.

Semen analysis was performed on fresh, uncentrifuged as well as centrifuged specimens by trained medical technologists in the Reproductive Biology Unit at Tygerberg Hospital. The following terminology was used: azoospermia – no sperm in sample; oligozoospermia – low sperm concentration ($<10 \times 10^6$ /ml); cryptozoospermia – non-motile sperms present after centrifugation. Men who were not azoospermic at the first follow-up semen analysis were instructed to return for further testing until they were azoospermic.

Statistical analysis was performed using GraphPad InStat software. Comparison of means was performed using the Mann-Whitney test for two groups and the Kruskal-Wallis test (non-parametric analysis of variance) for more than two. Fisher's exact test was used for contingency table analysis. Spearman's rank correlation test was used to determine non-parametric correlations. Statistical significance was accepted at $p < 0.05$.

Results

Between January 2004 and December 2005, 479 men underwent bilateral vasectomy. The average age of the men was 36.1 (range 21 - 66) years. They had a median of 2 (range 0 - 10) children, and only 19% had 4 or more children. Prior contraception consisted of female depot injection in 39.9%, female contraceptive pill in 30.1%, condom use in 21.0%, no contraception in 6.9%, intra-uterine device in 0.6%, coitus interruptus in 0.4% and female sterilisation in 0.6%, while 3% used a combination of contraceptive methods.

The procedures were performed by 10 registrars from the Urology Department at Tygerberg Hospital (418 (87%) of the procedures were performed by 4 registrars). The average operation time was 15.5 (range 5 - 53) minutes. The average length of vas removed was 10.6 (range 2 - 30) mm on the right and 10.9 (range 2 - 80) mm on the left.

Complications were reported by 12.9% of men (some had more than one complication) but these were minor and self-limiting in all cases (Table I). Apart from pain and scrotal swelling, the more significant complications were very rare: scrotal haematoma in 1.3% of cases, wound sepsis in 1%, bleeding in 0.6% and wound rupture in 0.4%. Comparing the groups with and without complications showed no significant differences with regard to mean patient age, duration of the procedure or findings at first or second semen analysis.

Only 11.7% of men returned for the first semen analysis within 90 days as instructed, and only 58.5% returned by 120 days. In total, only 63.3% returned for one semen analysis and only 17.5% returned for the second analysis, and 36.7% did not return for any semen analysis. Of those with azoospermia on the first analysis, only 9% returned for a second analysis. Of those who did not have azoospermia on the second analysis only 64.2% returned for a third analysis, and of those who still did not have azoospermia only 56% returned for a fourth semen analysis (Table II).

The percentage of specimens with azoospermia was significantly lower, and the percentage with sperm seen was significantly higher, in the first semen analysis compared with the second, third and fourth analyses, but there were no significant differences between analyses 2, 3 and 4 (Table II).

Semen analysis performed >365 days after the vasectomy showed the presence of sperm cells in 5 men – in 3 cases sperm were seen at the first (and only) analysis performed >365 days after the vasectomy, but no follow-up specimens were provided. In 2 men sperm cells were seen at the third and fourth semen analyses at 630 and 406 days, respectively, denoting clear evidence of vasectomy failure in these 2 cases (0.4% of the study cohort). One of the men underwent repeat vasectomy, after which azoospermia was recorded. If failure is defined as sperm seen in the ejaculate more than a year after vasectomy, the failure rate was 5/479 (1.04%).

In a further 12 men sperm were seen at semen analysis performed >180 days after the vasectomy and/or in the second semen specimen. No follow-up was available in 6 men, but

Table I. Complications of vasectomy

	N	%
Total No. of men	479	
Total No. of men with any complication	62	12.9
Pain	35	7.3
Scrotal swelling	26	5.4
Scrotal haematoma	6	1.3
Wound sepsis	5	1
Difficulty locating vas	5	1
Vasovagal episode	3	0.6
Bleeding	3	0.6
Wound rupture	2	0.4
Dysuria	1	0.2



Table II. Results of semen analyses

	Semen analysis							
	1st		2nd		3rd		4th	
	N	%	N	%	N	%	N	%
Men instructed to return	479		479		53		18	
Total reports	303	63.3	84	17.5	34	64.2	10	55.6
Azoospermia	53	17.5*	31	36.9	16	47.1	5	50.0
Sperm seen	125	41.3*	23	27.4	12	35.3	1	10.0
Oligozoospermia	40	13.2	6	7.1	1	2.9	0	0.0
Cryptozoospermia	66	21.8	22	26.2	4	11.8	4	40.0

*Statistically significant difference compared with 2nd, 3rd and 4th semen analysis.

follow-up analyses in the other 6 revealed cryptozoospermia in 3 and azoospermia in 3. If the 6 men with sperm in the second or subsequent specimen, but without further follow-up, are regarded as vasectomy failures, the overall failure rate was 8/479 (1.7%) or maximum 11/479 (2.3%). However, no cases of pregnancy were reported, and no litigation ensued from vasectomy failure in this series.

The average duration of the procedure was significantly shorter (14.6 minutes) in the group with vas length <10 mm removed compared with the group with vas length 10 - 19.5 mm removed (15.7 minutes) and the group with vas length >20 mm removed (17.3 minutes). There were no significant differences with regard to complication rates or findings on semen analysis in the groups with lengths of vas of <10 mm, 10 - 19.5 mm and >20 mm removed.

Most of the procedures (87%) were performed by 4 doctors (Table III). The average length of vas removed was significantly

longest for Dr D compared with the others. The average duration of the procedure was significantly longest for Dr A and shortest for Dr B. The average operating time for the last one-third of the procedures compared with the first one-third was significantly shorter in the case of Drs A, B and C but not Dr D. The complication rate was lowest for Dr A (5.6%), who had performed 71 vasectomies, and highest for Dr C (15.3%), who had performed 111, but this difference was not statistically significant ($p=0.0572$, two-sided Fisher's exact test). The complication rate for the last one-third of the procedures compared with the first one-third was lower for Drs A and C and higher for Drs B and D, although the differences were not statistically significant. The percentage of men returning for semen analysis was significantly lower for Dr A compared with Dr C but not Drs B or D. At the first post-vasectomy semen analysis the percentage of specimens with azoospermia was significantly higher in the group operated on by Dr A compared with Dr C, and the rate of failed vasectomy (sperm

Table III. Outcomes according to the registrar who performed the vasectomy

	Registrar							
	A		B		C		D	
	N	%	N	%	N	%	N	%
Total number of vasectomies	70	14.8	91	19.0	111	23.2	146	31.3
Average length of vas removed (mm)	10		8.1		7.3		16.0*	
Average duration (min)								
All procedures	18.6*		10.8*		14.3		16.9	
First 1/3	21.9		12.1		17.3		15.6	
Last 1/3	15.9**		9.9**		13.4**		16.4	
Complication rate								
Overall	4	5.6	11	12.1	17	15.3	20	13.3
First 1/3	1/23	4.6	3/30	10	10/37	27	6/48	12.5
Last 1/3	0/23	0	5/31	16.1	3/37	8.1	7/48	14.6
1st semen analysis								
Analysis not performed	34	49.3	35	38.5	33	29.7	52	36
Total reports	36	50.7***	56	61.5	78	70.3	94	64.0
Azoospermia	9	25.0***	9	16.1	12	15.4	18	18.8
Men with sperm seen >180 days after vasectomy	0	0***	4	4.4	8	7.2	3	2

*Statistically significant difference compared with other registrars.

**Statistically significant difference compared with average duration of first 1/3.

***Statistically significant difference compared with registrar C, but not B or D.



seen >180 days after vasectomy) was significantly lower for Dr A (0%) compared with Dr C (7.2%).

Discussion

Although most vasectomy complications are minor and self-limiting, the risk of complications may be related to the number of procedures performed annually by the practitioner.⁸ A national survey of urologists, family physicians and general surgeons found that the incidence of haematoma was 4.6% for physicians performing 1 - 10 vasectomies annually, 2.4% for those performing 11 - 50, and 1.6% for those performing >50.⁹ In comparison, in our study the scrotal haematoma rate was 1.3%. The total minor complication rate (including pain and scrotal swelling) was 12.9%, and was lowest (5.6%) for the registrar who had performed the smallest number of procedures. However, this difference was not statistically significant, probably owing to the relatively small number of study subjects.

For three of the four registrars who had performed 87% of the procedures the operative time decreased as they gained more experience, and the one who had the longest average operating time during the first third of cases had the greatest decrease in average operating time during the last third of cases. There was no obvious correlation between the average duration of the procedure and the complication rate for each of the four registrars. Comparing the first third of cases (when the doctor had performed less than 50 procedures) to the last third of cases, the complication rates for two doctors decreased but the rates for the other two increased, with no statistically significant differences. This indicates that surgical volume is not the only or most important factor determining the complication rate. There was a 'learning curve' in the sense that the average operation time decreased as the doctor gained more experience, but there was no clear correlation between the complication rates and the average duration of the procedure or the number of procedures performed.

The timing and the number of semen analyses required to confirm the success of vasectomy remain controversial because of variable clearance times of residual sperm from the seminal vesicles and ampullae of the vasa deferentia.⁶ It has been recommended that two semen analyses should be performed, the first at 10 - 12 weeks after vasectomy and the second 4 - 6 weeks later, or after 20 - 25 ejaculations, in order to allow time for clearance of stored sperm and to detect early failure or recanalisation.^{7,10,11}

Studies show that up to 90% of practitioners recommend two semen samples routinely after vasectomy, and up to 95% request further samples if non-motile sperm are present.⁶ However, numerous studies have reported poor compliance with post-vasectomy semen analysis, with as few as 42% of men providing a first semen sample, and only 25% providing a second.^{6,12,13} In our series 63.3% of the men returned a single

semen specimen and only 17.5% returned for two or more semen analyses. This may be because this was a free service utilised by men of lower socio-economic and educational status than those typically making use of fee-for-service medical facilities. The reasons for non-compliance reported in one study were inconvenience in 58% of men and embarrassment in 38%, whereas 29% were confident that the procedure was successful, 17% forgot and 4% were afraid of repeat surgery.¹⁴

In our study it was difficult to determine the true vasectomy failure rate because of the poor compliance with follow-up. It has been reported that scheduling an appointment for post-vasectomy semen analysis provided a significant improvement in compliance with the first analysis, but scheduling an appointment did not increase compliance with a second post-vasectomy analysis if the first specimen was azoospermic.¹⁵ All the men in our study were given verbal and written scheduled appointments for follow-up semen analysis. Nonetheless, of those with azoospermia at the first analysis, only 9% returned for a second analysis.

Although definitions vary, early vasectomy failure is regarded as any number of motile spermatozoa persisting more than 4 months after the procedure. In one report the estimated risk of post-vasectomy pregnancy was reduced by half if the surgeon performed more than 50 vasectomies per year.¹⁶ In our study the risk of possibly failed vasectomy was lowest for the registrar who had performed the smallest number of cases but had the longest operating time and the lowest complication rate, suggesting that factors other than surgical volume may play a role in vasectomy success.

Based on a meta-analysis of the literature, Griffin *et al.* proposed a post-vasectomy semen analysis protocol consisting of one semen analysis at 3 months after vasectomy, or after a minimum of 20 ejaculations.¹⁷ An earlier analysis should not be considered owing to lack of evidence to support this approach. If the sample is azoospermic at 3 months, the man can be considered sterile and no further follow-up is necessary. If a sample is positive at the 3-month test, further analysis is required. If motile sperm are present, the vasectomy is probably a failure and another test 1 month later will confirm this, after which re-vasectomy should be considered.¹⁷

Conclusions

In this study, bilateral vasectomy under local anaesthesia performed by junior urology registrars had a minor complication rate of 13% and a failure rate of 0.4 - 2.3% on semen analysis. Despite intensive counselling and written instructions, 37% of men did not return for any postoperative semen analysis. However, there was no litigation resulting from alleged vasectomy failure. There were no clear correlations between complication and failure rates and average operation time or the number of procedures performed by individual doctors. This indicates that vasectomy can be safely and



effectively performed by junior doctors as an outpatient procedure under local anaesthesia. Vasectomy should be much more actively promoted and supported by all health delivery services in South Africa as a safe and effective form of male contraception.

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