DOI: 10.4081/aiua.2024.12682

ORIGINAL PAPER

Vasectomy histology: Is it still useful?

Anthony Sim [1], Panagiotis Nikolinakos [2], Konstantinos Charitopoulos [2], Ivo Donkov [2], Samuel Bishara [2]

[1] Imperial College London, UK;
[2] Department of Surgery West Middlesex Hospital, Twickenham Road, Isleworth, London TW7 6AF.

Summary ***Objectives: To determine if histological evaluation of the vasa is useful when post-vasectomy semen analysis (PVSA) compliance is low and to determine whether compliance could be predicted.***
Methods: A retrospective evaluation of patients undergoing vasectomy between 2018 and 2022 was undertaken. A comparison of the PVSA between three vasa histological categorisations was made: complete divisions, incomplete division(s), absent vas(a). A multivariate model was constructed to predict PVSA compliance.
Results: From 388 patients, 191 (49.2%) undertook PVSA. Four patients had a revision of vasectomy. On 3 occasions this was due to the histology findings and once from semen analysis with normal histology. There was no significant difference in the number of azoospermic samples (95.4% vs 91.2%, ns), of samples with presence of Rare Non-Motile Sperm (RNMS) (2.6% vs 8.8%, ns) and those with sperm present (2.0 vs 0%, ns), between patients with complete division of the vasa on both sides and those with incomplete division on one side respectively. There was no difference in patient characteristics between those who complied with PVSA and those who did not.
Conclusions: This paper suggests that there is a role for histological evaluation of the vasa when PVSA compliance is poor. Incompletely divided vasa on histology are not associated with an adverse PVSA.

KEY WORDS: *Vasectomy; Histology; Semen analysis; PVSA; Sterility; Patient compliance.*

Submitted 21 May 2024; Accepted 13 June 2024

INTRODUCTION

Vasectomy is a commonly undertaken and effective form of contraception. 8.531 vasectomies were performed in the UK in 2021/22, which is 30% below the last pre-pandemic total for 2019/20 (12.157) (1). It is estimated that it is the primary form of contraception for 42 million couples worldwide (2).

Updated vasectomy guidelines for the UK were introduced in 2016, advocating the use of a single post vasectomy semen analysis (PVSA) at 3 months to determine clearance (3). This represents a welcome change in reducing the number of necessary semen analyses. However, the need for two PVSAs to determine special clearance has been challenged (4). There is likely to be variation in the management of patients with low numbers of non-motile sperm present in PVSA, as demonstrated by a recent international survey which highlighted a range of approaches being adopted by clinicians (5). Histological examination of the vasa is not commented upon by the UK guidelines. The AUA guidelines state that although histological evaluation is unlikely to cause harm it is not recommended as PVSA is preferred (6). The Faculty of Sexual & Reproductive Healthcare guidelines are more categorically against histology evaluation stating that "Routine histology on vasectomy specimens represents an unacceptable burden on both laboratory staff and time and is expensive" (7). However, there is likely variation in practice here too (8), perhaps out of caution or fear of litigation. PVSA makes the pathological examination of the vasa redundant, as the identification of two vasa specimens does not preclude the possibility of vasa duplications or division of the vas on the same side twice (9-12). It has been our own practice to submit the vasa specimens for pathological evaluation.Perhaps the greatest pitfall of vasectomy evaluation is the low compliance with PVSA which has generally been documented to be between 30% and 80% (8, 13-17). Addressing this real-world problem has a greater potential to strengthen vasectomy evaluation, than any further refinement of guidance on the timing and interpretation of the semen analysis. Poor compliance presents a real challenge; on the one hand there is increased risk of an unwanted pregnancy, litigation, and unclear appropriation of responsibility; on the other hand, unnecessary resources may be squandered chasing up men who will ultimately never carry out a PVSA.

The aim of this study was to evaluate the utility of the vasectomy histology in determining the need for revision vasectomy, in a retrospective cohort of patients who underwent vasectomy between 2018 and 2022 inclusive.

Material and Methods

An *NHS Health Research Authority* evaluation questionnaire was completed which determined that ethical approval was not required for the study as only routine health data was evaluated in a retrospective manner.

The coding department provided a list of all vasectomies undertaken between 2018 and 2022, including patient age and anaesthetic modality. The histology, PVSA and f/u appointment records were extracted from contemporaneous electronic records.

Procedures were carried out after written consent and appropriate counselling, under local anaesthetic, general anaesthetic, spinal anaesthetic or sedation. In all cases the vasa were excised diathermised and ligated. The excised vasa were placed in formalin in sperate pots, labelled

according to side, and sent to the pathology laboratory for evaluation.
Semen analysis was requested, and patients were provided with written instructions on how to organise a PVSA at 3 months after the surgery.
The histology outcome of the vasectomy was classified as either 2 vasa present and divided, 2 vasa present and one or more incompletely divided, or one or more vasa absent from each side.
The semen analysis was conducted according to the 2016 British Association of Urology guidelines. The semen analysis outcome, as per guidelines were classified, as present (any motile sperm or > 100,000 immotile sperm), rare non-motile sperm (< 100,000 immotile sperm) or azoospermia (no sperm detected). Rare non-motile sperm is believed to carry no greater risk of paternity than absent sperm, and its persistence may be reflective of sperm that's had previously refluxed in the seminal vesicles or the ampulla of the vas (4, 18).
When more than one semen analysis was carried out the final semen analysis was regarded as definitive and utilised in this analysis.
The demographic details of the patient and procedure were recorded including age, ASA and anaesthetic type. A comparison of these demographics was made between those who did and did not undertake a PVSA. Differences between these two groups were assessed by an unpaired t-test for age, the Mann Whitney U test for ASA grade, and by the Chi Squared test for anaesthetic type.
A binary logistic regression was carried out to ascertain whether a predictive model using the patient and operative demographics could determine whether PVSA compliance could be predicted.
The proportion of semen analysis outcomes between the different histological categories were compared and evaluated using the Fisher test.
Statistical significance was taken as $p < 0.05$ (two tailed). Statistical analyses were carried out using Minitab statistical software.

Table 1.
Semen analysis according to histological report.

Histology	Number	Semen analysis	Azoospermia	RNMS	Spermatozoa present	Revision vasectomy
2 divided vasa	306	154	147 (95.5%)	4 † (2.6%)	3 (1.9%)	1 (0.3%)
2 vasa present but possible incomplete division	75	34	31 (91.2%%)	3 † (8.8%)	0 (0%)	0 (0%)
Absent vas on one side	4	1	0 (0%)	0 (0%)	1 (100%)	3 (75%)
No histology	3	2	1 (50%)	1 (50%)	0 (0%)	0 (0%)
Total	388	191	179 (93.7%)	8 (4.2%)	4 (2.1%)	4 (1.0%)

†: Not significant difference by Fisher test.

Results

388 vasectomies were carried out between 2018 to 2022 and were include in this study. For 385 vasectomies, histological evaluation of the vasa took place and in 3 cases this was absent. 191 patients (49.2%) undertook semen analysis at 12 weeks or later, 6 patients repeated PVSA once (1.5%) and 197 (50.8%) did not carry out a follow up PVSA.
The outcome of PVSA according to the histological classification of the vasa is shown in Table 1.
Four patients (1.0%) underwent revision vasectomy. Three of these patients were identified through the histology, as they had an absent vas on one side. One was identified through the PVSA, which demonstrated sperm though they had 2 vasa histologically confirmed as divided.
2 of these 3 patients identified from histology proceeded to revision vasectomy without PVSA. One of these 3 patients had a PVSA prior to revision which demonstrated the presence of sperm. All the patients who had a revision vasectomy were histologically confirmed to have had 2 vasa present after the revision procedure.
One of the 4 patients who had an absent vas on histology, had only one vas identified at the time of an open procedure and was therefore likely to have ipsilateral absence of the vas, however they did not undertake a follow up PVSA.
The semen parameters when two completely identified vasa were compared to when the pathologist flagged one of the sides, though present as being incompletely divided. There is no significant difference in the number of azoospermia samples (95.4% *vs* 91.2%, ns), those with *Rare Non-Motile Sperm* (RNMS) (2.6% *vs* 8.8%, ns) and those with sperm present (2.0 *vs* 0%, ns) between these two groups respectively. Incomplete division of the vasa demonstrated a 0% positive predictive power for determining the presence of spermatozoa on PVSA.
The demographic details for the study patients are shown in Table 2. There is some incomplete data. ASA Class was electronically recorded in 360 patients and the anaesthetic modality in 366 patients. GA was the most common anaesthetic (218 patients), followed by LA (141 cases), Sedation (6 cases) and Spinal anaesthetic (1 case). There

Table 2.
Characteristic of vasectomy patients according to PVSA compliance.

	PVSA	No PVSA	Probability
Age	41.4 (5.6, n = 191)	40.9 (6.3, n = 197)	NS $^{\alpha}$
ASA	1.3 (0.5, n = 180)	1.3 (0.5, n = 180)	NS $^{\beta}$
Anaesthetic Type:			NS †
General	112	106	
LA	68	73	
Sedation	3	3	
Spinal	0	1	
Total	(n = 183)	(n = 183)	

$^{\alpha}$: unpaired t-test, $^{\beta}$: Mann-Whitney U test, †: Chi Square test.

Table 3.
Binary logistic regression of variables hypothesised to predict compliance with PVSA. Area under ROC curve 0.54.

Term	Coefficient	SE Coefficient	Z-value	P-value
Constant	-0.570	0.755	-0.75	0.451
Age	0.0186	0.0175	1.07	0.287
ASA_Class	-0.242	0.225	-1.08	0.282
GA	0.178	0.229	0.78	0.437

is no significant difference in age, ASA, or anaesthetic modality between the two groups.
Theses variables were used to generate a multivariate model to determine if PVSA could be predicted. None of these parameters achieved statistical significance. The area under the ROC curve was 0.54 for the prediction of PVSA compliance.

Discussion

This paper accords with many others, highlighting the low follow up rate for PVSA that is typical across many practices, with just under 50% of patients complying with follow up. Several have investigated the reasons for this, with men citing travel and time constraints (14) and embarrassment (15) as reasons for this. Others have looked at strategies for improving follow up including home test kits (19-21), which have yielded variable results and postal notification strategies (22), which improved PVSA compliance.
Revision of the BAUS guidelines, to reduce the number of PVSA mandated form two to one is a step in the right direction, and one likely to facilitate compliance, however it seems that we will always be a long way from 100% compliance with PVSA. Whilst PVSA will always remain the gold standard, the question remains how we best manage non-compliance and does PVSA alone remain the optimal strategy when there is poor compliance and limited healthcare resources?
If there is 100 percent compliance with PVSA then clearly histology would be completely unnecessary, however, in this study more patients underwent redo vasectomy because of the histopathological findings than from the PVSA. Only one patient underwent redo vasectomy through the PVSA alone and three underwent redo vasectomy from the pathology findings.
The pathological findings are pertinent to the PVSA if no evidence of vasal tissue can be identified on one or more side. From this study, incomplete division of the vasa on one or both sides does not seem to have any impact on the PVSA, and largely reflects the difficulty in obtaining thin perpendicular sections through the vasa for pathological analysis.
The paper suggests that there may still be a role for vasa histology when the compliance rate is low as it picked up 75% of the known failures.
Lack of compliance and inefficiency of follow up remain a problem, one option would be to shift the responsibility for follow up to the patient by requesting a *patient initiated follow up* appointment (PIFU), so that a follow up appointment is generated if and when the patient carries out a semen analysis. Patients should be informed clearly, whilst a system is in place to make PVSA possible, they are responsible for making sure this takes place and if they do not undertake PVSA, then they take responsibility for a having a lower level of certainty, for the success of their procedure, at 99.0% (form the histology alone) rather than 99.95% (through PVSA). It may be some men feel that the 1.0% risk is not worth the hassle of a further semen analysis, or by having already undergone a vasectomy, they have already gone above and beyond to provide contraception for themselves and their partner.
Histology is relatively expensive and costs £95 per case in our institution. The cost effectiveness of histology is dependent on the compliance rate and the failure rate of vasectomy. Excluding consultation cost, the estimated cost of histology per failed vasectomy detected is £95/(Failure rate x Compliance rate). E.g., if the failure rate is 1% and the PVSA compliance rate is 50%, then histological cost per additional failed vasectomy detected is £95/(0.01 x 0.5) = £19000. In this study the actual cost was £12192 per failed vasectomy detection. Exploration of alternatives to histology which may provide similar diagnostic information is worthy of further evaluation.
The statistical risk of litigation from patients as a result vasectomy is low. A review found 67 cases over 28 years from the Westlaw database of US cases (23), though not all US cases may have been captured in this study. The simplest approach would be to follow the *Faculty of Sexual & Reproductive Healthcare* guidelines and abandon the histology, however we feel that under the circumstances of low PVSA compliance retaining the histology facilitates greater stewardship of our patients albeit at a financial cost.
There was no significant difference in the demographic factors between those who undertook a PVSA and those who did not. Likewise, a predictive model utilising binary logistic regression did not achieve statistical significance for any of the parameters and was only of low predictive power. The number of children that patients had previously was not universally recorded and therefore not utilised in this study. Some studies have demonstrated that fatherhood is associated with increased compliance with PVSA (14). Previous studies have demonstrated that increased age was associated with better PVSA compliance, but we did not find that to be the case in this study (13).

Conclusions

This paper suggests that there is a role for histological evaluation of the vasa when PVSA compliance is poor, which is likely to be the case in many centres.

References

1. NHS England. Part 4: Sterilisations and vasectomies. Available from: https://digital.nhs.uk/data-and-information/publications/statistical/sexual-and-reproductive-health-services/2021-22/sterilisations-and-vasectomies.

2. Haldar N, Cranston D, Turner E, et al. How reliable is a vasectomy? Long-term follow-up of vasectomised men. Lancet. 2000; 356:43-4.

3. Hancock P, Woodward BJ, Muneer A, Brown JCK. Laboratory guidelines for postvasectomy semen analysis: Association of Biomedical Andrologists, the British Andrology Society and the British Association of Urological Surgeons. J Clin Pathol. 2016; 69:655-60.

4. Beder D, Chitale S. The clinical impact of British guidelines on post-vasectomy semen analysis. Cent European J Urol. 2020; 73:558-562.

5. Agarwal A, Gupta S, Sharma RK, et al. Post-Vasectomy semen analysis: optimizing laboratory procedures and test interpretation through a clinical audit and global survey of practices. World J Mens Health. 2022; 40:425-41.

6. Sharlip ID, Belker AM, Honig S, et al. Vasectomy: AUA guideline. J Urol. 2012; 188:2482.

7. FSRH. Clinical Guideline: Male and Female Sterilisation (September 2014). Available from: https://www.fsrh.org/standards-and-guidance/documents/cec-ceu-guidance-sterilisation-cpd-sep-2014/

8. Katsoulis IE, Walker SR. Vasectomy management in Morecambe Bay NHS Trust. Ann R Coll Surg Engl. 2005; 87:131.

9. Miller S, Couture S, James G, et al. Unilateral absence of vas deferens: prevalence among 23,013 men seeking vasectomy. Int Braz J Urol. 2016; 42:1010-7.

10. Carr R. Apparent bilateral duplication of the vas deferens. Br J Urol. 1993; 71:354.

11. Erdemir F, Parlaktas BS, Yasar A, Uluocak N. Duplicated vas deferens: A rare congenital abnormality. Kaohsiung J Med Sci. 2008; 24:210-1.

12. Karaisli S, Ezer M. Duplicated vas deferens: A case report and comprehensive review of the literature. Andrologia. 2021; 53:e13896.

13. Christensen RE, Maples DC. Postvasectomy semen analysis: are men following up? J Am Board Fam Pract. 2005; 18:44-7.

14. Bradshaw A, Owusu R, Ballon-Landa E, et al. Poor compliance with post-vasectomy semen analysis: analysis of factors and barriers. J Urol. 2019; 201:e685.

15. Diederichs J, McMahon P, Tomas J, Muller AJ. Reasons for not completing postvasectomy semen analysis. Available from: https://www.cfp.ca/content/cfp/65/9/e391.full.pdf

16. Maatman TJ, Aldrin L, George BGS, Car-Others G. Patient non-compliance after vasectomy. Fertil Steril. 1997; 68:552-5.

17. Derosa R, Lustik MB, Stackhouse DA, McMann LP. Impact of the 2012 American urological association vasectomy guidelines on post-vasectomy outcomes in a military population. Urology. 2015; 85:505-10.

18. Philp T, Guillebaud J, Budd D. Late failure of vasectomy after two documented analyses showing azoospermic semen. Br Med J. 1984; 289:77.

19. Kiessling RJ, Hauser A, Eyre RC, Kiessling AA. A new approach to postvasectomy semen analyses eliminates the need to evaluate a fresh specimen. Andrology. 2023; 11:464-70.

20. Welliver C, Zipkin J, Lin B, et al. Factors affecting post-vasectomy semen analysis compliance in home- and lab-based testing. Can Urol Assoc J. 2023; 17:E189-92.

21. Trussler J, Browne B, Merino M, et al. Post-vasectomy semen analysis compliance with use of a home-based test. Can J Urol 2020; 27:10388-93.

22. Atkinson M, James G, Bond K, et al. Comparison of postal and non-postal post-vasectomy semen sample submission strategies on compliance and failures: an 11-year analysis of the audit database of the Association of Surgeons in Primary Care of the UK. BMJ Sex Reprod Health. 2022; 48:54-9.

23. Blazek AJ, Belle JD, Deibert MP, Deibert CM. Legal review of vasectomy litigation and the variables impacting trial outcomes. Urology. 2019; 131:120-4.

Correspondence

Anthony Sim, MD
anthony.sim21@imperial.ac.uk
Imperial College London, UK

Panagiotis Nikolinakos, MD
panagiotis.nikolinakos@nhs.net
Konstantinos Charitopoulos, MD
k.charitopoulos@nhs.net
Ivo Donkov, MD
i.donkov@nhs.net
Department of Surgery West Middlesex Hospital, Twickenham Road, Isleworth, London TW7 6AF

Samuel Bishara, MD (Corresponding Author)
samuel.bishara2@nhs.net
Department of Urology, West Middlesex University Hospital, Chelsea & Westminster Hospital NHS Foundation Trust, London, United Kingdom

Conflict of interest: The authors declare no potential conflict of interest.