

Infection/Inflammation

# Associations of Ultrasonographic Features with Scrotal Pain after Vasectomy

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**Purpose:** Scrotal discomfort is a recognized complication of vasectomy, but the natural history and incidence of this problem are uncertain. The typical ultrasonographic changes after a vasectomy primarily include epididymal thickening and epididymal tubular ectasia with diminished blood flow in the epididymis. We prospectively studied the differences in the ultrasonographic features of the testis and epididymis between patients with and those without scrotal discomfort after vasectomy.

**Materials and Methods:** We prospectively assessed pain scores in 178 men who underwent outpatient bilateral no-scalpel vasectomy at our institution between January 2009 and December 2010. At 2 months after vasectomy, we evaluated the postoperative scrotal pain questionnaire and scrotal ultrasonographic features for patients who returned for semen analysis. On the basis of the scrotal information, we investigated the potential relationships between scrotal pain or discomfort and scrotal ultrasonographic features of both testes and epididymides.

**Results:** The average age of the 114 men was 36.3 years (range, 29 to 53 years). group 1 (n=23), which reported scrotal pain or discomfort, showed no significant mean differences in the maximal diameter of the head of the epididymis when compared with group 2 (n=91), who had no scrotal pain or discomfort. Also, the width of the body of the epididymis between the two groups showed no significant differences.

**Conclusions:** There were no significant differences in ultrasonographic features according to the presence of chronic scrotal discomfort after vasectomy. Therefore, causes of scrotal pain other than obstruction may need to be considered after vasectomy.

**Key Words:** Color doppler ultrasonography; Epididymis; Vasectomy

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## INTRODUCTION

Vasectomy is a very common operation and has been accepted as a method of contraception. However, despite unparalleled efficacy and minimal morbidity, it is well recognized that many men fear or forego vasectomy because of concerns that the procedure will be associated with undue pain. Chronic scrotal pain is a recognized complication after vasectomy and represents the most common late complication, although there are few published data on the incidence of this complication [1-3]. The pain is intense enough to distress the patient and to prompt him to seek medical attention [4]. Although the etiology of scrotal or ep-

ididymal pain remains unclear, mechanical obstruction with perineural fibrosis and epididymal compression from adjacent cysts have been postulated as possible etiologic factors in scrotal pain after vasectomy [5,6]. Ultrasonography with Doppler study is often the first modality of choice for evaluating scrotal pathology in patients with scrotal pain. As is well known, when performing an ultrasonographic examination of the scrotum, various conditions related to the vasectomy can be found [7]. The typical ultrasonographic changes after a vasectomy primarily include epididymal thickening and epididymal tubular ectasia with diminished blood flow in the epididymis. It is important to be familiar with ultrasonographic features of

postvasectomy changes to be able to distinguish them from other epididymal or testicular disease to avoid unnecessary procedures. Therefore, we prospectively studied the differences in the ultrasonographic features of the testis and epididymis between men with and those without chronic scrotal discomfort after a vasectomy.

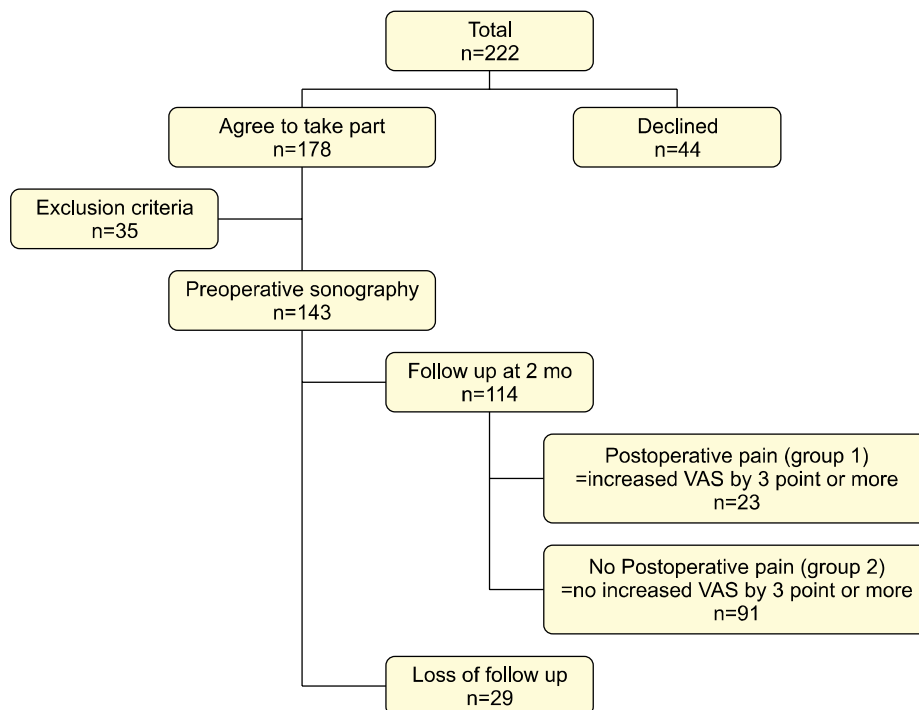
**MATERIALS AND METHODS**

We prospectively assessed pain scores in 178 men who underwent outpatient bilateral no-scalpel vasectomy at our institution between January 2009 and December 2010. Two urologists performed the operations. Before the procedure, an information packet was sent to the patients about the operation, and included in this was a specific questionnaire to assess preoperative scrotal discomfort. At the time of the procedure, the patients gave written informed consent in the usual manner. After the patients completed the preoperative questionnaire and agreed to participate in the study, preoperative scrotal ultrasonography was performed for comparison with the postoperative results. The surgery was performed by two urologists, and there were no differences in methods or skills. The vas deferens was occluded by using two silk sutures, and an approximately 1 to 2 cm segment of the vas deferens between the ligatures was excised. All patients had intraluminal electrocautery applied to both ends of the divided vas deferens. Fascial interposition was not routinely used. At 2 months after vasectomy, we evaluated the postoperative scrotal pain questionnaire and scrotal ultrasonographic features for patients who returned for semen analysis. Scrotal ultrasonography was performed by use of high resolution (linear

6-16 MHz transducer) units (Aloka Prosound  $\alpha$  5; Aloka, Tokyo, Japan) by two urologists. Both testes, epididymides, and spermatic cords were examined via gray-scale ultrasonography in longitudinal and transverse planes, and their sizes were determined. The thickness of the epididymal body was measured on the basis of a longitudinal view. Color Doppler examination was also performed as part of the scrotal ultrasonography. The size of the epididymis was determined by measuring the largest diameter of the head of the epididymis and the diameter of the body of the epididymis posterior to the proximal third of the testis. By using all of the scrotal information, we investigated the differences in the epididymal diameter between before and after vasectomy and the potential relationships between scrotal pain or discomfort and scrotal ultrasonographic features. In this study, we regarded thickened epididymides, epididymal tubular ectasia, and a combination of both these findings in ultrasonography as an increased epididymal diameter.

Exclusion criteria included 1) a history of previous vasectomy or other genital surgery, 2) a history of epididymitis or chronic prostatitis, 3) a history of chronic scrotal pain or discomfort, and 4) a varicocele or other scrotal mass.

SPSS ver. 13.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. For statistical analysis, the subjects were also divided into group 1 and 2 according to new-onset scrotal pain or discomfort. Differences in variables among the groups were analyzed via the Student's t-test. Comparison of the ultrasonographic findings before and after the vasectomy was performed by using the paired t-test. In all tests,  $p < 0.05$  was regarded as indicating statistical significance.



**FIG. 1.** Flow chart of the participants. VAS: visual analogue scale.

## RESULTS

Between January 2009 and December 2010, 222 men had a vasectomy at our hospital, with 178 completing the preoperative questionnaire. Preoperative scrotal ultrasonography was performed in 144 patients who met the inclusion criteria. At 2 months after vasectomy, 114 (79.1%) of these men completed the follow-up questionnaire, scrotal ultrasonography, and semen analysis (Fig. 1). The average age of the 114 men was 36.3 years old (range, 29 to 53 years). At the scrotal ultrasonography at 2 months after vasectomy, epididymal thickening including tubular ectasia was noted in 110 men (96.5%). In all, 23 men (20.2%) described the new onset of scrotal discomfort after vasectomy. In the current study, new onset of scrotal discomfort after vasectomy was defined as having a postoperative visual analogue scale (VAS) score higher by 3 points or more than the preoperative VAS score. Subsequently, the subjects were analyzed separately and divided

**TABLE 1.** Comparison of epididymal measurements between before and after vasectomy

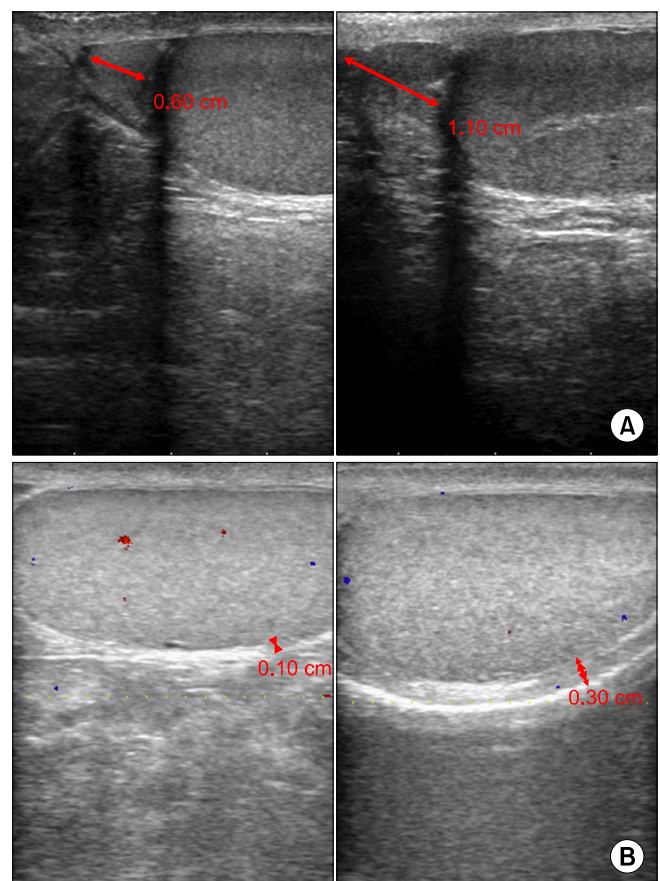
	Mean of measurements in cm (range)		
	Before vasectomy	2 mo after vasectomy	p-value
<b>Group 1</b>			
Left			
Head	0.65±0.27 (0.3-1.2)	1.07±0.49 (0.5-2.3)	<0.001
Body	0.27±0.13 (0.1-0.5)	0.46±0.14 (0.2-0.7)	<0.001
Right			
Head	0.64±0.22 (0.3-1.3)	1.05±0.46 (0.4-2.2)	<0.001
Body	0.25±0.11 (0.1-0.5)	0.43±0.15 (0.2-0.7)	<0.001
Total			
Head	0.65±0.24 (0.3-1.3)	1.06±0.47 (0.4-2.3)	<0.001
Body	0.26±0.12 (0.1-0.5)	0.44±0.14 (0.2-0.7)	<0.001
<b>Group 2</b>			
Left			
Head	0.62±0.21 (0.3-1.3)	1.02±0.35 (0.5-2.0)	<0.001
Body	0.23±0.11 (0.1-0.6)	0.41±0.13 (0.2-0.8)	<0.001
Right			
Head	0.60±0.22 (0.2-1.3)	0.99±0.35 (0.5-2.2)	<0.001
Body	0.24±0.11 (0.1-0.5)	0.41±0.14 (0.2-0.8)	<0.001
Total			
Head	0.61±0.21 (0.2-1.3)	1.00±0.35 (0.5-2.2)	<0.001
Body	0.24±0.11 (0.1-0.6)	0.41±0.13 (0.2-0.8)	<0.001

into two groups according to scrotal pain or discomfort.

Epididymal measurements showed significant differences between before and after vasectomy (Table 1)(Fig. 2). As shown in Table 2, group 1 (n=23), who reported scrotal pain or discomfort, showed no significant differences in the maximal diameter of both epididymal heads when compared with group 2 (n=91), who had no scrotal pain or discomfort. Also, the width of both epididymal bodies did not differ significantly between the two groups. Spermatocele was detected in two cases in group 1. Hydrocele and varicocele were not detected. No significant differences in epididymal measurements were noted between the two urologists.

## DISCUSSION

Vasectomy remains a common operation for urologists. Chronic testicular or scrotal pain is a recognized complication of vasectomy, but the exact incidence of such pain remains unknown [2]. Contemporary studies suggest that chronic postvasectomy pain syndrome (PVPS) is more common than originally thought. McMahon et al reported



**FIG. 2.** Longitudinal sonography of right testis and epididymis before vasectomy and 2 months after vasectomy show increase in thickness of epididymis. (A) Largest diameter of the head of the epididymis. (B) Diameter of the body of the epididymis posterior to the proximal third of the testis.

**TABLE 2.** Results of preoperative measurements and mean differences in measurements between the two groups

	Group 1 (n=23)	Group 2 (n=91)	p-value
VAS	≥3	<3	
<b>Preoperative measurements in cm (range)</b>			
<b>Left</b>			
Head	0.65±0.27 (0.3-1.2)	0.62±0.21 (0.3-1.3)	0.608
Body	0.27±0.13 (0.1-0.5)	0.23±0.11 (0.1-0.6)	0.181
<b>Right</b>			
Head	0.64±0.22 (0.3-1.3)	0.60±0.22 (0.2-1.3)	0.357
Body	0.25±0.11 (0.1-0.5)	0.24±0.11 (0.1-0.5)	0.420
<b>Total</b>			
Head	0.65±0.24 (0.3-1.3)	0.61±0.21 (0.2-1.3)	0.241
Body	0.26±0.12 (0.1-0.5)	0.24±0.11 (0.1-0.6)	0.125
<b>Mean differences in measurements in cm</b>			
<b>Left</b>			
Head	0.43±0.27	0.39±0.19	0.394
Body	0.19±0.06	0.17±0.06	0.355
<b>Right</b>			
Head	0.41±0.29	0.39±0.21	0.772
Body	0.17±0.11	0.17±0.06	0.836
<b>Total</b>			
Head	0.42±0.28	0.39±0.20	0.427
Body	0.18±0.09	0.17±0.06	0.451

VAS: visual analogue scale

chronic testicular pain in 33% of men who had undergone vasectomy, which was troublesome in 15% and caused 5% to seek medical attention [2]. Choe and Kirkemo identified chronic scrotal pain in 18.7% of patients after vasectomy, and it had an adverse effect on their quality of life in 2.2% of those cases [8]. In our analysis, the incidence of chronic scrotal pain after vasectomy was 20.2%. The present results are similar to those previously reported by others. Scrotal pain after vasectomy has been referred to by many terms, including late postvasectomy syndrome, post-vasectomy orchalgia, congestive epididymitis, and PVPS [1,9-11]. Currently, the syndrome is generally termed PVPS [12].

The cause of chronic PVPS remains controversial; one leading theory proposes that the obstruction and resulting dilatation of the epididymal duct produces interstitial fibrosis. It has also been suggested that pain results from perineural fibrosis and inflammation after the rupture of epididymal ducts, with extravasation of spermatozoa around the epididymal tubules and at the site of vasal transection. The nerves in these areas become densely en-

cased in fibrous tissue, with distortion, angulation, and lymphatic infiltration [2]. It is unclear why some patients develop persistent symptoms, whereas others have only transient complaints. A different degree of local fibrosis after an inflammatory response and the varying extent of epididymal compression might account for the subjective experience of scrotal pain in some patients. West et al described the histological findings of epididymides in patients with scrotal pain after vasectomy as epididymal engorgement, complex cystic disease, and chronic epididymitis [13]. It is most likely that the ultrasonographic feature of tubular ectasia of the epididymis represents engorgement of the epididymal body from obstruction. Quantitative morphometric analysis of testicular histology in men after vasectomy showed dilatation of the seminiferous tubules, interstitial fibrosis, and reductions in the seminiferous cell population [14]. In appropriately selected patients, vasovasostomy can produce marked improvement or resolution of pain. This therapy has the obvious drawback of restoring fertility. Nangia et al reported that 69% of patients were pain-free after reversal, noting that the selection criteria for surgery are important to the outcome [15]. A careful preoperative evaluation should include serial physical examinations to confirm the site of persistent pain, consideration of a psychological evaluation to exclude somatization, and scrotal ultrasound to assess for occult pathology. Myers et al reported, in a small series, that 84% of patients with PVPS had complete resolution of pain after vasovasostomy [16]. Our study prospectively evaluated the scrotal pain and postvasectomy status on scrotal ultrasonography after vasectomy. It was hypothesized that chronic scrotal pain after vasectomy would be associated with obstruction of the epididymal duct. However, our results showed no significant differences in ultrasonographic features at 2 months after vasectomy between the two groups. Nevertheless, this is the first study that has described the relationship between ultrasonographic features and PVPS.

The differential diagnosis of scrotal pain after vasectomy must include nerve impingement or injury, varicocele, hydrocele, infection, testicular neoplasm, intermittent testicular torsion, inguinal hernia, referred pain, and psychogenic causes [4]. Although each of these is a potential cause of pain, most can be excluded by a thorough history, physical examination, and urine analysis [12]. The main limitation of the present study is the relatively short-term follow-up. For the present study, the follow-up duration has so far been restricted to 8 weeks. We are continuing to evaluate the patients at 6 months after vasectomy to obtain long-term results.

## CONCLUSIONS

In summary, in our study with short-term follow-up, we found no statistically significant differences in the enlargement of the epididymis or scrotal ultrasonographic features between the scrotal pain and no pain groups.

Therefore, causes of scrotal pain after vasectomy other than obstruction may need to be considered.

### Conflicts of Interest

The authors have nothing to disclose.

### REFERENCES

- Selikowitz SM, Schned AR. A late post-vasectomy syndrome. *J Urol* 1985;134:494-7.
- McMahon AJ, Buckley J, Taylor A, Lloyd SN, Deane RF, Kirk D. Chronic testicular pain following vasectomy. *Br J Urol* 1992;69:188-91.
- Ahmed I, Rasheed S, White C, Shaikh NA. The incidence of post-vasectomy chronic testicular pain and the role of nerve stripping (denervation) of the spermatic cord in its management. *Br J Urol* 1997;79:269-70.
- Davis BE, Noble MJ, Weigel JW, Foret JD, Mebust WK. Analysis and management of chronic testicular pain. *J Urol* 1990;143:936-9.
- Holden A, List A. Extratesticular lesions: a radiological and pathological correlation. *Australas Radiol* 1994;38:99-105.
- Sweeney P, Tan J, Butler MR, McDermott TE, Grainger R, Thornhill JA. Epididymectomy in the management of intra-scrotal disease: a critical reappraisal. *Br J Urol* 1998;81:753-5.
- Reddy NM, Gerscovich EO, Jain KA, Le-Petross HT, Brock JM. Vasectomy-related changes on sonographic examination of the scrotum. *J Clin Ultrasound* 2004;32:394-8.
- Choe JM, Kirkemo AK. Questionnaire-based outcomes study of nononcological post-vasectomy complications. *J Urol* 1996;155:1284-6.
- Shapiro EI, Silber SJ. Open-ended vasectomy, sperm granuloma, and postvasectomy orchialgia. *Fertil Steril* 1979;32:546-50.
- Schmidt SS, Free MJ. The bipolar needle for vasectomy. I. Experience with the first 1000 cases. *Fertil Steril* 1978;29:676-80.
- McCormack M, Lapointe S. Physiological consequences and complications of vasectomy. *Can Med Assoc J* 1988;138:223-5.
- Christiansen CG, Sandlow JI. Testicular pain following vasectomy: a review of postvasectomy pain syndrome. *J Androl* 2003;24:293-8.
- West AF, Leung HY, Powell PH. Epididymectomy is an effective treatment for scrotal pain after vasectomy. *BJU Int* 2000;85:1097-9.
- Choi HS, Hong JW, Kang SJ, Shin SJ. Ultrastructural changes of human testis after vasectomy. *Korean J Urol* 1993;34:528-34.
- Nangia AK, Myles JL, Thomas AJ JR. Vasectomy reversal for the post-vasectomy pain syndrome: a clinical and histological evaluation. *J Urol* 2000;164:1939-42.
- Myers SA, Mershon CE, Fuchs EF. Vasectomy reversal for treatment of the post-vasectomy pain syndrome. *J Urol* 1997;157:518-20.