

Prevalence of scrotal calculi and their relationship with pain

Sinan Tan, Muhammet Fuat Özcan, Mustafa Karaoğlanoğlu, Ali İpek, Ayşenur Şirin Özcan, Halil Arslan

PURPOSE

The purpose of this study was to determine the frequency of scrotal calculi in men referred for scrotal ultrasonography (US), to identify any associated pathologies, and to investigate if any relationship exists between scrotal lithiasis and pain.

MATERIALS AND METHODS

This was a retrospective study in which 4084 scrotal US examinations in 3435 men were evaluated. Scrotal US was performed using a high-frequency linear transducer. Forty patients were questioned as to whether scrotal pain was present. Patients were asked to grade their scrotal pain intensity using the Numerical Rating Scale.

RESULTS

Sixty-seven of the 3435 patients with scrotal US examinations had scrotal calculi with a mean size of 3.7 ± 1.4 mm (range, 1.6–7 mm). Twenty patients with scrotal calculi had no scrotal pain. Nine patients with scrotal pain (22.5%) had no US or clinical abnormalities except scrotal calculi.

CONCLUSION

The frequency of scrotal calculi was 1.95%. Approximately one-quarter of patients with scrotal calculi and pain had no additional abnormalities. Therefore, scrotal calculi should be considered in the differential diagnosis of scrotal pain.

Key words: • calculi • scrotum • lithiasis • ultrasonography

The presence of scrotal calculi is a relatively rare condition that is characterized by the presence of freely mobile calcified bodies between the layers of the tunica vaginalis of the testes, which are often found in patients who have been referred for scrotal ultrasound (1). The etiology of the scrotal calculi is uncertain. However, inflammatory changes within the remnants of the appendix, testis or epididymis may play a role in the development of these types of calculi (1, 2). There are a limited number of studies on scrotal calculi in the literature, and most of these are case reports. Furthermore, to our knowledge, no clinical trial has focused on whether there is a relationship between scrotal calculi and pain.

The purpose of this large series study was to determine the frequency of scrotal calculi in men who were referred for scrotal ultrasound, and to identify any associated pathologic conditions in order to investigate whether any relationship exists between the presence of scrotal calculi and pain.

Materials and methods

This research was approved by the institutional human ethics committee at our hospital. A retrospective review of the radiology data processing system database revealed the existence of 4084 ultrasonography (US) scrotal reports from 3435 men between January 2008 and February 2011.

US examinations were performed using US equipment with a 9–14 MHz linear probe (Logic9, GE Healthcare, Milwaukee, Wisconsin, USA) and with an 8–14 MHz linear probe (Technos MPX, Esaote, Genoa, Italy). US examinations were performed by two radiologists who were experienced in ultrasound techniques. The examinations were performed while the patient was lying in the supine position. The scrotum was immobilized prior to the application of a small amount of gel, and the US scans were performed in the transverse, longitudinal and multiple oblique planes. In this study, the patient information and the US findings were obtained from the US reports. These reports had been recorded in the radiology information system and we evaluated each of the scrotal US reports.

Scrotal calculi were defined as typical round or oval echogenic foci with or without acoustic shadowing that were located between the layers of the tunica vaginalis of the testes (Fig. 1). Additionally, scrotal abnormalities, such as the presence of hydrocele or varicocele, or any other testicular or epididymal abnormalities that were reported during the scrotal US examination, were noted.

Following the identification of scrotal calculi from the US reports, a total of 67 patients were contacted by phone, and 40 patients were interviewed. Subsequently, patients were asked whether they had any scrotal

From the Clinics of Radiology (S.T. ✉ drsinantan@gmail.com, M.K., A.I., A.Ş.Ö., H.A.) and Urology (M.F.Ö.), Ankara Atatürk Education and Research Hospital, Ankara, Turkey.

Received 28 June 2011; revision requested 27 July 2011; revision received 15 August 2011; accepted 16 August 2011.

Published online 31 October 2011
DOI 10.4261/1305-3825.DIR.4808-11.1

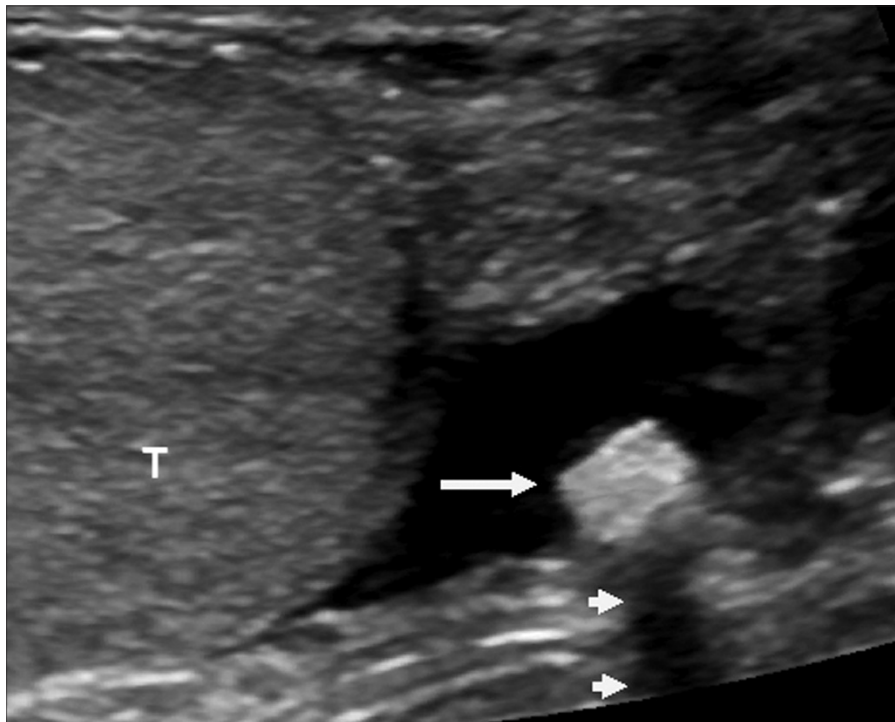


Figure 1. A scrotal calculus in a 42-year-old man with scrotal pain. A longitudinal US image of the testis (T) shows a 6 mm calculus (long arrows) with posterior acoustic shadowing (short arrows).

pain (currently or in the past). Those who experienced pain were further questioned about their memory of the duration and the maximum intensity of the pain. The patients were asked to grade their scrotal pain intensity using a numerical rating scale (NRS), and interval scales were used for the scoring (0, no pain; 10, worst imaginable pain). Additionally, patients who had experienced pain were evaluated for the existence of provocative factors or additional clinical abnormalities. The interviews were conducted by the primary investigator (S.T.) and oral consent was obtained from the participants.

Statistical analysis

A descriptive analysis was performed for the demographic and clinical characteristics of the patients. The Spearman test was used for the correlation analysis. The statistical analyses were performed using a special software (SPSS version 13.0, SPSS Inc., Chicago, Illinois, USA) and statistical significance was set for *P* values less than 0.05.

Results

Scrotal calculi were reported in 67 (1.95%) of 3435 patients from US evaluations. The mean age of the patients was 41.6±18 years (range, 17–79 years).

The scrotal calculi were located in the left hemiscrotum for 33 patients, in the right hemiscrotum for 25 patients, and were bilaterally reported in nine patients.

Overall, a total of 98 scrotal calculi were reported in 67 patients. The mean size of the scrotal calculi was 3.7±1.4 mm (range, 1.6–7.0 mm). There was a weak correlation between patient age and the size of the calculi that bordered on statistical significance (*P* = 0.08, *r*=0.276).

By US examination, 23 (34.3%) of the 67 patients with scrotal calculi had no additional US abnormalities of the scrotum. From the remaining 44 (65.7%) patients, 55 additional US abnormalities were found (Table).

Forty patients were questioned regarding the presence of scrotal pain (Fig. 2). The mean NRS pain score was 2.1±2.5 (range, 0–7). In 20 (50%) of the 40 patients, scrotal pain was not reported. There was no correlation detected between the size or number of calculi and the pain score. When patients with and without additional US abnormalities were analyzed separately, there was also no correlation detected between the calculi size and the pain score (*r*=0.4, *P* = 0.12; and *r*=0.2, *P* = 0.36; respectively).

Regarding the patients with scrotal pain, nine (22.5%) had no US abnormalities besides scrotal calculi. These patients had intermittent pain at 2–4 weeks intervals for at least 6 months. In this group, the mean NRS pain score

Table. Additional US findings in 44 cases with scrotal calculi

Additional diagnosis	Total (n=55)	Location		
		Ipsilateral	Contralateral	Bilateral
Hydrocele	23 (41.8%)	12	1	10
Varicocele	20 (36.3%)	8	4	8
Epididymal cyst	8 (14.6%)	5	1	2
Testicular cyst	1 (1.8%)	1	–	–
Epididymitis	1 (1.8%)	1	–	–
Testicular microlithiasis	2 (3.7%)	–	–	2

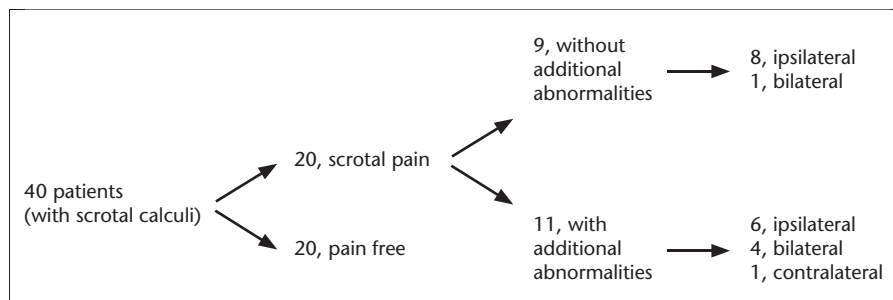


Figure 2. Diagram of 40 patients with scrotal calculi and analysis of pain

was 4.6 ± 2 (range, 2–7). These patients did not have lower urinary tract symptoms, sexual dysfunction or any other known provocative cause for scrotal pain. In eight of these nine patients, the scrotal pain was present on the ipsilateral side of the calculi. In one patient, a scrotal calculus was located in the left hemiscrotum, although the pain was bilateral. Pain-related discomfort was present in each of these cases.

Of the patients with scrotal pain, 11 (27.5%) had additional scrotal US abnormalities. Of these, six patients experienced varicocele, four patients experienced hydrocele and one patient had a large epididymal cyst.

Discussion

Scrotal calculi are commonly found during routine US examinations. High-frequency (7.5 to 15 MHz) US is the ideal method for the diagnosis of these calculi, because it offers increased resolution of the scrotal contents (3, 4). During an US examination, the calculi are easily defined as round or ovoid due to the hyperechoic nature of the calcification. Calculi in motion in the fluid between the layers of the tunica vaginalis can be identified based on changes in their position. The movement of these calculi is more easily visualized in the presence of hydrocele, and this is particularly helpful for distinguishing the calculi from other scrotal calcifications and other pathologic findings (5).

Scrotal calculi are rare benign lesions of the scrotum. Artas and Orhan reported the prevalence of scrotal calculi among 868 patients who had no history of microtrauma to be 2.65% (1). However, repeated chronic microtrauma to the scrotum may be a risk factor for the development of calculi. Frauscher et al. (6) and Turgut et al. (7) reported the existence of scrotal calculi in 81% of extreme mountain bikers and 7% of equestrians, respectively. In our study, the frequency of scrotal calculi was 1.95% from a total of 3435 men who had been consecutively recruited from the surgical and internal medicine clinics.

The size of scrotal calculi is variable, and these commonly measure less than 1 cm. Frauscher et al. (6) and Artas and Orhan (1) found the mean diameters of scrotal calculi to be 4 ± 3 mm (range, 2–14 mm) and 4.22 ± 2.42 mm (range,

2–10 mm), respectively. In our study, we found the mean size of the scrotal calculi to be 3.7 ± 1.4 mm (range, 1.6–7.0 mm), which is similar to the sizes reported previously. We found a weak correlation between patient age and calculi size, which may have been secondary to the long period required for calculus formation. The inclusion of a greater number of patients may have revealed a stronger relationship between age and calculi size. Thus, it would be useful to investigate this association in larger patient groups.

The etiology of scrotal calculi is unclear, although they may result from inflammatory changes within the remnants of the appendix, testis or epididymis (1, 2). Moreover, repeated microtrauma may be a risk factor for the development of scrotal calculi (6, 7). Histologically, the scrotal calculi consist of fibrinoid deposits around a central nidus of hydroxyapatite (3, 8). Biochemical analyses of the calculi have revealed that they are composed of calcium, oxalate and phosphorus (9).

Scrotal calculi are often found in association with the existence of secondary hydrocele. Namjoshi (5) reviewed the cases of 350 patients and found the existence of calculi and calcareous material in association with hydrocele in 32 patients, which corresponded to a prevalence rate of 9%. In our study, we found hydrocele in approximately one-third of patients with scrotal calculi. For patients with hydrocele, abnormal reabsorption and repeated deposition of cholesterol, calcium, fibrin, and hydroxyapatite may result in the formation of scrotal calculi (10).

Scrotal pain is common, but the etiology of this pain is not clearly understood for many patients (11). Scrotal pain could be due to either referred pain or idiopathic pain, and the testicular causes of pain include infection, tumor, testicular torsion, varicocele, hydrocele, spermatocele, trauma, or previous surgical intervention (12). Organs and body structures that share nerve pathways with scrotal structures, such as the ureter, the prostate or the hip, can cause referred pain in this area (12, 13). Scrotal US is an important component of the evaluation of patients with scrotal pain (14). In this study, we investigated the relationship between scrotal calculi and pain. Half of the patients with scrotal

calculi were found to have no pain. However, 9 (22.5%) of the 40 patients with scrotal pain had no US abnormalities or known provocative factors besides the scrotal calculi. Additionally, the pain for most of these patients was detected at an ipsilateral site, and pain-related discomfort was present in each of these patients. These results suggest that scrotal calculi can affect a patient's quality of life. Furthermore, the movement of calculi in the fluid between the layers of the tunica vaginalis may irritate the surrounding soft tissue, and this irritation may result in occasional pain. However, this issue warrants evaluation by further prospective studies.

Approximately half of the patients with scrotal pain had additional scrotal US abnormalities. As these concomitant abnormalities may have resulted in scrotal pain, the association between scrotal calculi and pain could not be assessed for these patients. For one patient with concomitant hydrocele who underwent a hydrocelectomy, the pain subsided following surgery.

Our study had certain limitations, including the fact that it was retrospective. Furthermore, scrotal pain can be caused by a variety of factors, and the number of patients we evaluated for scrotal pain was very limited. We have no data to comment on whether pain was experienced by patients with scrotal calculi more or less often than by the remaining 3368 patients given US examinations. Furthermore, we cannot definitely state that the pain of the patients was related to the existence of the calculi, as we do not know whether the pain would have resolved following various treatment options.

In conclusion, scrotal calculi were reported in 1.95% of 3435 patients who underwent scrotal US examinations, and the majority of these identified patients also had various benign scrotal abnormalities. Most of the patients with scrotal calculi did not experience scrotal pain. However, pain-related discomfort was present in some patients with scrotal calculi who had no known additional abnormalities. Therefore, we recommend that the presence of scrotal calculi be considered for the differential diagnosis of scrotal pain. Further research on larger patient groups is warranted to clarify the relationship between scrotal calculi and pain.

Conflict of interest disclosure

The authors declared no conflicts of interest.

References

1. Artas H, Orhan I. Scrotal calculi. *J Ultrasound Med* 2007; 26:1775–1779.
2. Li GH, Li XD, Cheng S, Chen ZD. A large intrascrotal calculus. *Asian J Androl* 2005; 7:103–105.
3. Linkowski GD, Avellone A, Gooding GA. Scrotal calculi: sonographic detection. *Radiology* 1985; 156:484.
4. Gorman B, Carroll BA. The scrotum. In: Rumack CM, Wilson SR, Charboneau JW, eds. *Diagnostic ultrasound*. 3rd ed. St. Louis: Mosby, 2005; 849–885.
5. Namjoshi SP. Calculi in hydroceles: sonographic diagnosis and significance. *J Clin Ultrasound* 1997; 25:437–441.
6. Frauscher F, Klauser A, Stenzl A, Helweg G, Amort B, zur Nedden D. US findings in the scrotum of extreme mountain bikers. *Radiology* 2001; 219:427–431.
7. Turgut AT, Kosar U, Kosar P, Karabulut A. Scrotal sonographic findings in equestrians. *J Ultrasound Med* 2005; 24:911–917.
8. Sánchez Merino JM, Lancina Martín A, Grases Freixedas F, Parra Muntaner L, Gómez Cisneros SC, García Alonso J. Intra-scrotal lithiasis. Crystallographic analysis. *Arch Esp Urol* 2002; 55:523–526.
9. Parlaktas BS, Uluocak N, Filiz E, Erdemir F, Ozyurt H. Intra-scrotal calculi: a very rare stone disease. *Int J Urol* 2006; 13:849–850.
10. Garriga V, Serrano A, Marin A, Medrano S, Roson N, Pruna X. US of the tunica vaginalis testis: anatomic relationships and pathologic conditions. *Radiographics* 2009; 29:2017–2032.
11. Sweeney CA, Oades GM, Fraser M, Palmer M. Does surgery have a role in management of chronic intrascrotal pain? *Urology* 2008; 71:1099–1102.
12. Granitsiotisa P, Kirkb D. Chronic testicular pain: an overview. *European Urology* 2004; 45:430–436.
13. Planken E, Voorham-van der Zalm PJ, Lycklama A Nijeholt AA, Elzevier HW. Chronic testicular pain as a symptom of pelvic floor dysfunction. *J Urol* 2010; 183:177–181.
14. Mihmanli I, Kantarci F. Sonography of scrotal abnormalities in adults: an update. *Diagn Interv Radiol* 2009; 15:64–73.