



The sanguineous sperm (hemospermia)—current appraisal and review

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ABSTRACT

Aims: Hemospermia is an infrequently discussed urological problem. Most health care providers including general surgeons and physicians are unfamiliar with this disorder, its etiology & management. We undertook the present review to ascertain the magnitude of this problem and to devise a working algorithm to help the clinician in approaching a case of hematospermia. The symptoms, differential diagnosis and management have been discussed. **Materials and Methods:** An Internet search was made over the 'Pubmed' for indexed publications in the English literature using the keywords hematospermia; hemospermia and bloody urethral discharge. **Results:** The search yielded about 75 indexed publications. These were reviewed and analyzed to determine the various etiological factors, differential diagnosis and their management. We have suggested a clinical working algorithm and a protocol to deal with cases of hemospermia. **Conclusions:** Hemospermia is not an uncommon urological disorder. The problem is often idiopathic, transient and self-limiting in more than half the cases. Polysymptomatic persistent hemospermia especially in the elderly may herald a more serious underlying problem that should be investigated thoroughly to rule out malignancy. While not all cases merit an extensive workup, selected cases of recurrent, symptomatic hemospermia associated with other abnormalities may be analyzed in greater detail. The stepwise clinical working algorithm suggested and devised by us on the basis of published cases will assist the treating surgeon/urologist in the evaluation of such suspected cases of hemospermia.

Key words: Hematospermia, hemospermia, bloody urethral discharge

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INTRODUCTION

Hemospermia or bloody seminal discharge is an uncommon clinical entity. Though it is considered to be usually due to prostatitis and generally runs a benign course resolving spontaneously most of the time, it often invokes considerable anxiety and is frightening for the patient. Though the most common cause is infection or inflammation of the prostate, urethra and the seminal tract, the older patients with a persistent hemospermia need to be evaluated. The concern and apprehension in the mind of the physician also stems from the pos-

sibility that an individual may be harboring malignancy or a serious underlying abnormality. Many surgeons & physicians are unfamiliar with this disorder and this forms the basis for our current review of hematospermia. We have reviewed the various etiological factors, and discussed their clinical presentation, differential diagnosis, diagnostic modalities and the current management protocol so as to familiarize the clinician when dealing with such cases.

Definition and etiology

The international nomenclature of human semen parameters defines hemospermia (HS) or hematospermia as the presence of fresh or altered blood in the ejaculate derived from pathology of accessory sexual glands, urethra or the bladder; which is related to emission and ejaculation, associated with infertility, hematuria,

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lower urinary tract obstructive symptoms, vascular abnormalities, ductal obstruction, cysts, neoplasms and systemic iatrogenic factors. HS still remains an infrequently discussed urological problem that is often relegated to the end of most textbooks of urology. Though historically HS was thought to be associated with altered sexual behavior in the form of overindulgence or prolonged abstinence and inhibition, it is now believed to be intermittent, benign and self-limiting in a majority.^[1] According to Perez JR et al even a protracted phase of daily ejaculations via masturbation may cause hematospermia, probably owing to stress of the vasculature of the ejaculatory system.^[2] The overall lack of awareness and concern by the urologist/clinician stems from a common notion that this is generally a benign self-limiting problem,^[3] though this may not be always correct. It is important that the urologist approach such patients with adequate concern and is aware of the underlying conditions, especially malignancy. [Table 1] shows a tabulated list of etiological factors associated with HS. These may be congenital, inflammatory, neoplastic, or related to iatrogenic trauma. The commonest cause of HS is idiopathic in more than 70% of the cases.^[4] About 0.5% of patients with cancer prostate may present with HS as a sentinel symptom.^[3] Iatrogenic trauma leading to HS is most commonly seen with transrectal ultrasound guided prostate biopsy and according to one recent large study of 5957 biopsies performed in 4303 clinically healthy men over a ten year period HS occurred as minor complication in 36.3% of the subjects.^[5] [Table 2] depicts a summary of reported series and case reports of hematospermia showing their salient features, etiological, diagnostic factors and their outcome. One of largest

series of HS reported by Leary et al^[6] comprised 200 men in the 20-74 year age group, with 29% having recurrent HS with a 5-23 year follow up period with 4% developing prostate cancer eight years following the initial evaluation.

Clinical features & presentation

Hemospermia may be mono-symptomatic and primary or it may be secondary and present as a poly-symptomatic disorder in association with other symptoms depending on the underlying etiology. Other diverse associated symptoms include pelvic/perineal pain, orgasmalgia (pain at the time of orgasm),^[7] persistent dysuria, hematuria, urinary tract infection and infertility (ejaculatory duct obstruction/azoospermia / oligozoospermia).^[8] One must also inquire in to the history whether HS is acute or chronic and whether it is mono or polysymptomatic. A history of post ejaculatory persistent painless hematuria is strongly suggestive of prostatic/urethral polyps.^[9,10] History of perineal/pelvic pain/discomfort should lead one to the suspicion of SV/ED cysts/calculi associated infection. History of HS associated with infertility, painful ejaculation, and perineal, testicular or scrotal pain should be carefully evaluated for possible ejaculatory duct obstruction (EDO).^[11] The blood pressure should be recorded in all cases to rule out hypertension as a cause of hemospermia (at least according to one study hypertension was detected in 7.3 % of the patients presenting with hemospermia).^[12] Massive hemospermia or post ejaculatory gross hemospermia is rarely encountered, the most likely causes include abnormal post urethral vessels or posterior urethral or prostatic apical varicosities, which may also lead to hematuria, passage of clots and urinary retention.

Diagnosis

The initial approach to a patient with HS should include a detailed history and clinical evaluation including a digital rectal evaluation (DRE). DRE may help in detection of palpable SV cysts and prostate abnormalities. It is important to be aware at this stage whether the HS is primary or secondary. Mono-symptomatic or primary HS is more common, often transient, idiopathic in origin and is generally not associated with significant urological disease.^[12,13] Never the less whenever a man over forty years presents with hemospermia, prostate cancer screening should be vigilantly performed since hemospermia may be associated with a higher risk of prostate cancer.^[3] A careful seminal cytology/seminogram should be done to differentiate clear HS from hemo-pyospermia in order to ascertain the underlying pathology.^[14,15] The next step should be to perform urine cytology, in case clusters of columnar epithelial cells are found one must consider benign prostatic epithelial polyps in the differential diagnosis and in case cells with malignant cytology found one must carry a careful diligent search for pro-

Table 1: Simplified classification of the salient etiological factors leading to hemospermia

Congenital	Prostatic urethral or adenomatous polyps, papillary prostatic urethral adenomas, hemangiomas, telangiectasia, vascular abnormalities, mullerian duct (utricule) cysts, and seminal vesicle cysts. (Children and pre-pubertal)
Inflammatory	Urethroprostatitis or epididymo-orchitis; seminal vesiculitis; calculi of the SV & ED apparatus, chronic prostatitis, chronic nonbacterial prostatitis (chlamydia trachomatis), viral urethral condylomas, SV amyloidosis, malakoplakia of prostate and SV, genitourinary tuberculosis & schistosomiasis (adolescents)
Neoplastic	Cancer and sarcoma of prostate, cancer seminal vesicle, SV adenomyosis, testicular tumors, metastasis to seminal vesicles (elderly)
Iatrogenic	Post ESWL™ lower ureteric calculi, post prostate biopsy, post HIFU/TURP, post prostate brachytherapy, post vasectomy.
Medical	Hypertension

SV/ED: Seminal vesicles, ejaculatory duct; ESWL™: Extra-corporeal shockwave lithotripsy; HIFU: High intensity focused ultrasound.

Table 2: Table depicting some important publishedreviews/reports on hemospermia

No	Author	Nos	Presentation	Diagnosis	Therapy
1	Han M, 2004	19	HS	(13.7%) Ca Prostate	-
2	Yagci C, 2004	56	HS	TRUS-Abnormalities-51(95%) Prostate calcifications (23), ED calculi (21), dilated ED/SV (18)/(21), ED cyst(6), prostatitis (6), BPH (18)	-
3	Singh I, 2003	1	HS + loin pain	Ejaculatory duct calculus	Endoscopic removal. Cured
4	Frenandez, 2003	1	HS + supra-pubic pain	Localised amyloidosis Diagnosed by TRUS Bx	-
5	Tan Mo, 2003	2	HS, hematuria, LUTS	Papillary adenoma -prostatic urethra-	Endoscopic fulguration. Cured
6	Kamura, 2003	10	HS, hematuria, voiding difficulty	Bullous lesion of prostaticUrethra.	Endoscopic extirpation. Cured
7	Chen, 2002	42	HS + vague pelvic pain	Chronic seminal vesiculitis.	TRUS-SV puncture + antibiotic instill. (91% cured)
9	Rodriguez, 2002	59/290(21%)	-	Post TRUS Bx hemospermia	AntibioticsCured
10	Calahorra, 2001	1	HS+ oligozoospermia	Giant SV cyst with ipsilateral renal agenesis	S.vesiculectomyCured
11	Yanagisawa, 2002	1	HS	Squamous carcinoma in acquired SV cyst	S.vesiculectomyCured
10	Ameur, 2002	7	HS	Urethroprostatitis, epididymo-orchitis & cancer prostate	Antibiotics and orchidectomy
12	Kochakarn, 2002	68	HS with a 5 year follow up	Prostatitis (29.7%), TB (4.4%) STD (5.8%), idiopathic (61%),hypertension (7.3%)	According to cause
13	Portillo FJ, 2001	9	HS- gross (2), microscopic (7)	Post ESWL for lower ureteral calculi	Self limiting in 12 weeks
14	Galan M, 2001	136/303 (44.9%)	HS	Post Prostate Bx	Self limiting in one week
15	Mi ZG, 2001	131	HS occurred in 51% post resect.	Posterior urethral adenoma	TU resection.Cured
16	Bermudez AM, 2002	1	HS + Recc epididy-orchitis	Cystic dilatation of the prostatic utricle with right renal agenesis	Transperitoneal S. vesiculectomy Cured
17	Lu CH, 2000	40	HS evaluated by TRUS	Idiopathic (17%), 83%-ED/ MD cysts, SV dilatation + stones, BPH, pre-prostatic vein engorgement, prostatic stones)	-
18	Lencioni R,1999	90	HS evaluated by MRI	Blood in SV/ED(23), Dilated SV/ED (30), Cystic SV/ED (14), SV calculi (7)	-
19	Furuya S, 1999	21	HS evaluated by TRUS+SV puncture	SV dilated(1),cyst(1), MD cyst (2), Amyloidosis(1), ectopic prostatic urethral tissue(4)	TRUS guided SV puncture/aspiration
20	Toyota, 1998	1	HS	Pelvic AV-malformation	EmbolisationCured
21	Vilana R 1997	2/9	HS	Schistosomiasis	-
22	Cho Ir,1997	17	HS evaluated by MRI	Calculi + cysts in SV/ED/MD	-
23	Nicolai M, 1996	80	HS	Idiopathic (50%)/Infect 20%,periurethral/ED calculi-60%, Dilated SV (31.4%), MD cysts (8.6%)	-
24	Segal As, 1996	107	HS	Benign urethral neoplasms: viral papillomas (67.3%), polyps (22.4%), angiomas (10.3%).	TU resection, electrocoagulation, partial urethral resection. Cured
25	Gattoni, 1996	85	HS	Periurethral calcification-41.3%, prostatitis 24.7%, Seminal vesiculitis-11.7%,Prostatic Ca-3.5%,Idiopathic-12.9%	-
26	Dik P, 1996	34	HS+ scrotal pain+ dysuria,infertility	Medial prostatic cyst	TU cyst marsupialisationCured
27	Corachan M, 1996	10	HS + prostatitis like symptoms	Schistosomiasis diagnosed by ultrasound & parasitology	-
28	Amano T, 1994	46	HS	Prostatic stones+ SV dilatation & calculi,BPH Prostatitis in 73.9% diagnosed by TRUS	-
29	Schall MD, 1992	26	HS, hypospermia, oligospermia, + painful ejaculation	[Mullerian cysts(4), wolffian cysts(3), prostate ca(1)], EDO, seminal vesiculitis+ non cystic SV pathology (7) diagnosed by HR-MRI-ER coil	-
30	Sampalmieri G, 1992	60	Isolated HS -20%Assoc HS-35%	Urethro-prostatitis, SV dilatation, Ca prostate, TB	-
31	Sato N, 1990	61	HS + Hematuria+ urethrorrhagia	Prostatic urethral papillary adenoma	TU fulguration+ Recurrence in 6.7%
32	Fernandez JM, 1990	29	Polysymptomatic HS	Urethral-prostate-vesicular inflammation-55%, idiopathic-24%, SV cyst(1),Ca (2)	-
33	Chou K, 1999	4	HS+ Hematuria	Prostatic urethral adenomatous polyp	-
34	Tzai TS, 1989	38	HS	Idiopathic-29%,[prostatitis(20)SV infection (3), BPH(3), SV stone(1), prostatic calculi(3)]-71% on TRUS	-
35	Leifert S, 1985	1	HS+ urethrorrhagia	Urethral ectopic prostatic tissue	TU fulgurationCured
36	Baroudy AC, 1984	25	HS + hematuria	Prostatic urethral papillary adenoma	TU fulgurationCured
37	Yu HH, 1977	65	Isolated HS, TB, Scrotal pain	Idiopathic-57%, TB-11%, Epididymal nodule-28%	-
38	Leary,1974	200	HS	Ca prostate-4%, 29% recurrent HS	-

HS-Hemospermia, SV-Seminal vesicle, ED-Ejaculatory duct, MD-mullerian duct, TRUS-Transrectal ultrasound, HR-MRI-ER-High resolution magnetic resonance imaging with endorectal coil, TU-Transurethral, Bx-Biopsy, TB-Tuberculosis.



static neoplasm or malignancy with special immunoperoxidase stains for evidence of prostatic epithelial cell origin.^[16-18] In case the cytology is negative it is appropriate to carry out urine/semen culture analysis to rule out an infectious etiology. If sterile pyuria is encountered one must rule out chronic non-bacterial prostatitis, prostatodynia and rare infections such as genitourinary tuberculosis, schistosomiasis, chlamydia trachomatis, cytomegalovirus infestation, localized amyloidosis of the seminal vesicles and or HIV.^[19-23]

Radiographic imaging by transrectal ultrasound (TRUS), vasography and or MRI is indicated where no apparent cause can be ascertained and the suspicion of a structural abnormality of the seminal apparatus exists. Initially it is best to proceed with TRUS^[24] which can demonstrate any structural abnormality in the seminal vesicle (SV), vas ampulla, ejaculatory duct (ED) such as dilatation, mullerian or utricular cyst, and ED or SV calcification, congenital mullerian (utricle) cysts, cysts/calculi of the SV, ED and the prostate.^[25-27] Cystic changes in the SV and ED apparatus contribute to HS via certain allergic or inflammatory reactions.^[26] In case multiple cystic masses are found in association with prostatic cysts it is important to delineate them with more accurate and precise modalities such as CECT or MRI to plan their management.^[11,25,28,29] Normal SV are depicted on T₂ weighted images as a mixture of high and low-signal intensity (convolution of tubules with a diameter of < than 0.5 cm).^[29] Recently MRI with a body coil and an endorectal coil using fast spin-echo techniques have been also employed to evaluate such cysts. SV hemorrhage, chronic infection and fibrosis can be detected by T_{1/2} weighted images of MRI with a high degree of accuracy.^[30,31] In acute hematospermia both TRUS and MRI may appear normal. In chronic hemospermia TRUS may reveal dilated SV with or without increased echogenecity due to hemorrhage within the SV, in such cases an MRI may show increased signal intensity on T1 weighted images which may become slightly decreased in signal on T2 weighted images. Other findings such as ejaculatory/mullerian duct/prostatic cysts, calculi and urethral polyps may also be ascertained.

In cases of HS with infertility due to suspected ejaculatory duct occlusion the diagnosis can be confirmed by percutaneous seminal-vasography combined with methylene blue solution for radiological and direct cystoscopic visualization.^[11] Percutaneous vasography is an efficient method to diagnose diseases of the seminal vesical and ductal system such as seminal vesiculitis, seminal vesicle cysts, chronic prostatitis and cancer prostate all of which may be associated with hemospermia.^[32] If all attempts fail to clinch the diagnosis cystourethroscopy should be considered^[33] and particular concentration should be directed towards the prostatic urethra and the area around verumonta-

num for any polyps or ectopic prostatic tissue as a cause of persistent painless hematuria and hemospermia.^[9,10] [Table 3] shows a stepwise clinical diagnostic algorithm that has been suggested by us to facilitate the work up of case of hemospermia and or hemopyospermia.

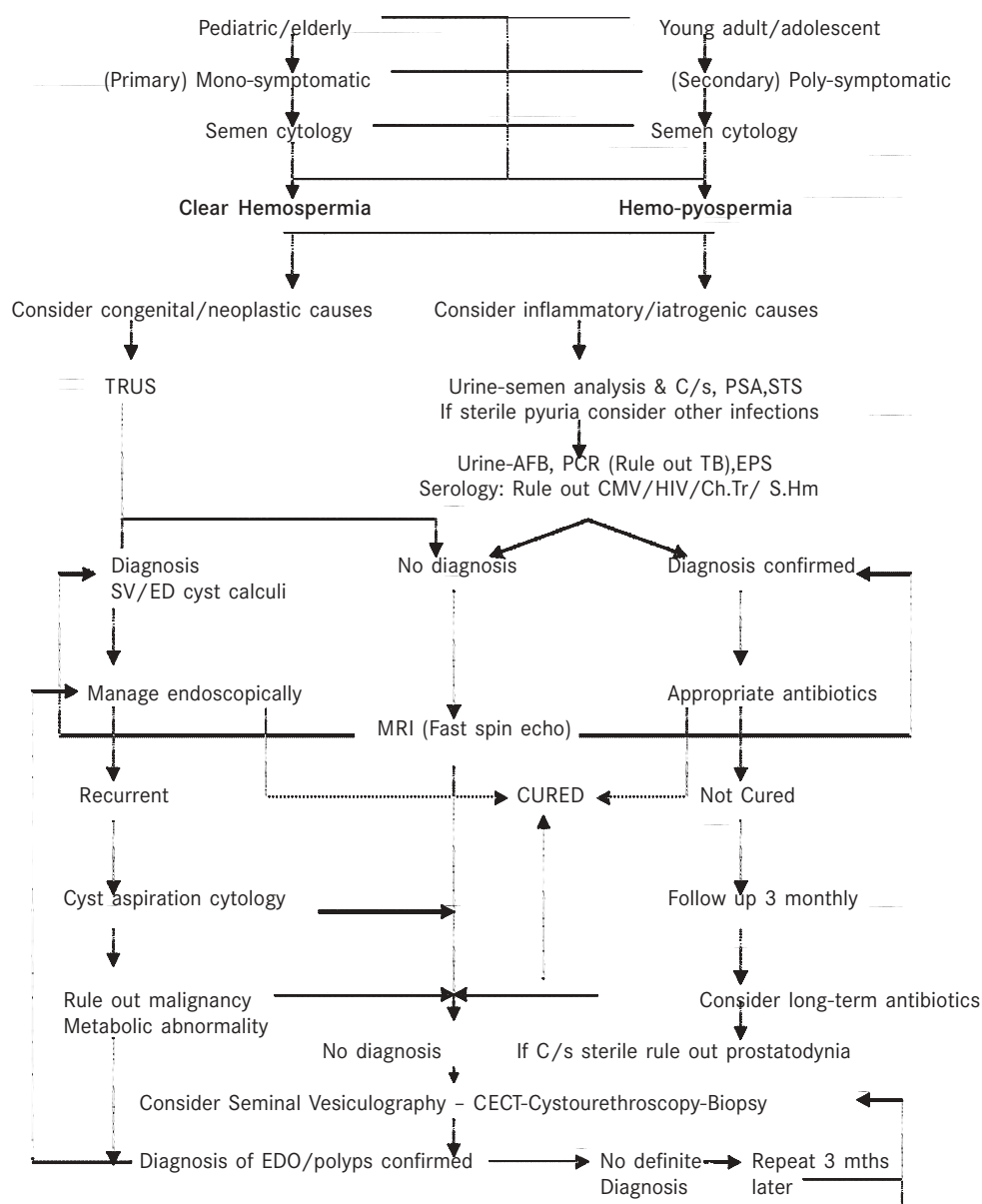
Management

Treatment should be tailored to the cause. Primary or isolated hemospermia is often self-limiting. Infection and inflammatory pathology of the lower seminal tract, which is often the most frequent underlying pathology, should be treated with appropriate antibiotics.^[34] Where radiological imaging reveals structural abnormality surgical correction should be performed especially in cases of persistent and or recurrent hemospermia. Cysts of the ejaculatory duct and seminal vesicle apparatus have been traditionally treated by transurethral cyst deroofing especially when associated with calculi or ejaculatory duct obstruction.^[5] Alternatively solitary/recurrent SV cysts can be safely managed by transperineal or transrectal aspiration and or ultrasound guided sclerotherapy.^[33,35] TRUS guided aspiration & antibiotic injection of the dilated SV+ED apparatus may be diagnostic^[36] as well as therapeutic.^[37] TRUS guided continuous trans-catheter instillation of antibiotics has been successfully deployed for the therapy of chronic seminal infections with a cure rate of over 90%. Although simple cyst aspiration is useful and a minimally invasive option to determine and treat the bleeding site responsible for HS^[38] it necessitates a longer follow up and is often associated with a 50% echo proven relapse rate.^[8] Besides simple cyst puncture, endoscopic section or marsupialisation can also be considered for large or complicated cysts. For a reliable cyst transurethral de-roofing it is essential to perform the procedure under TRUS guidance and preoperative cyst injection with a colored dye such as methylene blue.^[37] With current endoscopic procedures the long-term cure rate (for mullerian or seminal cysts) approaches 82%.^[8] Vesiculectomy or partial vesiculectomy may give excellent results in cases of larger and or recurrent SV cysts. Ejaculatory duct obstruction due to calculi and or cysts presenting with hemospermia can also be managed successfully endoscopically with a transurethral incision.^[39,40]

CONCLUSIONS

In most young patients hemospermia is idiopathic, or associated with an infectious etiology and is often transient where a cause may never be found. Hemospermia is generally of inflammatory origin in the younger patients, where as it is often due to urethritis, prostatitis or epididymo-orchitis, but in the elderly men, it is generally due to benign or malignant prostatic tumors. When it occurs as a poly-symptomatic disorder or when it persists in the elderly, they should be investigated thoroughly to rule out more serious underlying disorder.

Table 3: Clinical algorithm



TRUS- Transrectal ultrasound; PSA- Prostate specific antigen; STS-Serological test for syphilis, CMV-Cytomegalovirus; Ch Tr-chlamydia trachomatis; S.Hm-Schistosoma hematobium; EDO-Ejaculatory duct obstruction. EPS: Expressed prostatic secretions, CECT- Contrast enhanced computerized tomography.

ders such as malignancy. Transrectal ultrasound (TRUS) should be the initial investigative modality of choice once an infectious etiology has been ruled out. If TRUS is inconclusive a fast spin echo magnetic resonance imaging should be considered. Should all other imaging modalities fail to conclude a definite diagnosis a cystourethroscopy may be considered.

Most cases of hemospermia can be evaluated along the lines of the stepwise clinical diagnostic algorithm as outlined in Table-3. Whilst an extensive workup may not be indicated in all such patients, we recommend the suggested workup in selected symptomatic and

recurrent cases of hemospermia associated with other disorders. Thus primary or solitary hemospermia (monosymptomatic) may be assessed by urinalysis, seminal cytology, evaluation for hypertension, and reassurance of the patient. Secondary or persistent and recurrent of hemospermia and or polysymptomatic hemospermia are best differentiated and clarified by a combination of TRUS, cystoscopy, and or magnetic resonance imaging.^[32] TRUS, IVP, MRI and cystoscopy may be indicated only in select cases. Treatment ought to be tailored to the outcome of the investigations and the final diagnosis. No specific therapy may be indicated for the idiopathic cases.

REFERENCES

1. Mulhall JP, Albertsen PC. Hemospermia: diagnosis and management. *Urology* 1995;46:463–7.
2. Correa-Perez JR. Occurrence of nonpersistent hemospermia after a prolonged period of daily ejaculatory intensity longer than 3 weeks. *J Assist Reprod Genet* 2004;21:341–2.
3. Han M, Brannigan RE, Antenor JA, Roehl KA, Catalona WJ. Association of hemospermia with prostate cancer. *J Urol* 2004;172:2189–92.
4. Ameur A, Tuiti D, Jira H, el Alami M, Boumdin H, Abbar M. Hemospermia: diagnosis and therapeutic aspects. Seven case reports. *Ann Urol* 2002;36:74–80.
5. Berger AP, Gozzi C, Steiner H, Frauscher F, Varkarakis J, Rogatsch H, *et al*. Complication rate of transrectal ultrasound guided prostate biopsy: a comparison among 3 protocols with 6, 10 and 15 cores. *J Urol* 2004;171:1478–80.
6. Leary FJ, Aguilo TJ. Clinical significance of hemospermia. *Mayo Clin Proc* 1974;49:815.
7. Nag S, Ellis R, Merrick G, Bahnson R, Wallner K, Stock R. American Brachytherapy Society recommendations for reporting morbidity after prostate brachytherapy. *Int J Radiat Oncol Biol Phys* 2002;54:462.
8. Coppens L. Diagnosis and treatment of obstructive seminal vesicle pathology. *Acta Urol Belg* 1997;65:11–9.
9. Furuya S, Ogura H, Shimamura S, Itoh N, Tsukamoto T, Isomura H. Clinical manifestations of 25 patients with prostatic-type polyps in the prostatic urethra. *Hinyokika Kiyo* 2002;48:337–42.
10. Tan MO, Kordan Y, Deniz N, Erdem O, Sen I, Bozkirli I. Papillary adenoma of the prostatic urethra: report of two cases. *Int J Urol* 2003;10:459–62.
11. Weintraub MP, De Mouy E, Hellstrom WJ. Newer modalities in the diagnosis and treatment of ejaculatory duct obstruction. *J Urol* 1993;150:1150–4.
12. Kochakarn W, Leenanupunth C, Ratana-Olarn K, Viseshsindh V. Hemospermia: review of the management with 5 years follow-up. *J Med Assoc Thai* 2001;84:1518–21.
13. Jinza S, Noguchi K, Hosaka M. Retrospective study of 107 patients with hemospermia. *Hinyokika Kiyo* 1997;43:103–7.
14. Papp G, Molnar J. Causes and differential diagnosis of hemospermia. *Andrologia* 1981;13:474–8.
15. Colpi GM, Roveda ML, Tognetti A, Balerna M. Seminal tract inflammation and male infertility. Correlations between leukospermia and clinical history, prostatic cytology, conventional semen parameters, sperm viability and seminal plasma protein composition. *Acta Eur Fertil* 1988;19:69–77.
16. Schnadig VJ, Adesokan A, Neal D Jr, Gatalica Z. Urinary cytologic findings in patients with benign and malignant adenomatous polyps of the prostatic urethra. *Arch Pathol Lab Med* 2000;124:1047–52.
17. Fan K, Schaefer RF, Venable M. Urethral verumontanal polyp: evidence of prostatic origin. *Urology* 1984;24:499–501.
18. Glancy RJ, Gaman AJ, Rippey JJ. Polyps and papillary lesions of the prostatic urethra. *Pathology* 1983;15:153–7.
19. Miyata Y, Sakai H, Kanetake H, Saito Y. Clinical study of serum antibodies specific to *Chlamydia trachomatis* in patients with chronic nonbacterial prostatitis and prostatodynia. *Hinyokika Kiyo* 1996;42:651–3.
20. Corachan M, Valls ME, Gascon J, Almeda J, Vilana R. Hemospermia: a new etiology of clinical interest. *Am J Trop Med Hyg* 1994;50:580–4.
21. Koment RW, Poor PM. Infection by human cytomegalovirus associated with chronic hemospermia. *Urology* 1983;22:617–21.
22. Meng MV, Werboff LH. Hemospermia as the presenting symptom of metastatic malignant melanoma of unknown primary origin. *Urology* 2000;56:330.
23. Herranz FL, Arellano GR, Nam CS, Jimenez GM, Pereira SI. Localized amyloidosis of the seminal vesicles. *Actas Urol Esp* 2003;27:825–8.
24. Littrup PJ, Lee F, McLeary RD, Wu D, Lee A, Kumasaka GH. TRUS of seminal vesicles and ejaculatory ducts: clinical correlation. *Radiology* 1988;168:625–8.
25. Schwartz JM, Bosniak MA, Hulnick DH, Megibow AJ, Raghavendra BN. CT of midline cysts of the prostate. *J Comput Assist Tomogr* 1988;12:215–8.
26. Worischek JH, Parra RO. Chronic hemospermia: assessment by transrectal ultrasound. *Urology* 1994;43:515–20.
27. Fuse H, Sumiya H, Ishii H, Shimazaki J. Treatment of hemospermia caused by dilated seminal vesicle by direct drug infection guided by ultrasound. *J Urol* 1988;140:991.
28. Soh S, Kawakami T, Egawa S, Uchida T, Koshiba K. Use of US in the diagnosis of cystic lesions in seminal vesicles and prostate. *Hinyokika Kiyo* 1995;41:33–7.
29. Maeda H, Toyooka N, Kinukawa T, Hattori R, Furukawa T. Magnetic resonance images of hemospermia. *Urology* 1993;41:499–504.
30. Hasegawa N, Miki K, Kato N, Furuta N, Ohishi Y, Kondo N, *et al*. MRI of hemospermia. *Nippon Hinyokika Gakkai Zasshi* 1998;89:956–60.
31. Lencioni R, Ortori S, Gioni D, Morelli G, Ceretti E, Cosottini M. Endorectal coil MRI findings in hemospermia. *Magna* 1999;8:99.
32. Sun G, Fang D, Zhu X, Chen Z, Lou G, Cai B. Diagnosis of seminal duct system diseases by percutaneous vasography (a report of 70 cases). *Zhonghua Nan Ke Xue* 2004;10:614–5.
33. Munkel Witz R, Krasnokutsky S, Lie J, Shah SM, Bayshtok J, *et al*. Current perspectives on hemospermia: a review. *J Androl* 1997;18:6–14.
34. John H, Ludwig M. Diagnostic and therapeutic procedures for hemospermia. *Urology* 2003;42:99–102.
35. Wang TM, Chuang CK, Lai MK. Seminal vesicle cyst: an unusual cause of hemospermia—a case report. *Changgeng Yi Xue Za Zhi* 1993;16:275–8.
36. Yagci C, Kupeli S, Tok C, Fitoz S, Baltaci S, Gogus O. Efficacy of TRUS in the evaluation of hemospermia. *Clin Imaging* 2004;28:286–90.
37. Chen R, Xu YM, Qiao Y, Zhang J, Tang TX, Wang MM. Interventional therapy for the chronic seminal vesiculitis. *Zhonghua Nan Ke Xue* 2002;8:281–2.
38. Furuya S, Ogura H, Saitoh N, Tsukamoto T, Kumamoto Y, Tanaka Y. Hemospermia: an investigation of the bleeding site & underlying lesions. *Int J Urol* 1999;6:539–48.
39. Singh I, Sharma N, Singh N, Gangas R. Hemospermia (ejaculatory duct calculus)—an unusual cause. *Int Urol Nephrol* 2003;35:517–8.
40. Fuse H, Nishio R, Murakami K, Okumura A. Transurethral incision for hemospermia caused by ejaculatory duct obstruction. *Arch Androl* 2003;49:433–8.