

### Hemospermia EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
1. Amano T, Kunimi K, Ohkawa M. Transrectal ultrasonography of the prostate and seminal vesicles with hemospermia. <i>Urol Int</i> 1994; 53(3):139-142.	Review/Other-Dx	46 patients with hemospermia	To examine role of TRUS in patients with hemospermia.	Abnormal findings in the prostate and seminal vesicles, including prostatic stones, BPH, prostatitis, and dilatation and calculi of the seminal vesicles, were observed in 34 patients (73.9%). TRUS was a useful and noninvasive procedure to investigate the causes of hemospermia. It could demonstrate latent diseases and exclude malignancy of the prostate and seminal vesicle.	4
2. Fletcher MS, Herzberg Z, Pryor JP. The aetiology and investigation of haemospermia. <i>Br J Urol</i> 1981; 53(6):669-671.	Review/Other-Dx	81 patients with hemospermia	To examine a series of patients with haemospermia in an attempt to identify the underlying cause and to outline a plan for investigation and management.	The cause of haemospermia was determined in 70 (86%) of 81 patients. Inflammatory lesions accounted for the bleeding in most men <30 years of age. Persistent haemospermia should always be investigated since clinically unsuspected tumors may be the source of bleeding in the older age groups. Analysis of the semen, prostatic fluid and urine should be performed initially. Cystourethroscopy should then be carried out if the initial investigations are negative and, if this too is negative, vasography is indicated.	4
3. Furuya S, Kato H. A clinical entity of cystic dilatation of the utricle associated with hemospermia. <i>J Urol</i> 2005; 174(3):1039-1042.	Review/Other-Tx	138 patients with hemospermia (30 [22%] had midline cyst)	To examine the clinical significance of cystic dilatation of the utricle as a lesion underlying hemospermia and the importance of the relationship between such structures.	Seminal vesicle fluid on 1 or 2 sides was hemorrhagic in 13/19 patients (aspiration failed in 6) and fluid from the midline cyst was nonhemorrhagic in 5/19 (aspiration failed in 7). The midline cyst communicated with the urethra (cystic dilatation of the utricle) in 15 patients (79%) and with 1 or 2 ejaculatory ducts in 11 (58%). In 5/11 patients with communication with the ejaculatory duct hemospermia persisted for more than 1 year. Four of these patients were cured by transurethral unroofing of the cystic dilatation of the utricle.	4

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4. Jinza S, Noguchi K, Hosaka M. [Retrospective study of 107 patients with hemospermia]. <i>Hinyokika Kyo</i> 1997; 43(2):103-107.	Review/Other-Dx	107 men with hemospermia; Age; 16-73 years (mean 45.6 years); 65 patients (60.7%) were asymptomatic	Retrospective study on men with hemospermia between 1986 and 1993.	Study recommends a routine physical examination to detect infectious or inflammatory lesions, in younger patients with transient hemospermia, whereas, a thorough urological screening for more serious urogenital diseases and measurement of blood pressure in older patients especially those with persistent hemospermia.	4
5. Jones DJ. Haemospermia: a prospective study. <i>Br J Urol</i> 1991; 67(1):88-90.	Review/Other-Dx	74 men with haemospermia; most (76%) had experienced 1 or 2 episodes only and 9 (12%) were over 40 years old	Prospective study of men with haemospermia.	In patients >40 years of age with haemospermia, a potentially treatable cause will normally be found by routine investigation which should include cystoscopy. In younger men, noninvasive investigation alone should identify any pathology. Invasive investigations should be reserved for those patients in whom the problem is prolonged, excessive or in association with other symptoms.	4
6. Leary FJ, Aguilo JJ. Clinical significance of hemospermia. <i>Mayo Clin Proc</i> 1974; 49(11):815-817.	Review/Other-Dx	200 patients with hemospermia	Documentation on the clinical experience of patients with hemospermia.	General physical examination including digital rectal palpation and urinalysis is good for examining patients. No further diagnostic procedures are necessary if no abnormalities are detected.	4
7. Lencioni R, Ortori S, Cioni D, et al. Endorectal coil MR imaging findings in hemospermia. <i>Magma</i> 1999; 8(2):91-97.	Review/Other-Dx	90 patients	To illustrate the spectrum of abnormalities found at endorectal coil MRI in patients with hemospermia presenting with hemospermia.	Abnormalities were observed on endorectal-coil MRI in 49/90 patients (54%). Endorectal coil MRI can detect abnormal findings in more than half of the patients, and may be helpful in assessing the level at which hemorrhage occurred and in defining the cause of the disease.	4
8. Leocadio DE, Stein BS. Hemospermia: etiological and management considerations. <i>Int Urol Nephrol</i> 2009; 41(1):77-83.	Review/Other-Dx	N/A	To provide the primary care physician an algorithm for the evaluation and management of hemospermia based on frequency of occurrence and patient age.	Typically, patients present to their primary care physician after a single episode of hemospermia out of concern for malignancy or venereal disease. In men ≤40 years of age, it is most often due to inflammatory or infectious processes. In men >40 years of age, however, an association exists between hemospermia and more serious underlying pathology. A significant number of cases remain idiopathic even after extensive investigation.	4

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9. Littrup PJ, Lee F, McLeary RD, Wu D, Lee A, Kumasaka GH. Transrectal US of the seminal vesicles and ejaculatory ducts: clinical correlation. <i>Radiology</i> 1988; 168(3):625-628.	Observational-Dx	52 patients	To examine role of TRUS in seminal vesicles and ejaculatory ducts.	TRUS may provide clinical insight into the causes of significant genitourinary symptoms that may previously have been ascribed to chronic nonbacterial prostatitis or have been considered to be idiopathic.	4
10. Mulhall JP, Albertsen PC. Hemospermia: diagnosis and management. <i>Urology</i> 1995; 46(4):463-467.	Review/Other-Dx	N/A	Review diagnosis and management of hemospermia.	Patients with hemospermia can be evaluated by checking the blood pressure and performing a urinalysis. Patients with persistent hemospermia are those most likely to benefit from additional studies (TRUS or cystoscopy).	4
11. Raaijmakers R, Kirkels WJ, Roobol MJ, Wildhagen MF, Schrder FH. Complication rates and risk factors of 5802 transrectal ultrasound-guided sextant biopsies of the prostate within a population-based screening program. <i>Urology</i> 2002; 60(5):826-830.	Observational-Dx	5,802 biopsies	To evaluate the complication rates and possible risk factors of TRUS-guided sextant biopsies of the prostate within a population-based screening program.	Hematuria lasting longer than 3 days and hemospermia were present after 22.6% and 50.4% of the procedures, respectively. More severe complications were far less frequent. 200 participants (3.5%) developed fever after biopsy. Urinary retention was seen 20 times (0.4%), and hospitalization was needed in 27 cases (0.5%). 25 of these men were admitted because of signs of prostatitis and/or urosepsis. Risk factor analyses revealed that an earlier episode of prostatitis was significantly associated with hospital admission and pain after biopsy. Characteristics of prostatic hyperplasia, such as prostate volume, transition zone volume/total prostate volume ratio, and a higher International Prostate Symptom Score, were all predictors of urinary retention.	4
12. Torigian DA, Ramchandani P. Hemospermia: imaging findings. <i>Abdom Imaging</i> 2007; 32(1):29-49.	Review/Other-Dx	N/A	Review potential etiologies, diagnostic workup, imaging techniques, relevant male pelvic anatomy, imaging appearance of specific associated pathologies, and treatment for hemospermia.	Noninvasive imaging may play an important role in the diagnostic workup of men with hemospermia, particularly in those who are >40 years old, have other associated symptoms or signs of disease, or have persistence of hemospermia.	4
13. Weidner W, Jantos C, Schumacher F, Schiefer HG, Meyhofer W. Recurrent haemospermia--underlying urogenital anomalies and efficacy of imaging procedures. <i>Br J Urol</i> 1991; 67(3):317-323.	Review/Other-Dx	72 patients	To examine underlying urogenital anomalies and value of imaging procedures in recurrent haemospermia.	TRUS showed, in addition to the US feature of adenoma (18 men), prostatic calcification in 5 patients with chronic bacterial prostatitis and cystic lesions in 4 patients.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
14. Worischek JH, Parra RO. Chronic hemospermia: assessment by transrectal ultrasound. <i>Urology</i> 1994; 43(4):515-520.	Review/Other-Dx	26 patients; 25 asymptomatic men as controls	To evaluate TRUS in the assessment of chronic hemospermia.	Significant US findings not present in the control group were detected in 24 patients with hemospermia. These consisted of dilated seminal vesicles in 8, ejaculatory duct cysts in 4, ejaculatory or seminal vesicle calculi in 4, the presence of ejaculatory duct and seminal vesicle dilatation in 4, seminal vesicle cysts with ipsilateral renal agenesis and absence of the vas in 2, and an intraprostatic müllerian duct remnant in 2. TRUS is the imaging modality of choice in the assessment of chronic hemospermia.	4
15. Yagci C, Kupeli S, Tok C, Fitoz S, Baltaci S, Gogus O. Efficacy of transrectal ultrasonography in the evaluation of hemospermia. <i>Clin Imaging</i> 2004; 28(4):286-290.	Review/Other-Dx	54 consecutive patients with hemospermia	To assess the efficacy of TRUS in the evaluation of hemospermia.	TRUS revealed one or more abnormalities in 51 patients (94.5%). Prostatic calcifications were found in 23 patients, ejaculatory duct calculi in 21, dilated ejaculatory ducts in 18, BPH in 18, and dilated seminal vesicles in 12, calcifications in seminal vesicles in 11, ejaculatory duct cyst in 6, prostatitis in 6, and periurethral Cowper gland mass in 1. TRUS is a noninvasive, safe method for the investigation of causes of hemospermia. It should be the first radiological investigation.	4
16. Papp GK, Kopa Z, Szabo F, Erdei E. Aetiology of haemospermia. <i>Andrologia</i> 2003; 35(5):317-320.	Review/Other-Dx	N/A	Review etiology of haemospermia.	Prostatic calculi, chronic prostatitis and carcinoma of the prostate unequivocally were found as most frequent of haemospermia. Considering the rare genital malignancies more than 10% frequency was found. Only 2.4% of the malignancies occurred in patients under 40 years of age. Hence a detailed diagnosis is advocated in haemospermia patients over 40 years. 15% of patients with haemospermia had unknown etiology.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
17. Han M, Brannigan RE, Antenor JA, Roehl KA, Catalona WJ. Association of hemospermia with prostate cancer. <i>J Urol</i> 2004; 172(6 Pt 1):2189-2192.	Observational-Dx	26,126 ambulatory men 50 years or older (40 years or older with a family history of prostate cancer or black race)	To examine the incidence of hemospermia and the association between prostate cancer and hemospermia in a large prostate cancer screening population.	Prostate cancer was detected in 1,708 of the 26,126 men (6.5%) who underwent prostate cancer screening. Prostate cancer was diagnosed in 19/139 men (13.7%) who reported hemospermia upon entering the prostate cancer screening study. 10/13 men who underwent radical retropubic prostatectomy had stage pT2 disease, while 3 had stage pT3 disease. In the logistic regression model hemospermia was a significant predictor of prostate cancer diagnosis after adjusting for age, PSA and DRE results (OR 1.73, P=0.054).	3
18. Etherington RJ, Clements R, Griffiths GJ, Peeling WB. Transrectal ultrasound in the investigation of haemospermia. <i>Clin Radiol</i> 1990; 41(3):175-177.	Review/Other-Dx	52 consecutive patients	Review the TRUS findings in a series of patients with haemospermia and to assess the role for US in the investigation of this condition.	Scan abnormalities were demonstrated in 43 patients (83%). TRUS can suggest a cause of haemospermia in the majority of patients without resort to invasive investigations, and can exclude underlying prostatic malignancy. It is recommended as the first radiological investigation in patients presenting with haemospermia.	4
19. Zhao H, Luo J, Wang D, et al. The value of transrectal ultrasound in the diagnosis of hemospermia in a large cohort of patients. <i>J Androl</i> 2012; 33(5):897-903.	Observational-Dx	270 patients	Patients with hemospermia were evaluated by TRUS to assess its efficacy in the etiologic diagnosis of hemospermia.	Abnormalities were revealed by TRUS in 256 patients (94.8%). The percentages of pathological conditions located in the seminal vesicles, in the ejaculatory ducts, in the prostate, and in the bladder were 46.3% (125 cases), 29.6% (80 cases), 55.2% (149 cases), and 0.4% (1 case), respectively. The number of patients > 40 years old and 40 years old or younger were 126 and 144, respectively.	3

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
20. Coppens L, Bonnet P, Andrianne R, de Leval J. Adult mullerian duct or utricle cyst: clinical significance and therapeutic management of 65 cases. <i>J Urol</i> 2002; 167(4):1740-1744.	Observational-Tx	65 adults	Define guidelines for the exploration and treatment of adult müllerian duct cysts. Clinical presentation, diagnostic modalities, indications for invasive procedures and postoperative outcome were reviewed.	Clinical presentations were hematospermia in 40% of cases, other ejaculatory disturbances in 20%, recurrent testicular or pelvipereineal pain in 33%, lower urinary tract irritation symptoms in 25%, lower urinary tract infection in 18.5%, male infertility in 12% and incidental finding in 18.5%.; Cyst dimensions did not influence the indication for invasive procedures, which were performed in 27/65 patients (41.5%) to treat disabling symptoms in 28% and obstructive infertility in 5%, and investigate complicated cysts on TRUS in 6%. These procedures included transperineal or transrectal puncture in 9 patients, simple endoscopic section of the utricle meatus in 12 and large marsupialisation in 6.; Endoscopic procedures improved or cured 82% of the patients at a mean follow-up of 51 months, during which neither early nor late complications were noted.; Authors recommend that investigation and/or treatment be done in symptomatic or infertile patients.	2
21. Hernandez AD, Urry RL, Smith JA, Jr. Ultrasonographic characteristics of the seminal vesicles after ejaculation. <i>J Urol</i> 1990; 144(6):1380-1382.	Review/Other-Dx	12 men	Men from a sperm donor bank underwent TRUS before and after ejaculation to investigate possible changes that could influence interpretation of seminal vesicle US.	The mean length of the seminal vesicles was 2.98 cm before and 2.95 cm after ejaculation. The anteroposterior diameter decreased only from 0.59 to 0.52 cm. Minimal differences were noted between the right and left seminal vesicles, and the greatest variation in size in an individual was only 3 mm.	4

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22. Munkelwitz R, Krasnokutsky S, Lie J, Shah SM, Bayshok J, Khan SA. Current perspectives on hemospermia: a review. <i>J Androl</i> 1997; 18(1):6-14.	Review/Other-Dx	N/A	Review the etiology of hemospermia and an algorithm is provided for the diagnosis and management.	History and physical examination, accompanied by specific radiologic tests, focused examination of biological fluids, screening TRUS, MRI, and observation with flexible instrumentation will reduce the number of "idiopathic" cases of hemospermia, identify serious pathology, and enable treatment early in the course of the disease.	4
23. Rifkin MD, Dahnert W, Kurtz AB. State of the art: endorectal sonography of the prostate gland. <i>AJR</i> 1990; 154(4):691-700.	Review/Other-Dx	N/A	1. Review the anatomy of the prostate as it relates to endorectal US and cancer of the prostate;; 2. Review the clinical indications for endorectal US;; 3. Review the technique of performing the procedure, and; 4. Illustrate the US features of the normal and abnormal prostate gland.	Prostate US is not a screening tool now, although it may be in the future. Cancer can be detected, but the data are not available to show: 1. The sensitivity and specificity of the technique applied to the appropriate patient population;; 2. The accuracy of US compared with that of other techniques, or; 3. Improvement in prognosis by detecting and treating cancers that would be identified with an early screening program.	4
24. Abe M, Watanabe H, Kojima M, Saitoh M, Ohe H. Puncture of the seminal vesicles guided by a transrectal real-time linear scanner. <i>J Clin Ultrasound</i> 1989; 17(3):173-178.	Review/Other-Dx	143 total patients: seminal vesiculitis 98; hemospermia 20; and prostatic cancer, 25	To examine effect of transrectal real-time linear scanner applied to the transperineal puncture of the seminal vesicles. Aspiration of fluid and injection of antibiotics and/or steroid drugs into the vesicles were performed for the diagnosis and treatment of seminal vesiculitis and hemospermia.	Clinical symptoms improved in 62% of the former and in 50% of the latter cases. Cancer cells were detected in aspirated vesicular fluid in 7/17 cases with prostatic cancer. A remarkable improvement in the diagnosis of prostatic cancer invasion into the seminal vesicles can be expected from this new diagnostic procedure.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
25. Furuya S, Ogura H, Saitoh N, Tsukamoto T, Kumamoto Y, Tanaka Y. Hematospermia: an investigation of the bleeding site and underlying lesions. <i>Int J Urol</i> 1999; 6(11):539-547; discussion 548.	Review/Other-Dx	21 patients	To evaluate the site of hemorrhage and causative lesions in patients with hematospermia using the puncture technique for seminal vesicles and/or müllerian duct cysts under US guidance.	Dark reddish seminal vesicle fluid was aspirated and the site of bleeding was considered to be the seminal vesicles in 11 patients (52%) (group A). In group A, abnormalities of the seminal vesicles were noted in 9 patients (82%). These consisted of dilated seminal vesicles in 7 (bilateral in 4, unilateral in 3), a seminal vesicle cyst in one and seminal vesicle amyloidosis in one. A müllerian duct cyst was confirmed to be the bleeding site in 2 patients (10%; group B). The bleeding site was estimated to be organs rather than the seminal vesicles in 4 patients (group C), in all of whom ectopic prostatic tissue was observed in the prostatic urethra. In groups B and C, seminal vesicle abnormalities were not detected by TRUS. In the remaining 4 patients (group D), failure to aspirate seminal vesicle fluid means that it is unclear whether hemorrhage was from the seminal vesicle or from another source. In group D, ectopic prostatic tissue was demonstrated in the prostatic urethra of 3 patients and unilateral seminal vesicle dilation was detected by TRUS in one patient.	2
26. Fuse H, Sumiya H, Ishii H, Shimazaki J. Treatment of hemospermia caused by dilated seminal vesicles by direct drug injection guided by ultrasonography. <i>J Urol</i> 1988; 140(5):991-992.	Review/Other-Tx	7 patients	To examine bilateral seminal vesicle puncture and injection of drugs with US guidance performed in patients with hemospermia resistant to conservative therapy and with dilated seminal vesicles.	6/7 patients had resolution of hemospermia for 2 to 3 months and then relapse. No side effect was noted.	4



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27. Jarow JP. Seminal vesicle aspiration in the management of patients with ejaculatory duct obstruction. <i>J Urol</i> 1994; 152(3):899-901.	Review/Other-Dx	11 infertile men	Seminal vesicle aspiration under TRUS guidance was performed to assess the use of this diagnostic test in the evaluation and management of patients with ejaculatory duct obstruction.	The absence of sperm within the seminal vesicle aspirate from 8 patients who had sperm in the ejaculate demonstrates that sperm are not normally present within the seminal vesicles. Numerous motile sperm were observed in the seminal vesicle aspirate from an azoospermic patient in whom vasography documented complete ejaculatory duct obstruction, demonstrating that sperm can reflux into the seminal vesicles in patients with distal obstruction. Two patients with suspected partial ejaculatory duct obstruction had sperm in the seminal vesicles. Sperm are not normally present within the seminal vesicles and ejaculatory duct obstruction should be suspected in any patient with numerous sperm within the seminal vesicles.	4
28. Cho IR, Lee MS, Rha KH, Hong SJ, Park SS, Kim MJ. Magnetic resonance imaging in hemospermia. <i>J Urol</i> 1997; 157(1):258-262.	Review/Other-Dx	17 patients	To evaluate the prostate and seminal tract with MRI in patients with hemospermia.	Abnormalities were noted on TRUS in 15/17 patients (88%) and on MRI in all. MRI with an endorectal surface coil is a powerful modality for evaluating the seminal tracts of patients with hemospermia. It can be performed clinically when TRUS is not satisfactory.	4
29. Schnall MD, Lenkinski RE, Pollack HM, Imai Y, Kressel HY. Prostate: MR imaging with an endorectal surface coil. <i>Radiology</i> 1989; 172(2):570-574.	Review/Other-Dx	15 patients with biopsy-proved prostatic carcinoma and 2 healthy volunteers	MRI with an endorectal surface coil is examined. Endorectal surface coil was developed to obtain high-resolution MR images of the prostate.	Compared with images obtained with a body coil, the surface coil images better demonstrate prostatic anatomy and pathologic conditions.	4

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30. Schnall MD, Pollack HM, Van Arsdalen K, Kressel HY. The seminal tract in patients with ejaculatory dysfunction: MR imaging with an endorectal surface coil. <i>AJR</i> 1992; 159(2):337-341.	Review/Other-Dx	26 patients with signs and symptoms of ejaculatory dysfunction (hemospermia, hypospermia, oligospermia, or painful ejaculation)	To examine the normal and pathologic anatomy of the seminal tract by using an endorectal surface coil for MRI in patients with ejaculatory disorders.	Findings were abnormal in 15 patients. Abnormalities detected included 4 cases of müllerian cysts, 3 cases of wolffian cysts, one case of anaplastic prostatic carcinoma, and various noncystic abnormalities of the seminal vesicles and ejaculatory ducts, including ejaculatory duct obstruction and seminal vesiculitis. In all cases, depiction of both the normal and abnormal anatomy of the entire seminal tract, including the vas deferens, seminal vesicles, and ejaculatory ducts, was excellent. This depiction of the detailed anatomy of the prostatic cysts made it possible to suggest specific diagnoses.	4
31. Furuya S, Furuya R, Masumori N, Tsukamoto T, Nagaoka M. Magnetic resonance imaging is accurate to detect bleeding in the seminal vesicles in patients with hemospermia. <i>Urology</i> 2008; 72(4):838-842.	Observational-Dx	26 patients with hemospermia; 15 had transperineal aspiration of the seminal vesicles under TRUS guidance to confirm the bleeding	To confirm the presence of hemorrhage in the seminal vesicles by aspiration in patients with findings suspicious for hemorrhage on MRI; and to investigate the relationship between findings on MRI and the freshness of hemorrhage.	Bloody fluid was aspirated from all seminal vesicles showing a pattern suggestive of bleeding on MRI. The morphologic analysis of red blood cells in the fluid indicated relatively fresh hemorrhage in the seminal vesicles showing high-intensity signals on T1-weighted images and low-intensity signals on T2-weighted images (group A), but old hemorrhage in those showing high-intensity signal on T1-weighted images as well as T2-weighted images (group B). In 3 patients of group A who did not receive aspiration, repeated MRI during the follow-up showed that the signal intensity changed from low to high on T2-weighted images. On the other hand, in 2 patients of group B, who received aspiration, repeated MRI performed 12 and 7 days after aspiration showed low signal intensity on T2-weighted images.	3
32. Prando A. Endorectal magnetic resonance imaging in persistent hemospermia. <i>Int Braz J Urol</i> 2008; 34(2):171-177; discussion 177-179.	Review/Other-Dx	86 patients	To present the spectrum of abnormalities found at endorectal MRI in patients with persistent hemospermia.	Endorectal MRI showed abnormal findings in 52/86 (60%) patients with hemospermia. Endorectal MRI is recommended for the evaluation of patients with persistent hemospermia.	4

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33. Sosna J, Pedrosa I, Dewolf WC, Mahallati H, Lenkinski RE, Rofsky NM. MR imaging of the prostate at 3 Tesla: comparison of an external phased-array coil to imaging with an endorectal coil at 1.5 Tesla. <i>Acad Radiol</i> 2004; 11(8):857-862.	Observational-Dx	20 cases	To qualitatively compare the image quality of torso phased-array 3T imaging of the prostate with that of endorectal 1.5T imaging.	3T produced a significantly better image quality compared with the small fields of view for posterior border (P=.0001), seminal vesicles (P=.0001), and image quality rating (P=.0001). There was a marginally significant difference within the neurovascular bundles category (P=.0535). 3T produced an image of similar quality to image quality at 1.5T for posterior border (P=.3893), seminal vesicles (P=.8680), neurovascular bundles (P=.2684), and image quality rating (P=.8599).	2
34. Friedman AC, Seidmon EJ, Radecki PD, Lev-Toaff A, Caroline DF. Relative merits of MRI, transrectal endosonography and CT in diagnosis and staging of carcinoma of prostate. <i>Urology</i> 1988; 31(6):530-537.	Observational-Dx	27 patients with biopsy-proved carcinoma of the prostate; 17 had all three imaging studies, 7 had MRI only, and 3 patients were technical MRI failures and had CT only	MRI, TRUS of patients with biopsy-proved carcinoma of the prostate was performed to compare the sensitivity of these modalities to each other for diagnosis and to CT for staging.	US was superior to MRI for the detection of intraglandular carcinoma and capsular disruption. MRI was superior to both US and CT for evaluating seminal vesicle invasion, and slightly better than CT for detecting lymphadenopathy.	4
35. Schwartz JM, Bosniak MA, Hulnick DH, Megibow AJ, Raghavendra BN. Computed tomography of midline cysts of the prostate. <i>J Comput Assist Tomogr</i> 1988; 12(2):215-218.	Review/Other-Dx	4 cases	A report on CT cases of midline cysts of the prostate.	CT showed a characteristic sharply margined, low density, homogeneous midline cyst within the prostate. On US, a well-defined midline anechoic cystic mass was seen.	4
36. Van Engelshoven JM, Kreel L. Computed tomography of the prostate. <i>J Comput Assist Tomogr</i> 1979; 3(1):45-51.	Review/Other-Dx	55 cases	Conventional anatomy of the prostate is reviewed and the CT anatomy described and illustrated.	CT is an effective method of demonstrating the prostate and surrounding structures and of assessing prostatic enlargement.	4

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37. Weyman PJ, McClennan BL. Computed tomography and ultrasonography in the evaluation of mesonephric duct anomalies. <i>Urol Radiol</i> 1979; 1(1):29-37.	Review/Other-Dx	3 cases	Examine the role of CT and US in the evaluation of mesonephric duct.	CT and US were valuable noninvasive methods, supplementing standard radiographic techniques, for evaluating these anomalies.	4
38. Banner MP, Hassler R. The normal seminal vesiculogram. <i>Radiology</i> 1978; 128(2):339-344.	Review/Other-Dx	69 asymptomatic men	Review normal seminal vesiculogram criteria for normality are presented and the radiographic techniques reviewed.	Considerable variability in the appearance of the normal adult seminal tract was seen. On the left, the normal seminal vesicle averaged 5.6 cm long, 2.0 cm wide, and 0.6 cm in luminal diameter; on the right, it averaged 5.0 cm long, 2.0 cm wide, and 0.6 cm in luminal diameter. The normal ejaculatory duct averaged 16.0 mm long and 1.5 mm wide on the left and the same on the right.	4
39. Ramchandani P, Banner MP, Pollack HM. Imaging of the seminal vesicles. <i>Semin Roentgenol</i> 1993; 28(1):83-91.	Review/Other-Dx	N/A	Reviews the imaging of the normal and abnormal seminal tract and highlights the diagnostic strengths and failings of currently available imaging modalities.	Abnormalities would occasionally be manifested indirectly on urography or cystourethrography. US, especially TRUS, CT, and MRI make it possible now to image the normal and abnormal male seminal tract structures in a noninvasive fashion and with increasingly high resolution.	4
40. Tsui KH, Wang LJ, Chang PL, Huang ST, Hsieh ML, Lee SH. Hematuria from left internal pudendal and obturator arterial bleeding following sexual intercourse. <i>Arch Androl</i> 2003; 49(6):453-455.	Review/Other-Dx	1 patient	A report on a 46-year-old man with bladder tamponade 4-5 years before hospitalization.	Angiography confirmed the presence of left pudendal and obturator arterial bleeding, and embolotherapy of the internal pudendal and obturator arteries was performed. There was no mortality, or limb loss or loss of sexual potency at follow-up.	4
41. Wang LJ, Tsui KH, Wong YC, Huang ST, Chang PL. Arterial bleeding in patients with intractable hematospermia and concomitant hematuria: a preliminary report. <i>Urology</i> 2006; 68(5):938-941.	Review/Other-Dx	5 patients	To assess the presence of arterial bleeding and its outcome after TAE in patients with intractable hematospermia and concomitant hematuria.	Arterial bleeding mainly from the internal pudendal artery was revealed by angiography in all 5 patients. The cessation of bleeding by TAE was successfully achieved in all patients. Hematospermia was improved in 3 patients. In the other 2 patients, hematospermia subsided after TAE but recurred at 12 and 23 months. Subsequent angiography of the 2 patients showed recurrent arterial bleeding, fed by blood flow from the opposite side. One of the 2 patients agreed to undergo a second TAE, after which the hematospermia disappeared. None of the 5 patients had impotence at follow-up.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
42. Ganabathi K, Chadwick D, Feneley RC, Gingell JC. Haemospermia. <i>Br J Urol</i> 1992; 69(3):225-230.	Review/Other-Dx	N/A	Review diagnosis and management of haemospermia.	Many younger patients require only routine clinical examination, urine analysis and reassurance, but patients >40 years, those with persistent haemospermia, or those with associated hematuria require urological investigation. Imaging of the prostate and seminal vesicles with TRUS is of particular value in the investigation of these patients.	4
43. Yu HH, Wong KK, Lim TK, Leong CH. Clinical study of hemospermia. <i>Urology</i> 1977; 10(6):562-563.	Review/Other-Dx	65 cases	Review cases of hemospermia seen over a ten-year period.	No specific etiology was disclosed, although renal tuberculosis was seen in 11% of cases, indicating that hemospermia is a self-limiting and benign condition which does not require full urologic investigation.	4
44. Weintraub MP, De Mouy E, Hellstrom WJ. Newer modalities in the diagnosis and treatment of ejaculatory duct obstruction. <i>J Urol</i> 1993; 150(4):1150-1154.	Review/Other-Dx	8 patients	To examine the diagnosis and treatment of patients diagnosed as having ejaculatory duct obstruction.	MRI using an endorectal coil is a valuable adjunct in the diagnosis and therapy of this disorder.	4
45. Murphy NJ, Weiss BD. Hemospermia. <i>Am Fam Physician</i> 1985; 32(4):167-171.	Review/Other-Dx	1 patient	A review and case study on hemospermia.	In most hemospermia cases, reassurance combined with adequate patient education and long-term follow-up is the treatment of choice.	4
46. Aslam MI, Cheetham P, Miller MA. A management algorithm for hemospermia. <i>Nat Rev Urol</i> 2009; 6(7):398-402.	Review/Other-Dx	N/A	Review literature in an attempt to present a cohesive view of the etiologies and diagnostic and management strategies in patient's hemospermia.	No results stated in abstract.	4
47. Szlauer R, Jungwirth A. Haemospermia: diagnosis and treatment. <i>Andrologia</i> 2008; 40(2):120-124.	Review/Other-Dx	N/A	Review the etiology, diagnosis and treatment of haemospermia.	No results stated in abstract.	4
48. Ahmad I, Krishna NS. Hemospermia. <i>J Urol</i> 2007; 177(5):1613-1618.	Review/Other-Dx	N/A	Review literature on hemospermia with emphasis on etiology, diagnosis and management.	Most patients can be treated with minimal investigations and simple reassurance. In older patients or those with persistent hemospermia or associated symptoms further investigation in the form of TRUS, MRI and cystoscopy is of proven benefit.	4

### Hemospermia EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
49. Engin G, Kadioglu A, Orhan I, Akdol S, Rozanes I. Transrectal US and endorectal MR imaging in partial and complete obstruction of the seminal duct system. A comparative study. <i>Acta Radiol</i> 2000; 41(3):288-295.	Observational-Dx	218 infertile patients	To evaluate TRUS and MRI findings of infertile patients with suspected complete or partial obstruction of the seminal duct system.	Pathologic findings were detected in 75% and 61% of patients with azoospermia on TRUS and MRI, respectively. TRUS and MRI did not reveal any pathology in 64.7% and 59.1% of patients with nonazoospermia, respectively. The incidences of hypoplastic/atrophic seminal vessels (12/48 vs 5/170), seminal vessels agenesis (6/48 vs 1/170), vasal agenesis (5/48 vs 1/170) were significantly higher in the azoospermic subgroup ( $P<0.002$ ).	3
50. Li YF, Liang PH, Sun ZY, et al. Imaging diagnosis, transurethral endoscopic observation, and management of 43 cases of persistent and refractory hemospermia. <i>J Androl</i> 2012; 33(5):906-916.	Observational-Tx	43 patients	To explore minimally invasive transurethral imaging and surgery for the treatment of severe, persistent hemospermia in cases that were refractory to conservative treatments.	The causes of hemospermia were identified in all 43 patients, and their ejaculatory duct obstruction or seminal vesiculitis was successfully treated. No serious intraoperative or postoperative complications occurred. Pathologic analyses revealed that all of the resected or biopsied seminal vesicle tissues had chronic nonspecific inflammation in the seminal vesicle wall, and no tumors were identified. Preoperative symptomology of hemospermia disappeared in all patients followed up for 2 to 30 months (average, 16 months). A single patient experienced recurrence at 11 months and had a second minimally invasive surgery that was curative. A total of 95.3% (41 of 43) of the patients experienced normal orgasmic intensity after surgery.	3
51. Ishikawa M, Okabe H, Oya T, et al. Midline prostatic cysts in healthy men: incidence and transabdominal sonographic findings. <i>AJR</i> 2003; 181(6):1669-1672.	Observational-Dx	1,826 transabdominal US examinations performed on 1,115 men	To use transabdominal US to investigate the incidence of midline prostatic cysts in healthy men.	Midline prostatic cysts represent a common variant in asymptomatic men. In a patient with urologic symptoms, detection of a midline prostatic cyst requires a focused examination to determine whether the cyst represents a normal variant or is the cause of symptoms.	4

**Hematospermia**  
**EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
52. Untergasser G, Madersbacher S, Berger P. Benign prostatic hyperplasia: age-related tissue-remodeling. <i>Exp Gerontol</i> 2005; 40(3):121-128.	Review/Other-Dx	N/A	A summary of the multifactorial nature of prostate tissue remodeling in elderly men with symptomatic BPH with a particular focus on changes of cell-cell interactions and cell functions in the human aging prostate.	Life-long stress, pleiotrope mechanisms/factors and noxes on metabolically highly active epithelia seem to be main triggers for initiation of BPH and organ enlargement. Thus, the identification of essential factors involved in the mechanisms of organ-specific tissue-remodeling will be essential for the prevention and treatment of age-related aberrant prostate growth.	4
53. Bellin MF, Renard-Penna R, Conort P, et al. Helical CT evaluation of the chemical composition of urinary tract calculi with a discriminant analysis of CT-attenuation values and density. <i>Eur Radiol</i> 2004; 14(11):2134-2140.	Review/Other-Dx	100 human urinary calculi placed in 20 excised pig kidneys	To evaluate the efficacy of helical CT using a combination of CT-attenuation values and visual assessment of stone density as well as discriminant linear analysis to predict the chemical composition of urinary calculi.	Probabilities of correctly classifying calculus composition were: 0.91 for calcium oxalate monohydrate and brushite, 0.89 for cystine, 0.85 for uric acid, 0.11 for calcium oxalate dihydrate, 0.10 for hydroxyapatite, and 0.07 for struvite calculi. When the first two ranks of highest probability for the accurate classification of each calculus type were taken into account, 81% of the calculi were correctly classified. Assessment at 80 kV of the highest CT-attenuation value, visual density and the highest CT-attenuation value/area ratio accurately predicts the chemical composition of 64%-81% of urinary calculi. When the first two ranks of highest probability for the accurate classification of each calculus type were taken into account, all cystine, calcium oxalate monohydrate and brushite calculi were correctly classified.	4
54. American College of Radiology. <i>Manual on Contrast Media</i> . Available at: <a href="http://www.acr.org/~link.aspx?id=29C40D1FE0EC4E5EAB6861BD213793E5&amp;amp;z=z">http://www.acr.org/~link.aspx?id=29C40D1FE0EC4E5EAB6861BD213793E5&amp;amp;z=z</a> .	Review/Other-Dx	N/A	Guidance document on contrast media to assist radiologists in recognizing and managing risks associated with the use of contrast media.	N/A	4

Evidence Table Key

Study Quality Category Definitions

- *Category 1* The study is well-designed and accounts for common biases.
- *Category 2* The study is moderately well-designed and accounts for most common biases.
- *Category 3* There are important study design limitations.
- *Category 4* The study is not useful as primary evidence. The article may not be a clinical study or the study design is invalid, or conclusions are based on expert consensus. For example:
  - a) the study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
  - b) the study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;
  - c) the study is an expert opinion or consensus document.

Dx = Diagnostic

Tx = Treatment

Abbreviations Key

BPH = Benign prostatic hyperplasia

CT = Computed tomography

DRE = Digital rectal examination

MRI = Magnetic resonance imaging

OR = Odds ratio

PSA = Prostatic specific antigen

TAE = Transcatheter arterial embolization

TRUS = Transrectal ultrasound

US = Ultrasound