American College of Radiology
ACR Appropriateness Criteria®
Hematospermia

Variant 1: **Man <40 years of age, transient or episodic hematospermia, and no other symptoms or signs of disease.**

Radiologic Procedure	Rating	Comments	RRL*
US pelvis (prostate) transrectal	3		O
MRI pelvis without IV contrast	3		O
MRI pelvis without and with IV contrast	3		O
CT pelvis with IV contrast	1		☢☢☢
CT pelvis without IV contrast	1		☢☢☢
CT pelvis without and with IV contrast	1		☢☢☢☢
Arteriography pelvis	1		☢☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Variant 2: **Man ≥40 years of age, or man of any age with persistent hematospermia, or hematospermia accompanied by associated symptoms or signs of disease.**

Radiologic Procedure	Rating	Comments	RRL*
US pelvis (prostate) transrectal	8		O
MRI pelvis without and with IV contrast	8	This procedure is indicated if TRUS is negative or inconclusive. MRI can be used to evaluate for suspected prostate cancer or ejaculatory duct obstruction. This procedure should include dynamic contrast-enhanced MRI for suspected prostate cancer.	O
MRI pelvis without IV contrast	7	This procedure is indicated if TRUS is negative or inconclusive. MRI can be used to evaluate for suspected prostate cancer or ejaculatory duct obstruction.	O
CT pelvis with IV contrast	2		☢☢☢
Arteriography pelvis	2		☢☢☢☢
CT pelvis without and with IV contrast	1		☢☢☢☢
CT pelvis without IV contrast	1		☢☢☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

HEMATOSPERMIA

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Summary of Literature Review

Introduction/Background

Hematospermia (HS), or hemospermia, the presence of blood in the ejaculate or semen, has been recognized for centuries. Although it is not uncommon to encounter HS in clinical practice, the exact prevalence and incidence are not known. Most men with HS are young (<40 years of age), and HS may occur either as a single episode or repeatedly over time. It is typically a cause of great anxiety to men, mainly because of the imagined possibility of underlying malignancy or venereal disease. HS may be associated with pathology in the prostate gland, seminal tract (seminal vesicles, vasa deferentia, and ejaculatory ducts), verumontanum, urethra, urinary bladder, epididymis, or testes, with cited causes reported to include prior prostatic biopsy, prostatic calculi, inflammatory or infectious conditions such as prostatitis or seminal vesiculitis, ductal obstruction, prostatic cyst formation, and rarely vascular malformations. The majority of cases of HS were thought to be idiopathic in nature; however, as a result of improved imaging techniques, the number of cases labeled as idiopathic has decreased significantly, with one of the main sites of bleeding occurring in the seminal vesicles [1-13]. Of specific etiologies, infectious or inflammatory conditions are the most common, accounting for approximately 40% of HS cases overall. An infectious or inflammatory condition of the urogenital tract is the most common etiology in men <40 years of age [1,6,9,14].

Malignant tumors are infrequently associated with HS but need to be excluded in men ≥40 years of age. In a study by Han et al [15] involving 26,126 men who underwent routine prostate cancer screening, only 0.5% had HS, but 13.7% who reported HS were diagnosed with prostate cancer. Moreover, the presence of HS was shown to be a significant predictor of prostate cancer diagnosis (odds ratio =1.73) after adjusting for age, serum prostate-specific antigen (PSA), and digital rectal examination results through a logistic regression model. Other studies have reported a lower percentage of prostate cancer in men ≥40 years of age presenting with hematospermia, ranging from 2.6% to 6% [1,5,13,14,16]. Therefore, when a man ≥40 years of age presents with HS, screening for prostate cancer is recommended. Furthermore, when HS is persistent or refractory or has concomitant urological tract symptoms, noninvasive imaging and other diagnostic testing are typically performed to exclude an underlying correctible etiology, which includes obstruction or stricture at the level of the verumontanum, calculi, and cysts [7,17-19].

Overview of Imaging Modalities

Transrectal ultrasound (ultrasound pelvis [prostate] transrectal)

Transrectal ultrasound (TRUS) is a safe, inexpensive, effective, noninvasive, radiation-free imaging technique often used as the primary screening or diagnostic modality in men with HS to evaluate the prostate gland and seminal tract. Patients are typically placed in the left lateral decubitus position, and grayscale images are obtained with a 5.0- to 10-MHz TRUS transducer in axial and sagittal planes [12,13,19,20]. Color and power Doppler images can also be acquired, particularly when prostate cancer is suspected and prostatic biopsy is contemplated [2,8]. TRUS-guided aspiration or biopsy of the seminal vesicles or prostate gland can be performed to further elucidate the site of bleeding, to provide a definitive diagnosis if a lesion is detected, or to confirm the presence of ejaculatory duct obstruction [4,15].

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Magnetic resonance imaging

Magnetic resonance imaging (MRI), with its excellent soft-tissue contrast, provides radiation-free, multiplanar, high-spatial-resolution anatomic evaluation of the prostate gland and seminal tract. Imaging should be performed at either 1.5T or 3T, although there is no consensus at this time on the appropriate coil selection or field strength. The fundamental advantage of 3T over 1.5T is increased signal-to-noise ratio, which improves the spatial, temporal, and spectral resolution. Comparable performance between multichannel phased array coil MRI of the prostate at 3T and endorectal phased array coil MRI at 1.5T has been reported [20]. As opposed to TRUS, MRI is operator independent and can be performed when TRUS is unsatisfactory or nondiagnostic. Subsequently, small field-of-view axial T1-weighted images and axial, sagittal, and coronal T2-weighted images are obtained for high-resolution evaluation of the prostate gland, seminal vesicles, ejaculatory ducts, and ampullary portions of the vasa deferentia, followed by large field-of-view images to evaluate for pelvic lymphadenopathy [3,7,10,21]. The increasing availability of 3T MRI, which offers a higher signal-to-noise ratio and improved spatial resolution, may preclude the use of an endorectal coil for evaluating the seminal tract [22].

Computed tomography

Computed tomography (CT) is a noninvasive imaging modality that uses ionizing radiation to identify calcifications, gross soft-tissue masses, or cystic lesions of the prostate gland and seminal vesicles. However, it has limited value in the etiologic determination of HS given its lack of soft-tissue contrast and limitation in differentiating structural changes of the prostate and seminal tract [11,21].

Pelvic angiography

Pelvic angiography can be useful to evaluate for vascular causes of HS and is mainly reserved for men with intractable HS with or without hematuria when clinical, laboratory, and noninvasive imaging evaluations have not revealed an etiology. If an arterial source of hemorrhage is identified, such as from the internal pudendal artery, transcatheter arterial embolization can be performed in the same session for therapeutic purposes [23].

Discussion of Imaging Modalities by Variant

Factors that determine the extent of investigation are patient age, duration of HS, and associated symptoms and signs. However, a confounding issue is that currently there are no consensus or society guidelines on the distinction between transient or episodic HS and persistent HS. The distinction has been based on either the number of ejaculates or a specific time period, with differing opinions. Ultimately the decision to pursue further investigation will be made by the referring physician, typically a urologist.

Variant 1: Man <40 years of age, transient or episodic hematospermia, and no other symptoms or signs of disease.

Imaging assessment is not generally recommended for this patient population because watchful waiting, reassurance, and routine clinical evaluation may suffice, given that HS is apt to be a benign and self-limited condition unassociated with a significant underlying disease process [1,5,6,9,11,14,24]. The approach to any patient with HS begins with a detailed history and physical examination. Determination of the origin of bleeding within the ejaculate is vital, as postcoital hemorrhage from the patient's sexual partner may sometimes be mistaken for HS. Laboratory testing includes visual analysis of the ejaculate for red discoloration, microbiological testing, semen analysis, urinalysis, urine culture, assessment of serum coagulation, a serum chemistry panel, and a complete blood count [1,6,20,25].

Variant 2: Man ≥40 years of age, or man of any age with persistent hematospermia, or hematospermia accompanied by associated symptoms or signs of disease.

Noninvasive imaging techniques, predominantly TRUS and MRI, are recommended in patients ≥40 years of age with persistent or refractory HS or other associated symptoms or signs of disease [1-7,9-13,19,20,26]. All patients ≥40 years of age should be screened for prostate cancer by checking a PSA level [6,14,15,20,25,27]. Although not addressed by the medical literature, TRUS or pelvic MRI can be performed to allay anxiety and provide reassurance that no significant pathology exists in patients with negative history and physical examination.

TRUS

Many investigators have reported that TRUS should be used as the first-line imaging tool in this patient population. TRUS is very sensitive for detecting a variety of abnormalities that may involve the prostate gland and seminal tract in the setting of HS, reportedly demonstrating abnormalities in 82% to 95% of men with HS [4,12,13,19,21]. Abnormalities may include calcifications or calculi in the prostate, ejaculatory ducts, or seminal

vesicles; seminal vesicle, ejaculatory duct, or prostatic cysts; benign prostatic hypertrophy; prostatitis; and Cowper gland masses. However, it is important to consider that some of these abnormalities can be found in asymptomatic patients, such as benign prostatic hyperplasia and prostatic calcifications, which are age-related changes, and nonobstructing prostatic cysts [10,13,28,29]. TRUS has shown utility in guiding transperineal aspiration of the seminal vesicles [4]. A recent prospective trial enrolled 106 patients with persistent HS and found the diagnostic accuracy of TRUS and transurethral seminal vesiculoscopy was 45.3% and 74.5%, respectively, although the diagnostic accuracy was higher when both modalities were combined. Vesiculoscopy was most useful in the detection of calculi and obstruction/stricture at the level of the verumontanum orifice or ejaculatory duct [19].

Magnetic resonance imaging

MRI has been recommended when TRUS results are negative or inconclusive [1,3,6,10,20]. It should be emphasized that MRI has no established role in screening for prostate cancer; the utility of MRI in this patient population is in demonstrating anatomic abnormalities in the prostate gland and ejaculatory tract that may be accounting for the HS. The multiplanar ability of MRI to accurately depict structural changes in the prostate, seminal vesicles, ampulla of vas deferens, and ejaculatory ducts has enabled the modality to be particularly useful in determining the organ of origin of midline or paramedian prostatic cysts and to provide more accurate causative information compared to TRUS regarding ejaculatory duct obstruction and location and age of hemorrhage within the seminal tract [3,7,10,21]. Seminal vesicle width ≥1.7 cm or tubular duct diameter >5 mm is consistent with dilatation or enlargement and more likely caused by distal ejaculatory duct obstruction in the setting of persistent HS. This information aids in determining optimal surgical management in cases of transurethral resection of the ejaculatory duct or appropriate selection of ejaculatory duct orifice for cannulation during vesiculoscopy [3,7,10,21].

Computed tomography

CT has very limited value in the etiologic determination of HS for the reasons described above.

Pelvic angiography

Angiography has been reported sparsely in the literature to be useful for vascular masses when evaluating men with intractable HS with or without hematuria when clinical, laboratory, and noninvasive imaging evaluations have not revealed the etiology. If an arterial source of hemorrhage is identified, transcatheter arterial embolization can be performed during the same session as well [23].

Summary of Recommendations

- HS is an anxiety-provoking but otherwise generally benign and self-limited condition that is infrequently associated with significant underlying pathology and is most often considered to be idiopathic in nature.
- Watchful waiting, reassurance, and routine clinical evaluation typically suffice in men <40 years of age with transient HS and no other symptoms or signs of disease. When a cause can be identified, infection of the urogenital tract is the most common etiology of HS in men <40 years of age.
- Noninvasive imaging techniques, predominantly TRUS and MRI, can be used in men ≥40 years of age or men of any age with persistent or refractory HS or other associated symptoms or signs of disease. In men ≥40 years of age who have HS, screening for prostate cancer is advised.

Summary of Evidence

Of the 29 references cited in the *ACR Appropriateness Criteria® Hematospermia* document, 23 are categorized as diagnostic references, including 2 good-quality studies and 3 quality studies that may have design limitations. Additionally, 6 references are categorized as therapeutic references, including 1 good-quality study and 3 quality studies that may have design limitations. There are 20 references that may not be useful as primary evidence.

The 29 references cited in the *ACR Appropriateness Criteria® Hematospermia* document were published from 1974 through 2014.

Although there are references that report on studies with design limitations, 3 good-quality studies provide good evidence.

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with

different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults (see Table below). Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document.

Relative Radiation Level Designations		
Relative Radiation Level*	**Adult Effective Dose Estimate Range**	**Pediatric Effective Dose Estimate Range**
O	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢☢	0.1-1 mSv	0.03-0.3 mSv
☢☢☢	1-10 mSv	0.3-3 mSv
☢☢☢☢	10-30 mSv	3-10 mSv
☢☢☢☢☢	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (eg, region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies".		

Supporting Documents

For additional information on the Appropriateness Criteria methodology and other supporting documents go to www.acr.org/ac.

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