Acute Infectious Vasitis: Potentially Under-reported Condition Mimicking Inguinal Hernia

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Objectives

1. To define vasitis and differentiate its 2 distinct clinical entities
2. To review the pathogenesis and epidemiology of infectious vasitis
3. To outline the importance of correctly making the diagnosis in order to avoid unnecessary surgery
4. To describe the imaging characteristics of infectious vasitis in both Ultrasound and Computed Tomography with the use of multiple case examples
Vasitis: Definitions

- Vasitis = inflammation of the vas deferens
- Funiculitis = inflammation of the spermatic cord
- 2 clinical entities (Chan & Schlegel\(^1\)):
  1. Vasitis nodosa:
     - First described in 1943 by Benjamin\(^2\)
     - Generally asymptomatic, benign, chronic inflammation
     - Characteristic histologic findings
     - Associated with blockage of the vas deferens and leakage of spermatozoa due to high intraluminal pressure resulting in inflammatory process
     - Most common with history of vasectomy (reported in 50-60% post vasectomy patients), herniorrhaphy, and prostatectomy.\(^3\)
     - No specific treatment or management is indicated
  2. Infectious vasitis
Infectious Vasitis

• First described in 1795 by Benjamin Bell⁴:

  "It sometimes happens that inflammation of the testicle spreads to the cord, and excites pain and tumefaction along the course of it. At other times the cord inflames without any previous affection of the testis; it becomes tense, hard and painful. The swelling, for the most part, is, at first, confined to the vas deferens, but, at last, the other parts of the cord suffer also."

• Rare, described in 4 case reports prior to routine use of imaging between 1933-1988.⁵-⁸

• Acutely painful groin mass easily confused with epididymitis, orchitis, testicular torsion, or inguinal hernia. Correct diagnosis usually made at the time of surgery.

• Increasingly recognized in the era of medical imaging, preventing unnecessary surgery. From 2006 to present, there are 6 adult case reports/case series in the literature.⁹-¹⁴

• 4 cases in total are described in the pediatric literature.¹⁵-¹⁷
Infectious Vasitis: Classification

• Infectious Vasitis (Middleton\textsuperscript{18}):
  • Scrotal – usually concurrent inflammation of the epididymis +/- testicle
    • Diagnosis of exclusion is testicular torsion
  • Suprascrotal
  • Prepubic

• Isolated suprascrotal/prepubic vasitis can easily be confused with other more common causes of inguinal pain, tenderness, and swelling
  • Inguinal hernia
Infectious Vasitis: Pathogenesis

• Similar to epididymitis
• Retrograde spread of pathogen from prostatic urethra, prostate, or seminal vesicles
• Can be isolated suprascrotal vasitis or in combination with intrascrotal segment/epididymitis

• Pathogens (usually NOT isolated in the urine):
  • < age 40 – STI’s (Chlamydia, N. gonorrhea), UTI’s (Escheria coli, Haemophilus influenza)
  • > age 40 – UTI pathogens more common
  • Rare pathogens also described in case reports
    • Mycobacterium tuberculosis
    • Schistosoma haematobium
Tuberculous Vasitis

- TB involvement of the scrotum occurs in 7% of patients with TB\textsuperscript{21}
- Isolated epididymitis is the most common intrascrotal tuberculous disease
- Mechanisms:
  - Retrograde spread of organisms from prostate and seminal vesicles
  - Hematogenous dissemination
  - Testes may be secondarily infected by direct extension from the epididymis
- Tuberculous vasitis is VERY RARE - 3 cases in the literature\textsuperscript{19}
  - Pathogenesis unknown, but likely retrograde spread from urinary tract or direct extension from epididymis
  - All cases involved the scrotal segment of the vas, which is adjacent to the epididymal tail
Infectious Vasitis: Epidemiology

• Rare in the literature (total of 13 publications in adults and children)\textsuperscript{5-17}
  • Under-reported?

• Adults of any age:
  • Younger, STI bacteria probably > UTI bacteria
  • Older, UTI bacteria
  • Beware the diabetic or immunocompromised patient: single recent case report of emphysematous vasitis\textsuperscript{13}

• Children - VERY rare
  • 4 reports in the literature\textsuperscript{15-17}
  • UTI bacteria are the likely cause, but the pathogen is often not isolated
  • Associated with urogenital malformations (hypospadias, posterior urethral valve, and Müllerian duct remnant) and history of epididymitis
Who Cares?

• Probably underreported
• Easily misdiagnosed as other causes of groin/scrotal pain are much more common:
  • Epididymitis
  • Orchitis
  • Testicular torsion
  • Inguinal hernia
• Epididymitis and orchitis are treated similarly (antibiotics), so distinction not as important in these cases
• Multiple cases of vasitis have been misdiagnosed as inguinal hernia or testicular torsion and underwent unnecessary surgery\textsuperscript{5-8,13,15}
Clinical Presentation

- Acute inguinal/scrotal pain and swelling
- May have history of recent UTI or symptoms/signs of current UTI
- Infectious symptoms/signs (usually NOT present)
  - Fever
  - High WBC
  - Sepsis
- Presence of STI risk factors
- Presence of TB risk factors
Diagnosis: Ultrasound

- Inflammation and hyperemia of the spermatic cord/vas deferens
- May be associated with ipsilateral hydrocele in some cases (especially with concurrent epididymitis/orchitis)
- Gray-scale: echogenic fat surrounding the vas deferens, heterogeneous & hypoechoic spermatic cord & vas deferens consistent with edema
- Duplex colour Doppler:
  - Acute infectious vasitis: diffuse hyperemia of the vas
  - Tuberculous vasitis: avascular heterogeneous hypoechoic focal lesion of the vas\(^{19}\)
    - Similar in appearance to tuberculous epididymitis, avascularity thought to be due to abscess formation and caseation necrosis\(^{22}\)
- Easily confused with bowel
Examples
Normal Ultrasonographic Appearance

Longitudinal views of a normal suprascrotal vas deferens. The cursors show the inner lumen and outer diameter of the vas. (Middleton 2009)
Normal Ultrasonographic Appearance

Transverse views of the suprascrotal portion of a normal vas deferens (arrow) without (left) and with (middle and right) compression. The colour Doppler image on the right with compression shows no detectable flow in the vas and flow in adjacent arteries. (Middleton 2009)\textsuperscript{18}
Acute suprascrotal vasitis in a 71 year old male. Transverse gray scale sonography shows an enlarged and heterogeneously hypoechoic vas deferens (arrow). Colour Doppler sonography shows increased blood flow within the vas deferens (arrow). (Yang 2010)
Acute suprascrotal/intrascrotal vasitis & epididymitis in a 24 year old male. The left image shows transverse gray-scale sonography with enlargement of the spermatic cord, but the vas is normal in size with target appearance (arrow). Colour Doppler sonography on the right shows increased blood flow within the vas deferens (arrows). (Yang 2010)
Acute vasitis in a 40 year old male. Longitudinal ultrasound images of the left groin show a tubular structure with surrounding edema. The groin mass was thought to represent herniated bowel in this case. (Eddy 2011)\textsuperscript{10}

Acute vasitis in a 55 year old male presenting with a painful groin mass and signs of sepsis. Power Doppler ultrasound showing hypervascular spermatic cord. (Patel 2014)\textsuperscript{14}
Tuberculous vasitis in a 71 year old male. Longitudinal grayscale ultrasound image shows heterogeneously hypoechoic masses in the epididymal tail (thin arrow) and vas deferens (thick arrows). Colour Doppler image shows no blood flow in the epididymal tail and vas deferens.

Tuberculous vasitis in a 43 year old male. Longitudinal grayscale ultrasonography show heterogeneously hypoechoic masses in the epididymal tail (thin arrow) and vas deferens (thick arrows). Colour Doppler image shows no blood flow in the epididymal tail and vas deferens.

Tuberculous vasitis in an 80 year old male. Longitudinal grayscale ultrasound image shows hypoechoic masses in the epididymal tail (thin arrow) and vas deferens (thick arrows). Colour Doppler image shows no blood flow in the corresponding areas.
Diagnosis: Computed Tomography

- Often needed to clarify ultrasound findings (especially in the adult population)
- NO inguinal hernia is identified
- Inflammatory stranding and effacement of the normal spermatic cord fat
- Abnormal/asymmetric enhancement of the affected spermatic cord
- Extension into the scrotal portion of the vas with inflammatory changes in the epididymis and scrotum (hydrocele)
- One case of severe necrotizing/emphysematous infection with inflammatory changes and gas locules\(^\text{13}\)
  - Easily confused with inguinal hernia as gas assumed to be intraluminal bowel gas
Acute suprascrotal vasitis in a 40 year old male. He presented with left groin pain radiating to the scrotum. Ultrasonography (images shown previously) showed normal blood flow to the left testicle and epididymis. An unusual groin mass was interpreted as possible inguinal hernia and subsequent CT examination was performed. Coronal CT image on the left shows an abnormal left spermatic cord with effacement of normal fat (red arrow). The coronal CT image on the right was done 6 weeks later after a course of antibiotics and shows resolution of cord edema and inflammatory changes. (Eddy 2011)
Two weeks after the prior case, a 32 year old male presented to the same emergency department with a history of right groin pain. Ultrasound ruled out torsion and epididymitis but identified a tubular structure with surrounding edema in the right groin and was interpreted as possible vasitis. CT examination was performed. Axial CT image on the left shows an inflamed right spermatic cord compared to the normal left side. Sagittal CT image on the right shows an inflamed right spermatic cord and no hernia. (Eddy 2011)
Acute suprascrotal & intrascrotal vasitis with epididymitis in a 36 year old male. Enhanced coronal CT image shows thickening of the vas deferens (large arrow) and increased vascularity in the right scrotum (small arrow). Chlamydia trachomatis was isolated in the urine. There was complete resolution of symptoms after appropriate antibiotic treatment. (Dylewski 2014)
Acute emphysematous vasitis misdiagnosed as strangulated inguinal hernia in a 69 year old male with a history of diabetes mellitus and rectal cancer who recently underwent chemotherapy.

Contrast-enhanced axial CT images from cranial (A) to caudal (C) levels show a tubular lesion (arrows) with wall thickening and intraluminal air that extends from the pelvic cavity to the left upper scrotum through the inguinal canal. There are inflammatory changes in the surrounding fat and an abscess (curved arrow) in the prostate (B). (You 2014)
Same patient as the previous slide. Enhanced coronal CT image shows a blind-ending, bowel-like structure (arrows) with poor contrast enhancement of the wall, misinterpreted as strangulated inguinal hernia. The patient underwent emergency surgery. Surgical exploration revealed necrotizing infection along the left vas deferens and spermatic cord without evidence of an inguinal hernia. The left spermatic cord, including the vas deferens, left testicle, and left epididymis, were removed and debridement was performed. Pathology confirmed acute necrotizing gangrenous inflammation involving the vas deferens with growth of Escheria coli in the tissue and urine. The patient had an uncomplicated recovery with complete resolution after appropriate antibiotic course. A 1 month follow up CT showed complete resolution of the prostatic abscess. (You 2014)
Acute suprascrotal vasitis in a 76 year old male with concurrent epididymitis. Sequential axial enhanced CT images demonstrate inflamed right vas deferens with intraluminal debris (black star, top left image). Right ureter (black arrow, top left image) identified with surrounding associated soft tissue stranding. (Wilson 2006)
The only case of vasitis in the literature with MR images. Acute vasitis in an otherwise healthy 55 year old male (ultrasound images shown previously). He received a course of IV and then PO antibiotics and made an uneventful recovery.

Coronal (left) and axial (right) T2 weighted MR images showing edema of the left spermatic cord and surrounding soft tissues. (Patel 2014)
Pediatric Cases

• Only 4 cases reported in the literature
  • 2 year old with history of hypospadias underwent orchidectomy after suspected testicular torsion on ultrasonography and possible intrascrotal tumour found intraoperatively. Final diagnosis based on pathology specimen was acute vasitis complicated by abscess formation (thought to be tumour).\textsuperscript{15}
  • 4 year old with posterior urethral valve and Müllerian duct remnant underwent emergency surgery for suspected torsion. Intraoperative tumour discovered and patient treated conservatively due to similarity with prior case. Complete recovery with medical management.\textsuperscript{15}
  • 6 year old with acute vasitis and concurrent epididymitis. Ultrasound suggested possible inguinal hernia.\textsuperscript{16}
  • 12 year old with acute vasitis underwent ultrasound examination for exclusion of testicular torsion.\textsuperscript{17}
Intraoperative photograph from a 2 year old boy with hypospadias and bifid scrotum. He presented with an edematous and hyperemic right scrotum. No blood flow was detected on Doppler ultrasound and emergency surgery for testicular torsion was performed. Intraoperatively, there was no torsion, but a hard tumour (TM) was found inside the tunica vaginalis and a right orchidectomy was performed. On pathologic examination, the tumour was found to be an abscess. The final diagnosis was vasitis complicated by abscess formation. T = testicle, E = epididymis. (Muraoka 2010)\textsuperscript{15}

Intraoperative photograph from a 4 year old boy with posterior urethral valve and Müllerian duct remnant. He presented with acute pain and swelling of the right scrotum. No ultrasound was performed and the patient underwent emergency surgery for suspected testicular torsion. Intraoperatively, a tumour (TM) was palpated at the distal aspect of the vas deferens. The right testis (T) and epididymis (E) were normal. Due to the similarity to the previous case, he was managed with antibiotics and made a complete recovery. (Muraoka 2010)\textsuperscript{15}
Acute vasitis in a 6 year old boy as a complication of epididymitis. In the left image, colour Doppler ultrasonography of the left testis shows an enlarged, heterogeneous, and hyperemic epididymis (arrow). The patient was initially treated with analgesics as urinalysis was negative. His symptoms failed to resolve after a course of oral antibiotics and he was therefore admitted to hospital and received a course of IV antibiotics. Repeat ultrasound raised suspicion for inguinal hernia containing adipose tissue or omentum. Axial enhanced CT image on the right was negative for inguinal hernia and instead shows heterogeneous enhancing mass in the left inguinal region (arrow) with stranding of the surrounding fat as compared to the normal right spermatic cord. (Schurr 2014)
Same patient as the previous slide. Enhanced coronal CT image showing thickening and enhancement of the left spermatic cord (blue arrow). Heterogeneous inflammatory mass seen in the proximal cord (red arrow). No evidence of herniation from the peritoneal cavity. He was discharged on oral antibiotics with complete resolution at follow up. (Schurr 2014)
Acute vasitis in a 12 year old boy. He presented with severe left scrotal pain and underwent ultrasound examination for suspected testicular torsion. Long (left image) and short axis (right image) colour Doppler ultrasound images show increased blood flow in the scrotal part of the spermatic cord. There is also a hydrocele and increased thickness of the skin of the left hemiscrotum.

Oblique extended field of view gray-scale ultrasound image shows the normal left testis, hydrocele, thickened scrotal skin, and the course of the spermatic cord from the testis to the inguinal canal. (Vasileios 2013)
Conclusions

Vasitis = inflammation of the vas deferens, consists of 2 clinical entities:

1. Vasitis nodosa – chronic, benign, post “traumatic” (vasectomy, etc.) no intervention needed

2. Infectious vasitis
   - Scrotal – usually in combination with epididymitis/orchitis, need to exclude testicular torsion
   - Suprascrotal/prepubic – can mimic inguinal hernia
   - Pathogens (treated empirically as rarely grown in culture):
     - UTI – Escheria coli, Haemophilus influenza
     - STI – Chlamydia trachomatis, Neisseria gonorrhoea
     - Unusual – Mycobacterium tuberculosis, Schistosoma haematobium
Conclusions

• RARE
  • Adults – less than 10 publications EVER describe cases
  • Children – 3 recent publications describe 4 cases

• Important? YES!
  • Scrotal vasitis can mimick/occur in conjunction with epididymitis/orchitis (treated similarly)
    • Mimicks testicular torsion
    • Correct diagnosis can avoid unnecessary OR and potential orchidectomy\(^\text{14}\)
  • Suprascrotal/prepubic vasitis can mimick inguinal hernia
    • Before routine use of ultrasound/CT, multiple cases had unnecessary surgery\(^\text{5-8}\)
    • Emphysematous vasitis difficult to distinguish from strangulated inguinal hernia\(^\text{13}\)
References