REVIEW ARTICLE

PROSTATE DISORDERS DIAGNOSIS AND MANAGEMENT REVIEW WITH AN OSTEOPATHIC COMPONENT

Elizabeth V. George, DO[1]; Helaine Larsen, DO[1]

[1]Good Samaritan Hospital Medical Center – Family Medicine, West Islip, NY

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PSA

Physicians commonly encounter disorders of the prostate in the primary care setting, where shared decision making for prostate cancer screening should also occur. Hence, it is important for physicians to understand and differentiate the diagnoses of prostate disease. Initial evaluation should include a thorough history, physical examination, laboratory examination and imaging, if necessary. This article aims to provide a diagnostic and management approach for prostate disease.

INTRODUCTION

Found in biological males, the prostate is a gland the size of a walnut located below the bladder and anterior to the rectum, surrounding the urethra at the neck of the bladder. The prostate functions in controlling and preventing urine entry during ejaculation, expelling sperm during ejaculation, and secreting fluid that aids in sperm motility and survival.

Prostate disease can occur secondary to infection (acute vs. chronic vs. granulomatous prostatitis), enlargement of the prostate or malignancy of the prostate.

ACUTE BACTERIAL PROSTATITIS

Acute bacterial prostatitis is an infection of the prostate that is most commonly caused by gram-negative rods (*pseudomonas* species) and less commonly by gram-positive organisms (*enterococci*).[1,2] Routes of infection are attributed to ascent in the urethra and reflux of infected urine into the prostatic ducts; lymphatic and hematogenous routes are rare.

Symptoms of acute bacterial prostatitis include fever; irritative voiding symptoms; and perineal, sacral or suprapubic pain. Urinary retention can result from swelling or inflammation of the prostate leading to obstruction.[3]

Physical examination will reveal exquisite tenderness on digital rectal exam (DRE). However, care should be taken not to perform vigorous or multiple exams of the prostate since there is a risk of septicemia with such examinations.

Laboratory examination will reveal leukocytosis with left shift. Urinalysis (UA) will reveal pyuria, bacteriuria and varying degrees of hematuria. A positive urine culture will reveal the pathogen causing infection. Patients who fail to respond to antibiotic therapy within 24–48 hours should undergo a pelvic computed tomography (CT) scan or a transrectal ultrasound (US) to rule out prostatic abscess.

Patients who are afebrile and without signs of sepsis can be treated with empiric antibiotic therapy with either trimethoprim-sulfamethoxazole (1 double-strength orally every 12 hours) or a fluoroquinolone (ciprofloxacin 500 mg every 12 hours or levofloxacin 500 mg daily). It is important to note that men younger than 35 years of age who are sexually active and those older than 35 with high-risk sexual behavior should also be treated for *N. gonorrhoeae* and *C. trachomatis*.[4]

While awaiting sensitivities from the urine culture, patients may require hospitalization for intravenous (IV) antibiotics, which should be considered if the patient is febrile or if bacteremia is suspected. If the patient has been afebrile for 24–48 hours and sensitivities are available, then you can transition to oral antibiotics to complete a total of 4–6 weeks of antibiotic therapy. If there are obstructive symptoms, the patient can undergo straight catheterization to relieve retention, and an indwelling catheter can be maintained for fewer than 12 hours if needed.

Bacteria identified in the culture can be eradicated with the appropriate use of antibiotics. Progression to chronic bacterial prostatitis is rare if acute bacterial prostatitis is treated appropriately. However, family physicians should consider referring their patient to urology when there are signs of urinary retention or chronic prostatitis.

CORRESPONDENCE:
Elizabeth V. George, DO | egeorge91@gmail.com

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PROSTATE ABSCESS

Abscess of the prostate occurs following acute bacterial prostatitis that is left untreated or inappropriately treated.[5] A higher incidence is noted in patients with an immunocompromised state, such as diabetes mellitus or end-stage renal disease on hemodialysis. Patients with indwelling catheters or recent urethral instrumentation are also at higher risk of acute prostatitis.[6]

Patients will typically present initially with fever; irritative voiding symptoms; perineal, sacral or suprapubic pain; and urinary retention. A diagnosis of acute bacterial prostatitis is usually made (inaccurately) and the patient is treated with antibiotics. If symptoms return or persist during treatment, then prostatic abscess should be suspected.

DRE will often reveal tenderness and swelling of the prostate, and a workup should include a transrectal US and pelvic CT scan to confirm diagnosis.

Treatment of a prostate abscess requires drainage of the abscess. This drainage can be accomplished by using transrectal US guidance. If this does not provide adequate drainage, transurethral drainage is used, especially if the abscess is >1 cm.

CHRONIC BACTERIAL PROSTATITIS

Chronic bacterial prostatitis is a bacterial infection of the prostate that can occur secondary to acute bacterial prostatitis or recurrent urinary tract infections. Only half of those who present with chronic bacterial prostatitis have a history of acute bacterial prostatitis. As with acute bacterial prostatitis, the most common etiology is secondary to gram-negative rods and gram-positive *enterococci*.[7]

Symptoms of this condition are more variable than with acute infection. Patients can present with varying degrees of voiding symptoms, urethral pain and obstructive urinary symptoms, or they may present with perineal pain and low-back pain.

Unlike in acute bacterial prostatitis, the physical examination is often unremarkable. DRE of the prostate may be normal, boggy or indurated. Urinary retention should be ruled out with a post-void residual urine volume.

Laboratory examination will often reveal a normal UA (unless secondary cystitis is present). Post-prostatic massage voided urine will reveal increased leukocytes in urine and positive urine culture (a culture is required to make a diagnosis). The number of leukocytes is not indicative of the severity of disease. Imaging studies are generally not helpful in diagnosis.

The treatment for chronic bacterial prostatitis is similar to acute bacterial prostatitis in that if patients are febrile or systemically ill, they may require admission, and initial IV antibiotic therapy with broad-spectrum antibiotics is often necessary. Once patients are afebrile for 24–48 hours, they can continue oral therapy for 4–6 weeks. Symptomatic relief can be achieved with anti-inflammatory agents, hot sitz baths and alpha blockers. Prostatitis may be recurrent and difficult to cure, often requiring multiple courses of antibiotics. It is important to refer the patient to a urologist when a patient has persistent symptoms.

GRANULOMATOUS PROSTATITIS

Two forms of nonspecific granulomatous prostatitis have been identified as non-eosinophilic and eosinophilic. Non-eosinophilic granulomatous prostatitis occurs secondary to extravasated prostatic fluid, which causes a prostate tissue response. Eosinophilic granulomatous prostatitis (usually more severe) is secondary to an allergic response of the prostate to an unknown antigen. Viral, fungal or bacterial infections; use of the Bacillus Calmette-Guerin (BCG) vaccine; malakoplakia; and systemic granulomatous disease can all cause granulomatous prostatitis. More than 2/3 of cases have no specific cause that is found.[6]

Patients with acute granulomatous prostatitis can present with fever; chills; hematuria; obstructive, irritative voiding symptoms; and/or urinary retention. Patients with chronic granulomatous prostatitis (secondary to BCG) are usually asymptomatic.

DRE will reveal a hard, indurated, fixed prostate. Diagnosis confirmation requires prostate biopsy. UA and urine culture are non-revealing. A complete blood count will typically reveal a leukocytosis and marked eosinophilia (in eosinophilic granulomatous prostatitis).

The treatment for acute granulomatous prostatitis includes antibiotic therapy, corticosteroids and temporary bladder drainage. If patients do not respond to medical treatment, transurethral resection of the prostate (TURP) may be necessary to relieve any obstruction. Asymptomatic chronic granulomatous prostatitis does not typically require treatment.

NONBACTERIAL CHRONIC PROSTATITIS/ CHRONIC PELVIC PAIN SYNDROME

Both chronic nonbacterial prostatitis and chronic pelvic pain syndrome feature a combination of inflammatory, immunologic, endocrine, muscular, neuropathic and physiologic symptoms.[8]

The most common presenting symptoms include chronic perineal pain, suprapubic pain, pelvic pain, pain during or after ejaculation, testicular pain, groin pain, and low-back pain. Chronic pelvic pain syndrome is often aggravated by depression, anxiety and stress. The diagnosis is usually one of exclusion because the cause of chronic pelvic pain syndrome/nonbacterial chronic prostatitis is unknown.[9]

Nonbacterial chronic prostatitis and chronic pelvic pain syndrome differ in the laboratory examination. The laboratory examination in chronic nonbacterial prostatitis typically reveals increased leukocytes in expressed prostatic secretions. Cultures of urine and prostatic secretions are often negative. In chronic pelvic pain syndrome, laboratory examination often reveals negative leukocytes and negative cultures of expressed prostate secretions.

Treatment is dependent on presenting symptoms. Surgery is not recommended in these patients.[10,11]

TABLE 1:

Treatment of nonbacterial chronic prostatitis and chronic pelvic pain syndrome

PRESENTING SYMPTOM	TREATMENT
Voiding Symptoms	Alpha blockers (tamsulosin, alfuzosin, sildosin)
Psychosocial	Behavioral therapy, antidepressants, anxiolytics, referral to mental health specialist
Neuropathic Pain	Gabapentin, amitriptyline, referral to pain management
Pelvic Floor Muscle Dysfunction	Diazepam, pelvic floor physical therapy (Kegel exercises), pelvic shock wave lithotripsy, heat therapy
Sexual Dysfunction with Pain	Phosphodiesterase-5 inhibitors (sildenafil, tadalafil, vardenafil)

BENIGN PROSTATIC HYPERTROPHY

The incidence of benign prostatic hypertrophy (BPH)—the most common benign tumor in men—is related to age. The prevalence of the tumor increases with age, with a 90% prevalence in men 80 years or older. Risk factors are poorly understood, but genetic predisposition has been suggested.[12]

Patients can present with obstructive urinary symptoms including hesitancy, decreased force/caliber of stream, sensation of incomplete bladder emptying, double voiding, straining to urinate and post-void dribbling. Patients may also present with irritative symptoms including urgency, frequency or nocturia.

Physical examination should comprise a DRE and a focused neurologic evaluation. DRE often reveals smooth, firm, elastic enlargement of the prostate. Prostate size does not have a known correlation with the degree of symptoms. Elevated prostate specific antigen (PSA) can be secondary to BPH, but malignancy should also remain on the differential.

Laboratory testing should include UA to rule out infection. A PSA should also be obtained, especially in those with a life expectancy of more than 10 years. Note that there is overlap between levels seen in BPH and prostate cancer.

Imaging with CT or US of the kidney is recommended if there is concurrent urinary tract disease or complications, such as hematuria, urinary tract infection, chronic kidney disease or nephrolithiasis. Surgery is often recommended in the setting of these complications. Imaging should not routinely be ordered and should be considered on a case-by-case basis. Cystoscopy is also not routinely recommended but may be helpful in those seeking invasive therapy.

Patients can be treated with medical therapy (alpha blockers, 5-alpha-reductase inhibitors, phosphodiesterase-5 inhibitors, combination therapy, phytotherapy), surgical intervention (TURP, transurethral incision of the prostate, simple prostatectomy) or minimally invasive therapy (laser therapy, transurethral electrovaporization of the prostate, hyperthermia, implant to open prostatic urethra or water vapor thermal therapy).

PROSTATE CANCER

Prostate cancer is the second most common cancer in men worldwide, with more than 31,000 men dying from the illness annually, as well as the second-highest cause of death due to malignancy.[13] In the United States, there is a 11% lifetime risk of being diagnosed with prostate cancer and a 2.5% lifetime risk of dying from prostate cancer.[14] There have been significant improvements in mortality in recent years due to screening, but this comes at the cost of overdiagnosis and overtreatment. Some of the risk factors for prostate cancer include advanced age, African American race, family history, smoking and obesity. BPH is not a known risk factor.

Screening for prostate cancer includes DRE, PSA testing and/or transrectal US. Prostate cancer detected through DRE is often in an advanced state. Recommendations for prostate cancer screening vary across different organizations. However, shared decision making with the patient is agreed upon in most guidelines.

Patients with early-stage prostate cancer are often asymptomatic. Advanced prostate cancer can present with weight loss and loss of appetite. Obstructive or irritative voiding symptoms, including hematuria from local growth of the tumor into the urethra or bladder, may also occur. Metastatic disease into the vertebral column may present with bone pain. If cord compression is present, the patient may have paresthesia, weakness of the lower extremities, and fecal or urinary incontinence.

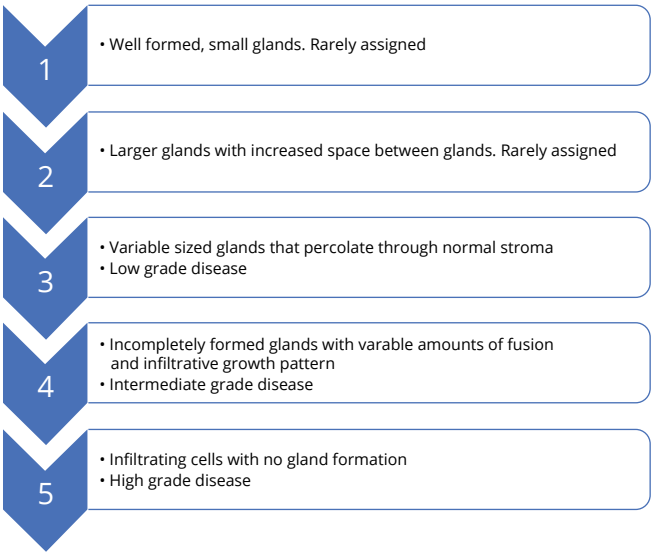
Physical examination may reveal induration and nodularity of the prostate on DRE; however, a negative DRE does not rule out prostate cancer. Locally advanced disease may present with lymphadenopathy, lymphedema of the lower extremities and a hyperreflexic bulbocavernosus reflex.

Laboratory examination not only may include an elevated PSA but also may reveal azotemia from bilateral ureteral obstruction due to extension into the trigone of the bladder or retroperitoneal adenopathy. Anemia can be present in cases of metastatic disease along with increased alkaline phosphatase in the setting of metastasis to the bone.

Prostate biopsy should be considered using joint decision making in men with abnormal DRE and/or elevated PSA. More than 95% of prostate cancers are adenocarcinomas. Based on the glandular architecture, a grade is assigned to the primary and secondary patterns in the specimen.[15]

FIGURE 1:

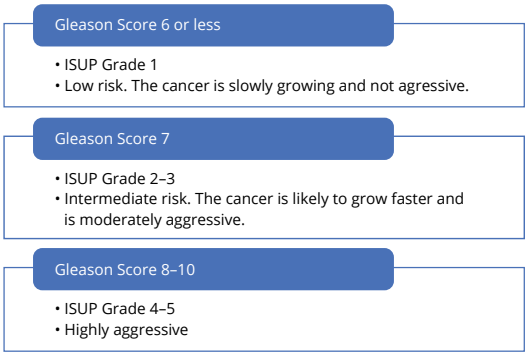
Gleason grades explained[13]



The Gleason score is obtained by adding the two grades together, from which an International Society of Urological Pathology (ISUP) grade group can be assigned to stratify risk.[16,17]

FIGURE 2:

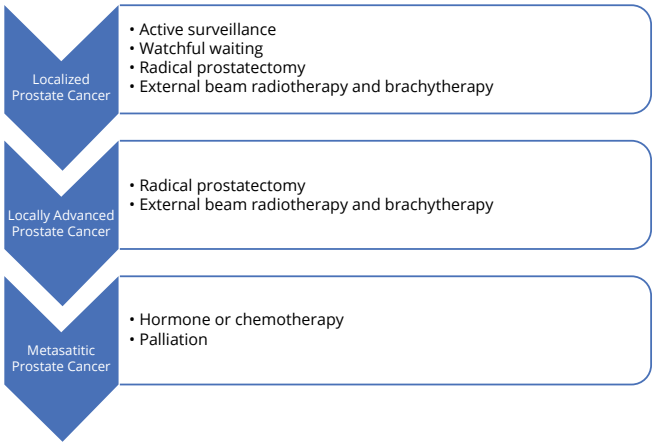
Gleason score and ISUP grade group[14]



There are multiple options for the treatment of prostate cancer based on staging, including watchful waiting, active surveillance, radical prostatectomy, external beam radiotherapy/brachytherapy and chemotherapy. Watchful waiting is a less aggressive form of monitoring cancer without treating it. It differs from active surveillance in that it does not involve frequent biopsies and testing. Active surveillance may require patients to have many biopsies to track cancer growth but avoids overtreatment and is non-invasive and non-radical. Curative treatment can be given if there are signs of disease progression. During the period of active surveillance, metastatic cancer can develop, removing the option for curative treatment. Watchful waiting also avoids overtreatment and is non-invasive; however, there is an increased risk of death due to prostate cancer, and metastatic cancer may develop in the interim. Radical prostatectomy aims to cure or control disease; however, approximately 20% of patients have residual tumors and around half of those patients will develop biochemical or clinical recurrence of prostate cancer. In addition, side effects of the procedure include infertility, erectile dysfunction and urinary incontinence. External beam radiotherapy and brachytherapy aim to cure or control disease. However, side effects include erectile dysfunction, urinary symptoms, bowel problems and infertility.[17]

FIGURE 3:

Treatment options for prostate cancer[15]



OSTEOPATHIC PRINCIPLES

The prostate is innervated from the prostatic plexus of the autonomic nervous system, which arises from the inferior hypogastric plexus. The preganglionic efferent sympathetic fibers of this plexus are derived from T10 to L2 spinal levels. The parasympathetic preganglionic fibers originate from S2 to S4. Somatic dysfunctions of the prostate are most often found in the T12–L1 region. Dysfunctions of the pubic symphysis and congestion of the ischiorectal fossa are also likely. Any somatic dysfunctions in this area should be treated to relieve or prevent discomfort secondary to prostate disease.[18]

SUMMARY

Management of symptoms and diagnoses of the prostate is an important aspect of primary care. In order to diagnose diseases of the prostate, the physician must start with a thorough history and physical examination. The laboratory examination, imaging and biopsy will help further narrow the differential. Treatment should be guided by history, clinical examination and lab results in joint decision making with the patient.

TABLE 2:

Summary of prostate diseases

	SYMPTOMS	PHYSICAL	LABS/IMAGING	TREATMENT
Acute Bacterial Prostatitis	Fever Irritative voiding symptoms, urinary retention Perineal, sacral, suprapubic pain	DRE: Exquisite tenderness	CBC: Leukocytosis with left shift UA: Pyuria, bacteriuria, hematuria UC: pos, MCC G-rods, pseudomonas	IV antibiotics pending cultures Oral antibiotics 4–6 weeks Straight catheter
Prostate Abscess	Recurring symptoms from acute bacterial prostatitis not responsive to antibiotics	DRE: Tenderness and swelling of prostate	Transrectal ultrasound Pelvic CT	Abscess drainage
Chronic Bacterial Prostatitis	Varying degrees of voiding symptoms Urethral pain Obstructive urinary symptoms	Physical exam unremarkable DRE: Normal, boggy, indurated	UA: Normal UC: Positive Post-prostatic massage voided urine: Increased leukocytes in urine	If febrile, treat like acute bacterial prostatitis May require multiple courses of antibiotics Symptom relief with anti-inflammatories, sitz baths and alpha blockers
Acute Granulomatous Prostatitis (AGP) and Chronic Granulomatous Prostatitis (CGP) **Subtypes: Eosinophilic and Non-Eosinophilic)**	**AGP**: Fever, chills, hematuria, obstructive and irritative urinary symptoms (eosinophilic is more severe the non-eosinophilic) **CGP**: Asymptomatic	DRE: Hard, indurated, fixed prostate	CBC: Leukocytosis and marked eosinophilia (in eosinophilic granulomatous prostatitis) UA: Normal UC: Negative Prostate biopsy	**AGP**: Antibiotic therapy, corticosteroids, bladder drainage, TURP **CGP**: No treatment necessary
Nonbacterial Chronic Prostatitis (NBCP)/ Chronic Pelvic Pain Syndrome (CPPS)	Chronic perineal, suprapubic, pelvic, testicular, groin or low back pain Pain during or after ejaculation Aggravated by psychosocial factors	Unrevealing	**NBCP**: pos WBC and negative culture of expressed prostate **CPPS**: neg WBC and neg culture of expressed prostate Both have neg post-prostatic massage urine cultures	See Table 1
Benign Prostatic Hypertrophy	Obstructive and irritative urinary symptoms	DRE: Smooth, firm, elastic enlargement of prostate	UA: To rule out UTI, PSA CT or renal ultrasound if UTI or complication	**Medical Therapy**: Alpha blockers, 5-alpha-reductase inhibitors, phosphodiesterase-5 inhibitors **Invasive Therapy**: TURP, simple prostatectomy, etc.
Prostate Cancer	Early stage: asymptomatic Advanced prostate cancer: obstructive or irritative voiding symptoms, weight loss, loss of appetite Metastatic disease: bone pain	DRE: Induration and nodularity of prostate. Negative DRE does not rule out prostate cancer Locally advanced disease with lymphadenopathy/ lymphedema	Elevated PSA, azotemia, anemia, elevated alkaline phosphatase Prostate biopsy (MCC adenocarcinoma)	See Figure 3

AUTHOR DISCLOSURE(S)

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REFERENCES

1. Papadakis M, McPhee S, eds. Current Medical Diagnosis and Treatment, 59th ed. McGraw Hill; 2020:2282–2285.
2. Davis NG, Silberman M. *Bacterial acute prostatitis.* In: *StatPearls* [Internet]. StatPearls Publishing. Updated October 7, 2021. https://www.ncbi.nlm.nih.gov/books/NBK459257/
3. Jameson JL, Fauci A, Kasper D, *et al*., eds. *Harrison's Principles of Internal Medicine*, 20th ed. McGraw Hill Education; 2020:972.
4. Brede CM, Shoskes DA. The etiology and management of acute prostatitis. *Nat Rev Urol*. 2011;8(4):207–212. doi:10.1038/nrurol.2011.22
5. Abdelmoteleb H, Rashed F, Hawary A. Management of prostate abscess in the absence of guidelines. *Int Braz J Urol*. 2017;43(5):835–840. doi:10.1590/S1677-5538.IBJU.2016.0472
6. McAninch J, Lue T, Smith D, Pineda Rojas E, eds. *Smith and Tanagho's General Urology*. McGraw Hill; 2014:219.
7. Papadakis M, McPhee S, eds. *Current Medical Diagnosis and Treatment*, 59th ed. McGraw Hill; 2020:2285–2287.
8. Papadakis M, McPhee S, eds. *Current Medical Diagnosis and Treatment*, 59th ed. McGraw Hill; 2020:2288–2289.
9. Vaidyanathan R, Mishra VC. Chronic prostatitis: Current concepts. *Indian J Urol*. 2008;24(1):22–27. doi:10.4103/0970-1591.38598
10. McAninch J, Lue T, Smith D, Pineda Rojas E, eds. *Smith and Tanagho's General Urology*. McGraw-Hill; 2014:597.
11. Papadakis M, McPhee S, eds. *Current Medical Diagnosis and Treatment*, 59th ed. McGraw Hill; 2020:2322–2324.
12. Papadakis M, McPhee S, eds. *Current Medical Diagnosis and Treatment*, 59th ed. McGraw Hill; 2020:2315–2327.
13. Merriel SWD, Funston G, Hamilton W. Prostate cancer in primary care. *Adv Ther*. 2018;35(9):1285–1294. doi:10.1007/s12325-018-0766-1
14. US Preventive Services Task Force; Curry SJ, Owens DK, Bibbins-Domingo K, *et al*. Screening for prostate cancer: US Preventive Services Task Force recommendation statement. *JAMA*. 2018;319(18):1901–1913. doi:10.1001/jama.2018.3710
15. Gordetsky J, Epstein J. Grading of prostatic adenocarcinoma: current state and prognostic implications. *Diagn Pathol*. 2016;11(25). doi:10.1186/s13000-016-0478-2
16. Staging and prognosis for prostate cancer. Cancer Council NSW. Published 2020. Updated April 2020. Accessed August 25, 2020. https://www.cancercouncil.com.au/prostate-cancer/diagnosis/staging-prognosis
17. McAninch J, Lue T, Smith D, Pineda Rojas E, eds. *Smith and Tanagho's General Urology*. McGraw-Hill; 2014:365–366.
18. DiGiovanna E, Schiowitz S, Dowling D. *An Osteopathic Approach to Diagnosis and Treatment*. Lippincott Williams and Wilkins; 2005:639–640.