

Prostate and Seminal Vesicle

Editors:

Larissa Bresler, MD, DABMA

Authors:

Jeffrey D. Branch, MD

Last Updated:

Wednesday, June 14, 2023

1. Introduction

The prostate is an **exocrine gland** within the male pelvis invested in a collagen capsule. Gross aspects of prostate anatomy are relevant to surgical approaches that optimize cancer control and preserve sexual function. Understanding zonal anatomy is critical to interpret variations in the endoscopic evaluation and treatment of benign prostatic disease. The seminal vesicles are important components of the reproductive tract and relevant to the clinical and pathologic staging of prostate malignancy.

2. Embryology/Histology

The seminal vesicles are derived from the **Wolffian duct** and require the presence of testosterone to persist in the male. The urogenital sinus gives rise to the prostatic urethra. Prostatic urethral (endodermal) outgrowths develop into the **glandular epithelium** of the prostate. Surrounding mesenchyme differentiates into the stromal **and the smooth muscle components** of the prostate.¹

2.1 Gross Anatomy

2.1.1 Arterial Supply

The prostate and seminal vesicles are supplied by branches of the **inferior vesical artery**. The first prostatic branch of the artery is the **urethral artery that enters the gland posterolaterally at 5 and 7 o'clock** positions while the second branch, **the cavernous**, runs with the neurovascular bundles at the level of the prostatic capsule.¹

2.1.2 Venous Supply

The venous drainage of the prostate and seminal vesicles is composed of the **inferior vesical veins** which feed into the internal iliac vein.¹ **Batson's venous plexus** is a network of valveless veins that connect the internal iliac to the vertebral vein plexus that is postulated to provide a route for bony metastases for pelvic malignancies.

2.1.3 Lymphatic Drainage

The primary lymph node drainage sites of the prostate are the **obturator and internal iliac lymph**

node chains.¹ Additional drainage is to the external iliac and presacral nodes.

2.1.4 Innervation.

Autonomic innervation of the prostate is via the **cavernous nerve** and facilitates seminal emission.¹

3. Adjacent pelvic organs and fascial investments

The base of the prostate is contiguous with the bladder. The prostate is invested anteriorly by the lateral pelvic fascia that contains a dorsal venous complex that is the venous drainage of the penis. Laterally the **pubococcygeus portion of the levator ani** musculature is present and shares investment with the **endopelvic fascia** (see **Figure 1**). The **rectum** is separated posteriorly from the prostate by loose **Denonvilier's fascia** which also envelops the seminal vesicles. The prostate narrows at the apex and muscular fibers are contiguous with the striated sphincter musculature.² The neurovascular bundle(NVB) encountered during nerve-sparing radical prostatectomy is invested within the prostatic fascia (**Figure 1**) in a posterolateral position.

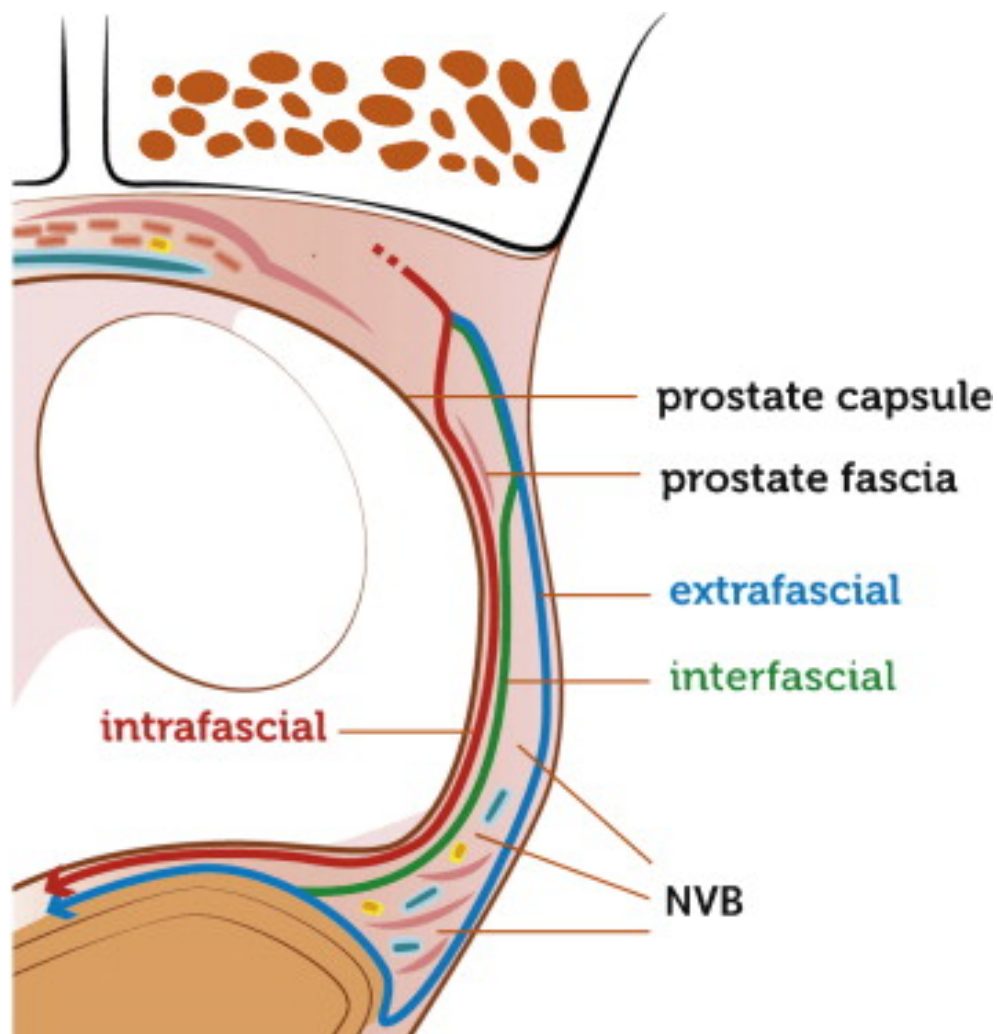


Figure 1: Depicts the neurovascular bundle(NVB) and three proposed dissection planes that influence preservation of the neurovascular bundle – intrafascial, interfascial and extrafascial.

4. Endoscopic/Zonal anatomy

Anteriorly a **fibromuscular stroma** extends from the bladder neck to the striated sphincter. The **transition zone** surrounds the prostatic urethra proximal to the ejaculatory ducts and is seen endoscopically as the lateral lobes of the prostate. The **central zone** surrounds the ejaculatory ducts and projects toward the base of the bladder and can manifest as the median lobe seen on cystoscopy. The **peripheral zone** forms the bulk of the gland distal to the verumontanum at the apex.³

The peripheral zone extends anterolateral (anterior horns) in regions of the prostate proximal to the verumontanum. Axial, sagittal and coronal reconstructions of modern pelvic imaging techniques, particularly endorectal coil - enhanced MRI, are rapidly evolving tools that require an understanding of zonal anatomy (See **Figure 2**). Endoscopic prostate anatomy(See **Figure 3**) corresponds to zonal anatomy and variations in configuration may influence surgical approach to bladder outlet obstruction.

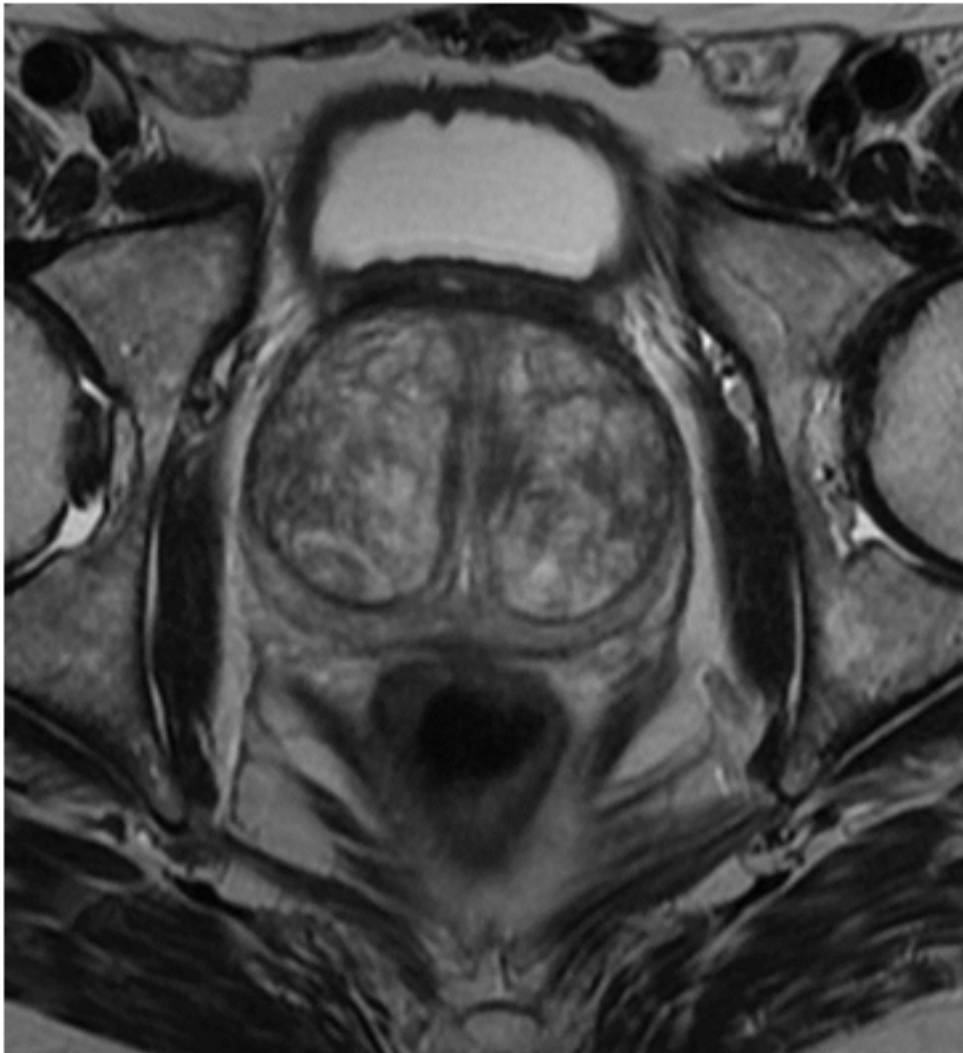
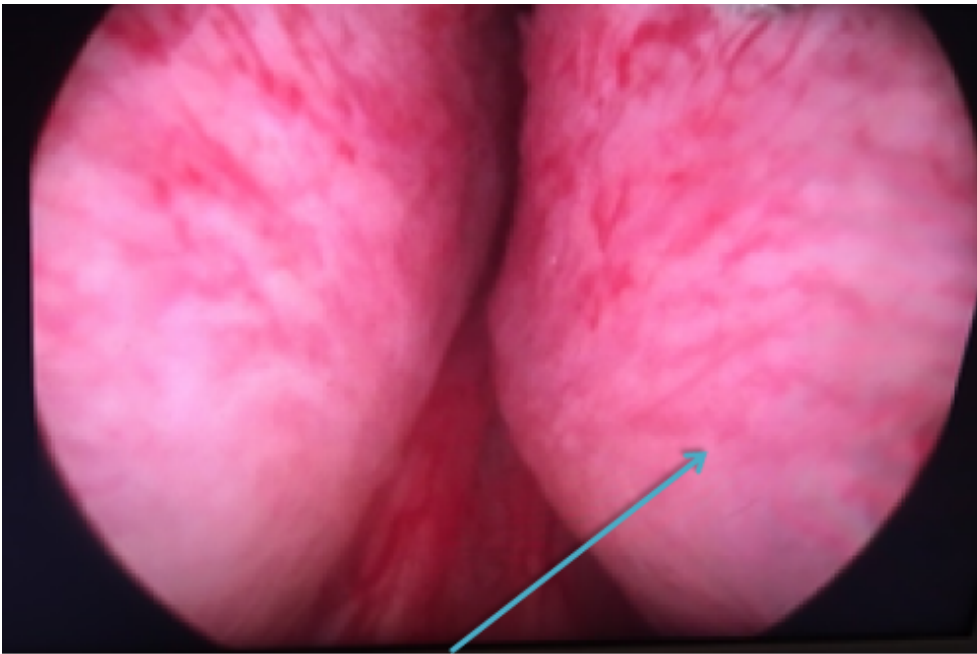


Figure 2: Axial MRI image of the prostate



Transition zone of the prostate(Endoscopic Lateral Lobes)

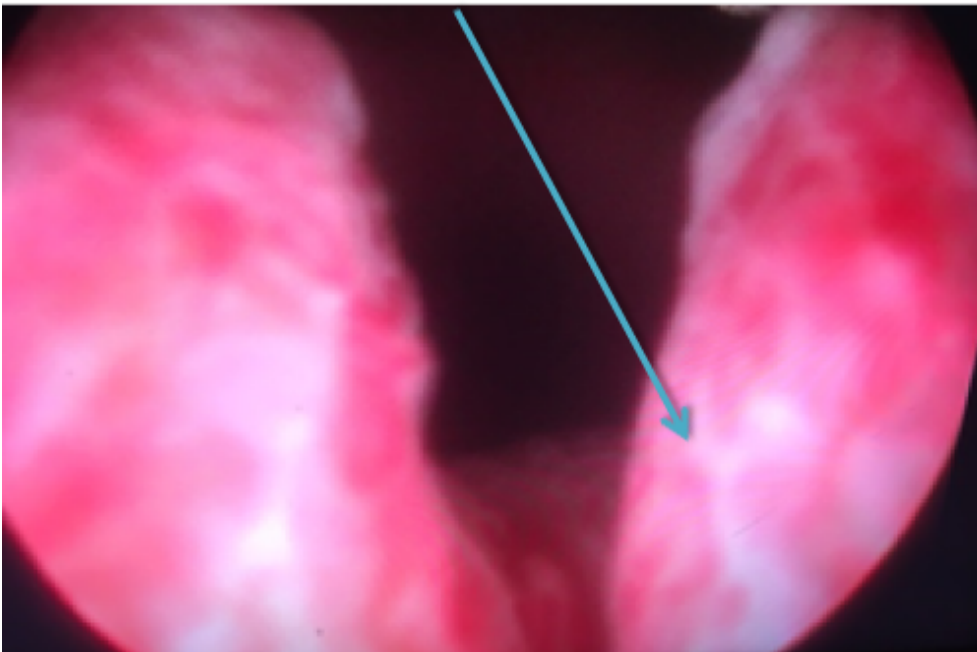


Figure 3: Endoscopic images of the prostate within the mid prostatic urethra(top) and proximal prostatic urethra/bladder neck(bottom)

References

- 1 Chung BI,MD, Sommer, Graham, MD, Brooks, James D.,MD. Anatomy of the Lower Urinary Tract and Male Genitalia: Campbell-Walsh Urology, 10 ed, Saunders, an McNeal JE Normal Histology of the Prostate. Am J Surg Pathol 1988;12:619-33

- 2 Walz J, Graefen M, Huland H. Basic principles of anatomy for optimal surgical treatment of prostate cancer. *World J Urol* 2007;25:31-8
- 3 McNeal JE Normal Histology of the Prostate. *Am J Surg Pathol* 1988;12:619-33