**Zonal anatomy: MRI appearance of the normal prostate and BPH**

Joan C. Vilanova  
Clinica Girona, Hospital Sta. Caterina. University of Girona  
GIRONA, Spain  
kvilanova@comg.cat

**INTRODUCTION**
- Exocrine gland shaped like Inverted cone, pyramid
- Accessory sex gland: 0.5/3.5ml ejaculate volume
- From traditional lobar anatomy → current **zonal anatomy**

**PROFILE**
- Introduction
- Zonal Anatomy MRI – normal prostate – T2WI
- BPH
- Other benign lesions
- T1WI anatomy

**ANATOMY**
- Non Glandular: fibromuscular stroma, urethra
- Glandular: Peripheral zone, central zone, transition zone, periurethral tissue


---

**ANATOMY**
- Base
- Midgland
- Apex

**ANATOMY**
- Sagittal
- Coronal

**ANATOMY**

---

**INTRODUCTION**
- Morphology: T1 & T2 WI
- T1WI: no zonal anatomy
- T2 WI: zonal anatomy
- High resolution T2 WI
  - Prostate & VS
  - Prostatic and periprostatic anatomy
- Adult anatomy
ANATOMY

- Peripheral zone: Anterior horn (A), lateral (L), paramedian (P)
- Central gland: Central zone + transition zone + periurethral tissue

Zonal ANATOMY

Youth

Adult

The central and transitional zones forms the central gland. In adulthood, benign prostatic hypertrophy arises from the transitional zone, compressing the central zone and forming the pseudo-capsule or surgical capsule (SC).

The transitional zone is called either central zone or central gland in adulthood.

- The peripheral gland (PZ) shows homogeneous high signal intensity on T2WI, in contrast to the heterogeneous low signal intensity of the central-transitional zone, although high intensity areas of adenoma may be observed in the central zone on T2WI.

PERIPROSTATIC ANATOMY

- "Capsule" (PC)
- Lateral relationship:
  - Periprostatic venous plexus
  - Neurovascular bundles
  - Muscles
- Anterior relationship:
  - Pubis, Santorini’s plexus, connective tissue (ligs.)
- Posterior relationship:
  - Fascia of Denonvilliers
- Inferior relationship: genitourinary membrane
- Superior relationship: seminal vesicles
NORMAL ANATOMY - “CAPSULE”

The prostate does not have a real capsule. It’s a fibro-muscular band named prostatic capsule (PC). The prostate is surrounded by a thin layer of connective tissue that merges with surrounding soft tissues, including nerves. → low signal intensity on T2.

NORMAL ANATOMY - NVB

• NVB passes from above to down posterolateral
• Area of weakness, especially the base & apex: site extracapsular extension Pca
• Transmote sensation from prostatic capsule

NORMAL ANATOMY - APEX

• Less capsule at the apex,
• Apex boundaries not clearly defined

NORMAL ANATOMY - BASE

• Peripheral base → prostatic stroma

BPH

• Enlargement of the transition zone
• Heterogeneous on T2WI
• Nodular focus of high and low signal on T2 WI
• Usually thin, well-defined rim of low signal on T2WI

BPH – T2 WI

• Signal related to composition:
  • Collagen, fibrous, smooth muscle, sclerosis → low signal on T2 WI
  • Glandular → high signal on T2 WI

BPH
- Compresses the peripheral zone

Other benign lesions
- Prostatitis, fibrosis, hyperplasia, atrophy, hemorrhage, scar
  - Fibrosis
  - Hyperplasia

- Variable histology → variable appearance: “organised chaos”

Other benign lesions
- Prostatitis
- Atrophy
- Scar

BPH
- Conglomeration of nodules of variable size/variable signal

Other benign lesions
- Postbiopsy hemorrhage (subacute). Low signal on T2 (similar as cancer and prostatitis-pitfall-) and high on T1
  - T1 WI
  - T2 WI

T1 Weighted Image
- No zonal anatomy
- Calcification, hemorrhage (postBx)
T1 Weighted Image

- **Hemorrhage exclusion sign on T1:**
  - Postbiopsy hemorrhage present in healthy tissue. Prostate cancer excludes hemorrhage, thus high signal not present on T1 WI

**SUMMARY**

- Knowledge of the normal anatomy is mandatory to interpret MRI of prostate
- Normal anatomic understanding play a key role in the assessment and management of prostatic disease
- Familiarity with the zonal anatomy allows a proper evaluation of the MRI findings to detect or rule out pathology
- BPH has a variable and complex appearance related to different histologic composition
- Combined analysis of T2 & T1 WI