Benign prostatic hyperplasia (BPH) is a common condition in middle-aged and older men and negatively affects the quality of life. An ultrasound classification for BPH based on a previous pathologic classification was reported, and the types of BPH were classified according to different enlargement locations in the prostate. Afterwards, this classification was demonstrated using magnetic resonance imaging (MRI). The classification of BPH is important, as patients with different types of BPH can have different symptoms and treatment options. BPH types on MRI are as follows: type 0, an equal to or less than 25 cm³ prostate showing little or no zonal enlargements; type 1, bilateral transition zone (TZ) enlargement; type 2, retrorethral enlargement; type 3, bilateral TZ and retrorethral enlargement; type 4, pedunculated enlargement; type 5, pedunculated with bilateral TZ and/or retrorethral enlargement; type 6, subtrigonal or ectopic enlargement; type 7, other combinations of enlargements. We retrospectively evaluated MRI images of BPH patients who were histologically diagnosed and presented the different types of BPH on MRI. MRI, with its advantage of multiplanar imaging and superior soft tissue contrast resolution, can be used in BPH patients for the differentiation of BPH from prostate cancer, estimation of zonal and entire prostatic volumes, determination of the stromal/glandular ratio, detection of the enlargement locations, and classification of BPH types which may be potentially helpful in choosing optimal treatment.
Benign prostatic hyperplasia (BPH) is characterized by expansile nodules, chyma, known as the dynamic effect (4). Stromal enlargement increases the resistance of the parenchyma, known as the static effect. Stromal enlargement typically compresses and decreases the volume of the peripheral zone in most BPH patients (6).

Magnetic resonance imaging classification of benign prostatic hyperplasia

MRI has been more commonly used in management of prostate cancer due to its better contrast resolution and sensitivity (3). Recent studies in the use of MRI for diagnosis of prostate cancer reported that MRI-based prostate volume-adjusted prostate-specific antigen (PSA) could improve the effectiveness of PSA in the diagnosis of prostate cancer, and MRI-US fusion biopsy could improve cancer detection in enlarged prostates (15, 16). Although US has been mainly performed in patients with BPH, MRI could be performed in patients with BPH due to

**Main points**

- Benign prostatic hyperplasia (BPH) is a common condition in middle-aged and older men and may cause lower urinary tract symptoms which can affect the quality of life.
- We presented the types of BPH based on the magnetic resonance imaging (MRI) classification.
- The most common types of BPH were types 1 and 3 in the existing literature.
- MRI, with its superior soft tissue contrast resolution, is more advantageous than ultrasound in determination of stromal/glandular ratio and classification of BPH types which may potentially help in choosing optimal treatment.

![Figure 1](image1.png)  
**Figure 1. a, b.** Axial T2-weighted image (a) of a 70-year-old male with type 3 BPH shows a predominantly hyperintense nodule (arrow) in the left transition zone. The pathology section (b) of this nodule is compatible with a mixed type BPH nodule consisting of mostly glandular components with markedly cystic glands (arrow).

![Figure 2](image2.png)  
**Figure 2. a, b.** Axial T2-weighted image (a) of a 69-year-old male with type 3 BPH shows a hypointense area (arrow) in the left transition zone and bilateral predominantly hyperintense areas (arrowheads). On the pathology section (b), the hypointense area is compatible with a pure stromal BPH nodule (arrow), and bilateral predominantly hyperintense areas are compatible with mixed type BPH nodules consisting of mostly glandular components with cystic glands (arrowheads).
increased PSA levels and suspected or known prostate cancer. MRI allows a secondary look at the BPH in these patients. Recently, the importance of MRI has been increasing in BPH patients, with potential uses including differentiation of BPH from prostate cancer, estimation of zonal and entire prostatic volumes, detection of enlargement locations, and choosing optimal medical therapy based on the stromal/glandular ratio (3).

Randall (5) previously described a classification for BPH in 222 postmortem cases and classified the enlarged regions of prostate. The types according to this classification are as follows: type 1, bilateral lobe enlargement; type 2, posterior commissural enlargement; type 3, bilateral and posterior commissural; type 4, subcervical; type 5, bilateral and subcervical; type 6, bilateral, posterior commissural and subcervical; type 7, anterior; and type 8, subtrigonal enlargement. Based on this classification, the US and MRI classifications of BPH were described (4, 6). BPH types on MRI are as follows: type 0, an equal to or less than 25 cm³ prostate showing little or no zonal enlargement (Fig. 3); type 1, bilateral TZ enlargement (35%); type 2, retrourethral enlargement (10%); type 3, bilateral TZ and retrourethral enlargement (46%); type 4, solitary or multiple pedunculated enlargement; type 5, pedunculated with bilateral TZ and/or retrourethral enlargement; type 6, subtrigonal or ectopic enlargement; and type 7, other combinations of enlargements.

Bilateral transition zone enlargement

The TZ margins appear more clearly with the enlargement, and the enlargement leads to the compression of the outer muscle layer of the urethra into a fibrostromal pseudocapsule (the surgical capsule). Bilateral TZ enlargement is analogous to the enlargements of “right and left lateral lobes” in Randall’s classification (5) and corresponds to type 1 in MRI classification (6) (Fig. 4). Bilateral TZ enlargement and BPH nodules are best evaluated on axial and coronal MRI scans.

Retrourethral enlargement

Randall (5) described the region posterior to the proximal urethra as posterior commissural (median), and it is regarded as retrourethral in MRI classification (6). Retrourethral enlargement arises from the deep PUGs. This type of enlargement may lead to bladder outlet obstruction by compressing the bladder and displacing the trigon superiority. It is best evaluated on sagittal images due to the relationship between the trigon and retrourethral prostatic tissue. Retrourethral enlargement alone is regarded as type 2 in MRI classification (6) (Fig. 5). Type 3 includes patients who exhibit both TZ and retrourethral enlargements (Fig. 6). Types 1 and 3 are the most common types seen (5).

Pedunculated enlargement

Randall (5) used the term “subcervical” enlargement for enlargement arising from the superficial PUGs in the posterior wall of
the proximal urethra. This corresponds to pedunculated enlargement in MRI classification (6) and is seen as an intravesicular prostatic protrusion above the urethra. In this type of enlargement, there are one or more than one lobulated enlarged prostatic nodules protruding directly into the bladder. In contrast to retrourethral enlargement, this type leads to bladder outlet obstruction without displacement of the trigon superiorly. It is best evaluated on sagittal images.

Pedunculated enlargement is more common in younger patients (5). Pedunculated enlargement alone is regarded as type 4 in MRI classification (6). Type 5 includes patients with pedunculated enlargements with TZ and/or retrourethral enlargements (Figs. 7 and 8).

**Subtrigonal enlargement**

An ectopic PUG enlargement may be seen in the subtrigonal region. Subtrigonal enlargement is usually oval- or round-shaped and limited to this region without any continuation inferiorly. This is a rare BPH type, and it is thought that this type may not usually lead to obstructive symptoms due to its relatively isolated location (4). This type is considered type 6 and is best evaluated on sagittal images (Fig. 9).

Type 7 includes patients exhibiting other combinations of these enlargements.

**Conclusion**

BPH is a common condition in middle-aged and older men and may cause lower urinary tract symptoms that can affect the quality of life. MRI, with its superior soft tissue contrast resolution, is more advantageous than US in differentiating BPH from prostate cancer, estimation of zonal and entire prostatic volumes, detection of enlargement locations, and classification of BPH types which may potentially help in choosing the optimal treatment. Thus, MRI can be effectively used for management of BPH in diagnosis, treatment, and response to the treatment.
Conflict of interest disclosure
The authors declared no conflicts of interest.

References