Prostatic Arterial Supply: Anatomic and Imaging Findings Relevant for Selective Arterial Embolization

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ABSTRACT

Purpose: To describe the anatomy and imaging findings of the prostatic arteries (PAs) on multirow-detector pelvic computed tomographic (CT) angiography and digital subtraction angiography (DSA) before embolization for symptomatic benign prostatic hyperplasia (BPH).

Materials and Methods: In a retrospective study from May 2010 to June 2011, 75 men (150 pelvic sides) underwent pelvic CT angiography and selective pelvic DSA before PA embolization for BPH. Each pelvic side was evaluated regarding the number of independent PAs and their origin, trajectory, termination, and anastomoses with adjacent arteries.

Results: A total of 57% of pelvic sides (n = 86) had only one PA, and 43% (n = 64) had two independent PAs identified (mean PA diameter, 1.6 mm ± 0.3). PAs originated from the internal pudendal artery in 34.1% of pelvic sides (n = 73), from a common trunk with the superior vesical artery in 20.1% (n = 43), from the anterior common gluteal–pudendal trunk in 17.8% (n = 38), from the obturator artery in 12.6% (n = 27), and from a common trunk with rectal branches in 8.4% (n = 18). In 57% of pelvic sides (n = 86), anastomoses to adjacent arteries were documented. There were 30 pelvic sides (20%) with accessory pudendal arteries in close relationship with the PAs. No correlations were found between PA diameter and patient age, prostate volume, or prostate-specific antigen values on multivariate analysis with logistic regression.

Conclusions: PAs have highly variable origins between the left and right sides and between patients, and most frequently arise from the internal pudendal artery.

ABBREVIATIONS

BPH = benign prostatic hyperplasia, DSA = digital subtraction angiography, IMA = inferior mesenteric artery, MIP = maximum intensity projection, PA = prostatic artery, PAE = prostatic artery embolization, PSA = prostate-specific antigen, 3D = three-dimensional

It has been suggested that prostatic artery (PA) embolization (PAE) for symptomatic benign prostatic hyperplasia (BPH) may become a common treatment like uterine artery embolization for uterine leiomyomas (1). Animal studies in pigs and dogs have shown that PAE can induce prostatic volume reduction, with no related sexual dysfunction (2,3).

Preliminary studies of PAE for symptomatic relief of lower urinary tract symptoms in patients with BPH have shown promising results (4–6). One of the most challenging aspects when performing PAE is to identify the PAs and differentiate them from the surrounding arteries.

Cadaveric studies have addressed the PA anatomy (7,8), with the description of two different arterial systems to the prostate gland: the cranial or vesicoprostatic branch that runs between the bladder base and the prostate that has hypertrophied and supplied most of the central gland ade-

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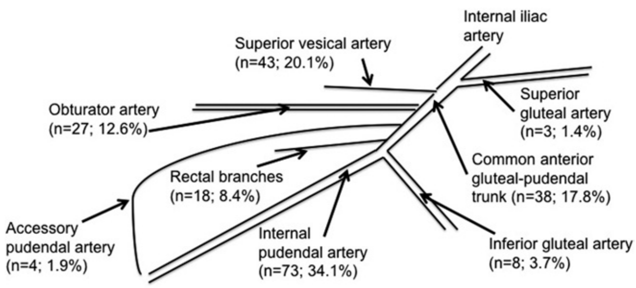


Figure 1. Schematic drawing of the different PA origins.

Table 1. PA Origin and Arterial Anastomosis Type

Finding	Incidence
PA origin	214 (100)
Internal pudendal artery	73 (34.1)
Superior vesical artery	43 (20.1)
Anterior common gluteal-pudendal trunk	38 (17.8)
Obturator artery	27 (12.6)
Prostatorectal trunk	18 (8.4)
Inferior gluteal artery	8 (3.7)
Accessory pudendal artery	4 (1.9)
Superior gluteal artery	3 (1.4)
Type of anastomosis	
Internal pudendal arteries	42 (43.3)
Contralateral PAs	17 (17.6)
Ipsilateral PAs	13 (13.4)
Rectal arteries	14 (14.4)
Vesical arteries	11 (11.3)
Lateral accessory pudendal arteries	30 (20)

PA = prostatic artery.
Values in parentheses are percentages.

nomas in BPH, also called "artery of the adenoma"; and the caudal, which originates inferiorly, closer to the rectum (9). Also, more than one PA may be found in as many as 30% of pelvic sides (10). After reaching the prostate, the PAs have a corkscrew appearance (7,8) and perforate the capsule in four quadrants, two anterior/lateral for the cranial PAs and two posterior/lateral for the caudal PAs (11–13).

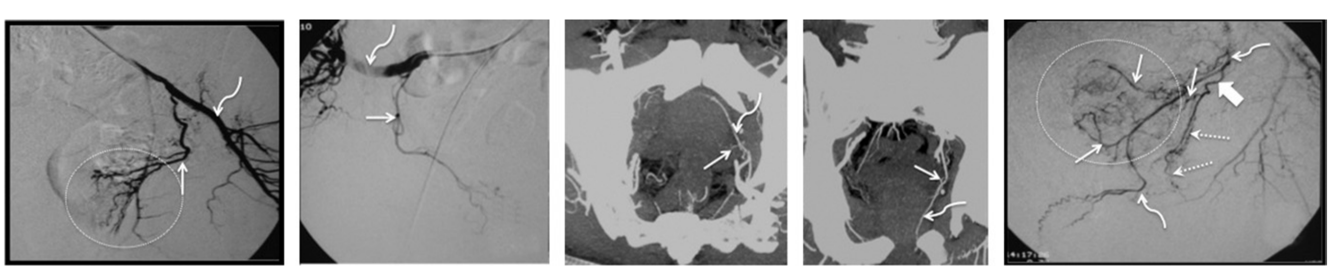
Few studies have addressed radiologically the anatomy of the male pelvic arterial system (14,15) and PAs (16). Knowledge of the male pelvic and PA anatomy is needed to safely perform PAE. In this study, we report the main arterial variations in prostatic vascularization relevant for PAE by using multirow-detector pelvic computed tomographic (CT) angiography and digital subtraction angiography (DSA), based on the retrospective evaluation of 150 pelvic sides.

MATERIALS AND METHODS

Patient Selection

A retrospective study was conducted from May 2010 to June 2011 in 75 male patients (150 pelvic sides) who underwent pelvic CT angiography and selective pelvic DSA before PAE for BPH. Patient age ranged from 50 to 85 years, with a mean of 66.0 years. Institutional review board approval was obtained for the study, and all participants signed an informed consent form for PAE. All patients were informed about the embolization technique used, and the experimental nature was clearly included.

Included were male patients with a diagnosis of BPH with moderate to severe lower urinary tract symptoms refractory to medical treatment for at least 6 months or experiencing acute urinary retention. Patients were excluded in the case of malignancy, which was evaluated by prostate-specific antigen (PSA), physical examination, transrectal ultrasound (in all patients), prostatic biopsy (in suspicious cases), and advanced atherosclerosis/tortuosity of the iliac arteries or PAs evaluated by pelvic CT angiography performed before PAE in all



a. b. c. d. e.

Figure 2. Rare prostatic artery (PA) origins. **(a)** Digital subtraction angiography (DSA) with same-side anterior oblique projection (35°) and caudal/cranial angulation (10°) of a left-side PA (straight arrow) arising from the inferior gluteal artery (curved arrow). The dotted circle marks prostate gland opacification. **(b)** DSA with same-side anterior oblique projection (35°) and caudal/cranial angulation (10°) of a right-side PA (straight arrow) arising from the superior gluteal artery (curved arrow). **(c)** Computed tomographic (CT) angiography with axial maximum-intensity projection (MIP) reformat shows PA (straight arrow) arising from a lateral accessory pudendal artery (curved arrow). **(d)** CT angiography with coronal MIP reformat shows PA (straight arrow) arising from a lateral accessory pudendal artery (curved arrow). **(e)** Selective left-side DSA with same-side anterior oblique projection (35°) and caudal/cranial angulation (10°) shows two independent PAs (straight arrows) and one prostatorectal trunk (thick arrow) that bifurcates into the middle rectal artery (dotted arrows) and one small posterior/lateral PA (straight arrow) originating from the left-side lateral accessory pudendal artery, finishing as the dorsal artery of the penis (curved arrows). The dotted circle marks prostate gland opacification.