

Variations in the blood Supply of Prostate gland in Maharashtra Population – A Cadaveric Study

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Conflict of interest: Nil

Abstract

Background: The prostate is a fibro-musculoglandular organ. Due to various functions, it requires more vascularity, but variations in arteries are a challenge to surgeons to avoid surgical emergencies during prostatectomy.

Method: 34 (thirty-four) non-pathogenic adult prostates are dissected to study arterial supply, cleaned with distilled water, and allowed to dry. The arteries are painted, and photographs are taken wherever variations are noted.

Results: Out of 34, major arterial supply was 15 (41%) inferior vesical artery; the least were 2 (5.88%) gluteopudendal trunk) and 2 (5.88%) middle rectal artery.

Conclusion: These variations are very important to urosurgeons during prostatectomy, although various radiological techniques like CT scans and angiography are available but complete and small branches cannot be visualized.

Keywords: Prostatectomy, Cannulation, Turpentine oil, Asian paint.

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Introduction

The prostate is a fibro-musculo-glandular organ, a walnut-sized gland in the male reproductive system that produces seminal fluid, which nourishes and transports sperm. It also plays a crucial role in ejaculation and controlling the flow of urine while its muscle helps push semen [1]. Owing to its various functions, it requires more energy; hence, it is supplied by more than one artery.

Arterial supply of the prostate gland is usually by the inferior vesical, middle rectal, and internal pudendal arteries [2]. These are all branches of the internal iliac artery, but apart from these branches of the internal artery, the prostate is also supplied by other branches of the internal iliac artery.

As age advances, there is benign enlargement of the prostate which obstruct the normal flow of urine, and malignancy of the prostate is also quite common. Under such conditions, prostatectomy becomes mandatory [3]. During a prostatectomy, the vasculature of the prostate has to be maintained. Although we have radiological techniques like CT scans, MRI scans, and angiography, the exact origin, termination, and branches of these arteries cannot be visualized [4]. Hence, an attempt is made

to dissect and evaluate the variations in arteries supplying the prostate.

Material and Method

34 (thirty-four) prostate specimens stored in the dissection hall of the anatomy department, Vedanta Institute of Medical Sciences hospital and research center, Dahanu (Taluk), Palgrah (district), Maharashtra-401606, were selected for study.

Inclusion Criteria: Non-pathological intact specimens are selected.

Exclusion Criteria: Pathological, cut, or damaged specimens were excluded from the study.

Method

The common and external iliac arteries are ligated close to their origin, and the former is cannulated distally and injected with acetone and then cleaned with distilled water to remove the clot. Arteries supplying the prostate are traced by dissection, then turpentine oil is applied and allowed to dry completely. Later on, arteries are painted with red Asian paint and allowed to dry. These specimens are preserved in 5% formalin. Variations of these

arteries are recorded. The duration of the study was from April 2024 to February 2026.

Statistical Analysis:

Various arteries supplying the prostate are classified with percentages. The statistical analysis was carried out using SPSS software.

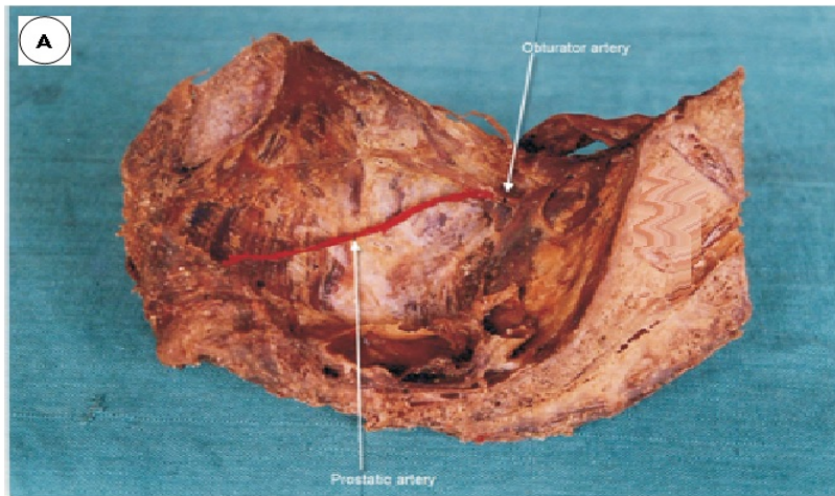


Fig A. Shows prostatic artery arising from the obturator artery

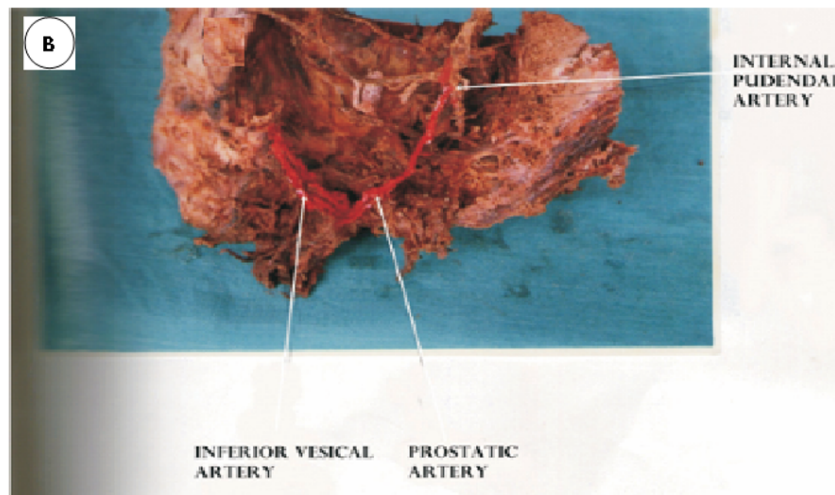


Fig B. Shows prostatic artery arising from the internal pudendal artery

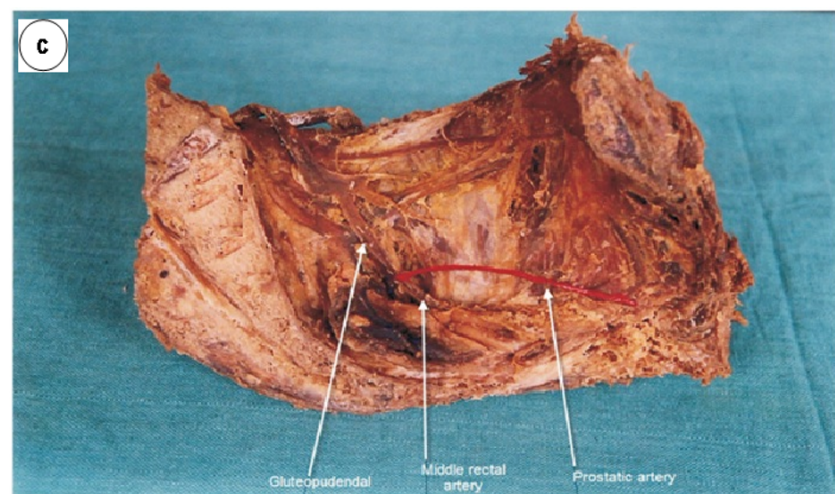


Fig 3. Shows prostatic artery arising from the middle rectal artery

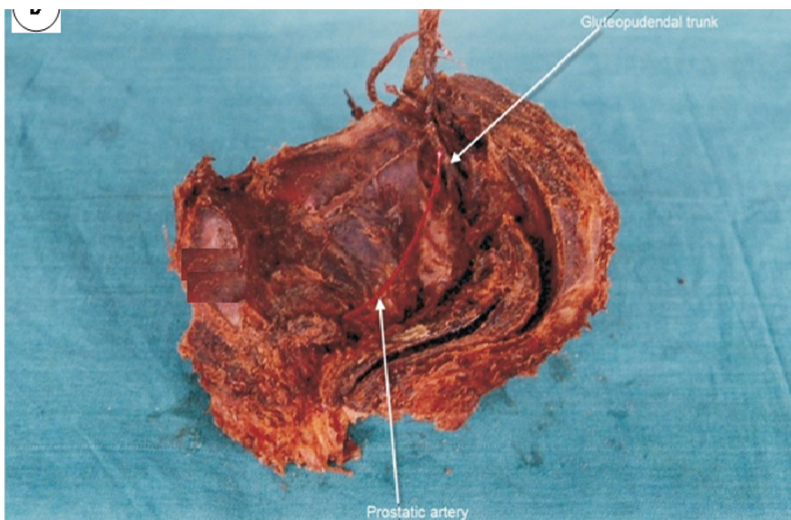


Fig D. Shows prostatic artery arising from the guteopudendal trunk

Observation and Results

Table 1: Distribution of variations of arterial supply to prostate gland: 15 (44%) Inferior vesical artery, 5 (14.7%); obturator artery, 5 (14.7%); internal pudendal artery, 5 (14.7%); umbilical

artery, 2 (5.88%); gluteopudendal trunk, 2 (5.88%); middle rectal artery.

Table 2: The present study is compared with previous workers, and our findings are more or less in agreement with previous studies.

Table 1: Variations of arteries of prostate gland in present study (Total No. of specimen: 34)

Sl. No	Variations of arteries	No. with %
1	Inferior vesical artery	15 (41%)
2	Obturator artery	5 (14.7%)
3	Internal pudendal artery	5 (14.7%)
4	Umbilical artery	5 (14.7%)
5	Gluteo-pudendal trunk	2 (5.88%)
6	Middle rectal artery	2 (5.88%)

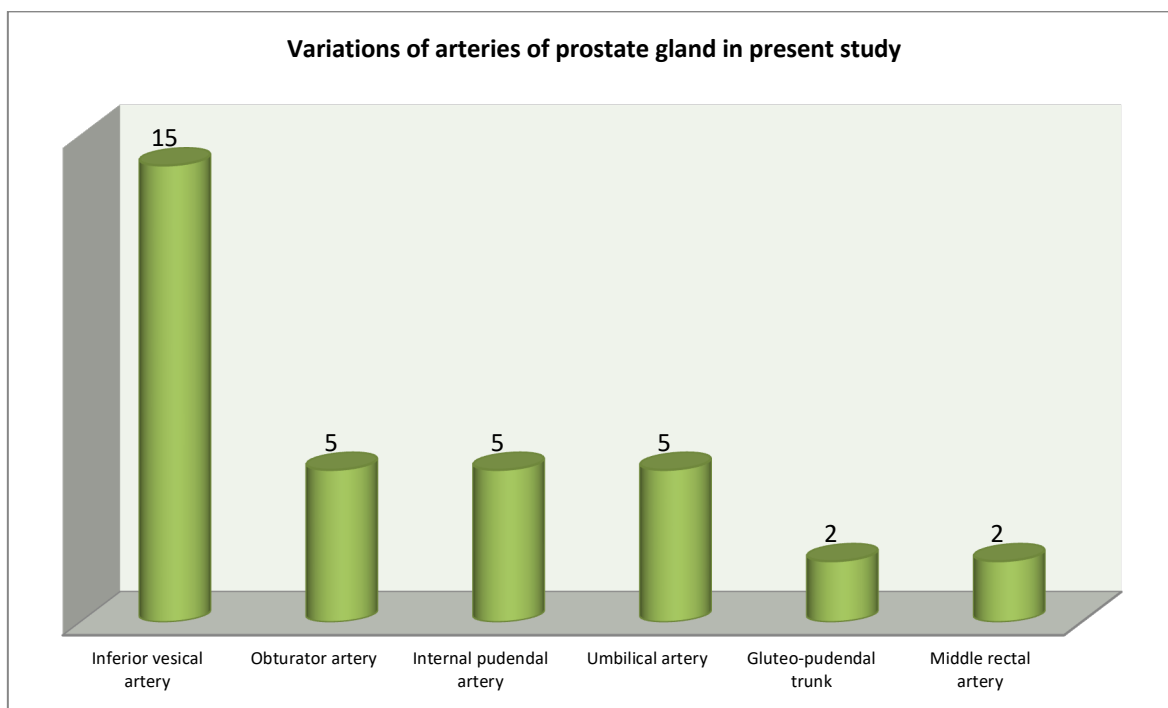


Figure 1: Variations of arteries of prostate gland in present study

Table 2: Present study compared with previous workers

Sl. No	Author name and year	Umbilical artery (%)	Middle rectal artery (%)	Obturator artery (%)	Internal pudendal artery (%)	vesical artery
1	Bilhim T (2012)	20%	8.4%	12.6%	34%	--
2	Braithwaite J.L (1952)	7%	--	4.3%	25.7%	6%
3	Clegg EJ (1955)	83%	30%	--	--	59%
4	Awetaguti S (1939)	90%	--	5%	--	--
5	Bumpus HC and Antopol. W (1934)	93.2%	--	5.3%	--	--
6	Rajendra and Makandar. UK (2014)	14.2%	7.13%	14.2%	14.2%	42.8%
7	Present study	14.7%	5.88%	14.7%	14.7%	44%

Discussion

A present study of variations in the blood supply of the prostate gland in the Maharashtra population. Out of 34 specimens, 15 (44%) had an inferior vesical artery, 5 (14.7%) had an obturator artery, 5 (14.7%) had an internal pudendal artery, 5 (14.7%) had an umbilical artery, 2 (5.88%) had a gluteo-pudendal trunk, and 2 (5.88%) had a middle rectal artery (Table 1).

The present variations are compared with previous workers (Table 2) (Figures A, B, C, D, and E). These findings are more or less in agreement with previous studies [5,6,7]. There is no documentation available to justify these variations in the arterial supply of Maharashtra cadaveric prostates. The probable reasons could be, in general, arteries pursue the shortest, most direct course in order to reach their destination, and this course is partly determined by mechanical convenience.

The angle at which branches leave an arterial system certainly depends to a considerable extent on hemodynamic factors. It is possible to calculate theoretically at what angle branching should be for the least possible loss of energy in the circulation so that the fall of pressure at the branch and the main vessel should be equal. The angle varies between 70°-90°. The bifurcation of the common iliac artery should be 75° [8]. If the degree is more or less, then 75° leads to variations in the arterial pattern to maintain hemodynamic pressure. Differential growth of the common iliac artery might have resulted in variations in the arterial pressure.

Constancy of arterial supply is partly morphogenetic and partly mechanical convenience. Slight variations in size and position of the prostate gland might have resulted in variations in the arterial pattern. The comparative anatomical or evolutionary persistence of arterial patterns may appear mechanically disadvantageous. Functionally connected structures inevitably make simultaneous demands on the circulation and from the main source. Developmentally, the prostate is dual in origin; the fibro-muscular part is mesodermal, and the glandular part is endodermal, developing at different months of fetal life [9]. Delay in

proliferation of these germ layers might have demanded more vascularity in postnatal life, which has resulted in variations in the arterial supply. Embryonic rudiments of glandular tissues can undergo a surprising degree of self-differentiation to adopt normal development, which requires more vascularity. Hence, these variations in the arterial pattern might have resulted.

As India is a multiracial country, different races have drifted into India. Hence, these variations may represent their ancestors [10]. Variations in the CR length of a fetus in intra-uterine life lead to differential growth in germ layers, which might have resulted in variations in the arterial supply to adopt the erect posture of postnatal life. It is also suggested that these variations of arterial supply to the prostate are due to the contiguity of the organs, i.e., the seminal vesicle and urinary bladder, with dual embryological derivatives [11]. Variation in the sequence of development might have resulted in variations of vascularity to compensate for these improper sequences and to adapt normal physiological function coordination to keep these organs active.

Summary and Conclusion

These variations in the origin of the prostatic artery could be due to dietary habits, environmental or genetic drift in the Maharashtra population, or all these factors might have influenced it. The CR length of the fetus in intrauterine life leads to differential growth of the blood vessels and germ layers, which have resulted in variations in the arterial pattern. This present study demands further genetic, nutritional, and embryological study because the exact mechanism of proliferation, differentiation, and division of angioblast cells is not yet established.

Limitation of study: Owing to remote location of research centre and small number of cadavers, we have limited findings and results.

This research work was approved by the ethical committee of Vedanta Institute of Medical Sciences hospital and research centre Dahanu (Taluk), Palgrah (district), Maharashtra-401606.

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