

Original article

Effects of Bilateral Orchiectomy on the Prostate of Adult Albino Rats: A Histological study

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Abstract:

Introduction: Castration was practised for many years for prostatic carcinoma & prostatic enlargement but the result of it is not satisfactory.

Methods: Forty-eight rats were divided into six groups and fifty percent rats of each group were considered as control. Group A,B,C,D,E were sacrificed at interval of 0,7,14,21,30,100 days and assessment for histological changes was performed. Weight of the rats and prostate was also measured separately in different phases. Density of periacinar and interacinar collar was more extensive in VP than DLP.

Observations: Post-castrated rats were found to gain weight. Different lobes of the prostate gland lost their weight in varying amounts but no appreciable histological difference was observed between dorsal and lateral lobes. The connective tissue sleeve intimately adhered around the acinus showed some separation from each other and from the basal lamina in 30-day and 100-day castrate.

Conclusion: Changes of ventral lobe of prostate was more rapid than dorsolateral lobe.

Key words: Prostate, Orchiectomy, Haematoxylin- Eosin stain.

Introduction:

In the past, castration was performed for prostatic enlargement prior to improvement of prostatic surgery (Aird, 1958¹). In case of prostatic carcinoma also, castration was a standard form of treatment for many years. The idea of this form of treatment first came from Huggins et al., 1942². He was the first who showed the dependency of prostatic tumours on androgen in a large percentage of population. Castration is still performed in metastatic cases of prostatic carcinoma to give symptomatic relief to the patient (Rain & Mann 1988³). However, in both the cases clinical results of castration are inconsistent (Sagalowsky et al., 1991⁴). The aim of the present study is to explore the possible correlation between aforementioned inconsistency at the light microscopical level.

Materials & Methods:

Fifty-two adult albino rats of Charles Foster Stain were taken from central animal house of Aligarh Muslim University. Out of Fifty-two rats, forty-eight were in age group of 4-8 months and they were divided into six groups (A,B,C,D,E,F). Each group consist of eight rats. Out of which, four rats were experimental and rests were control. The rest of the rats were in age group of 20-24 month and they were considered as group G. So, the group G consists of aged rats only. Group A was sacrificed on the same date of castration and group B,C,D,E,F were sacrificed at interval of 7,14,21,30,100 days (both control & experimental groups). The collected tissue from prostate was collected, processed and stained by Haematoxylin- Eosin. Each experimental group was weighed before castration and sacrifice.

Results & Analysis

The Post-castrated rats were found to gain weight. It was also observed that the longer the post-operative period, more was the weight gain. (Table-I) The control group were also found to gain weight. Different lobes of the prostate gland lost their weight in varying amounts. (Table-II) Maximum weight loss was found to achieve during the first week of the post-operative period as compared to that control animals.

Ventral lobe of prostate showed following changes: (Fig:2-6)

After seven days of castration columnar cells lining the convoluted subcapsular acini were found to reduce in height. Supranuclear light zone of columnar cells disappeared in experimental animals. Cuboidal epithelium lining the non-convoluted acini lying deep to convoluted acini did not show any appreciable change within the same period. Lumen of the glandular epithelium and the secretion within it does not show any remarkable changes. The thin fibromuscular periacinar collar of stroma normally tightly adhere around the acini.

After fourteen days of castration the glandular epithelium showed maximum changes and the acini were found to be markedly reduced in size from that of control. Due to shrinkage of the acini the lining epithelium became crowded and the nuclei appeared stratified. The secretion within the acini were found to be less in amount. The periacinar collar of stroma were found to increase in thickness and loosely adhered about the acini.

After twenty-one days of castration the diameter was same as that of 14th day with shrinkage of the acini with increase in thickness of periacinar collar.

After thirty days numerous small or oval acini with thick periacinar and interacinar stroma were found.

After hundred days the acini of the gland were found to be highly reduced and almost obliterated. No secretion except some amount of cellular debris were observed. Both interacinar & periacinar stroma showed remarkable increase in size.

Dorsolateral Prostate showed following changes: (Fig:2-6)

The histological appearance of dorsal lobe & lateral lobe was almost similar and they were collectively known as Dorsolateral prostate.

After seven days of castration large acini with many villous projections were observed. The lining epithelium was found to reduce from tall to low columnar epithelium with disappearance of supranuclear light zone. Thin periacinar stroma and homogeneous secretion inside the lumen were also noted.

After fourteen days small convoluted acinus was found to be lined by low columnar epithelium. It was encircled by thin periacinar stroma. Prominent interacinar stroma was found. Homogeneous secretion was observed inside the lumen.

After twenty-one days small convoluted acini lined by cuboidal cells were found. Thin periacinar stroma & homogeneous secretion inside the lumen were also present.

After thirty days small convoluted acini lined by cuboidal cells were found though the epithelium was about to the height of nucleus. The lining epithelial cells were found crowded due to shrinkage of the acini and the nuclei appeared stratified. Thick periacinar and prominent interacinar stroma were found. Almost all the acini were found empty.

After hundred days many smaller convoluted acini lined by low cuboidal epithelium was found. Interacinar stroma was more prominent than before. Most of the acini were empty. A few acini had coarse, granular, eosinophilic materials. The lumens of the acini were not found to be completely obliterated as it was seen in case of ventral prostate.

Prostate of elderly non-castrated rats:

Ventral prostate: Many small acini lined by cuboidal epithelium were observed. Some acini contained secretions mixed with cell debris. Thick periacinar and interacinar stroma were noted.

Dorsolateral prostate: many small convoluted acini were noted, lined by cuboidal epithelium. Some acini were found to contain granular secretions. Thick periacinar and interacinar stroma were also observed.

In the present study the control group did not show any aging effects on the histology of the prostate.(Fig:1)

The histological appearance of the prostate of the elderly rats had much similarity with post-castrated prostate shown in the present study.

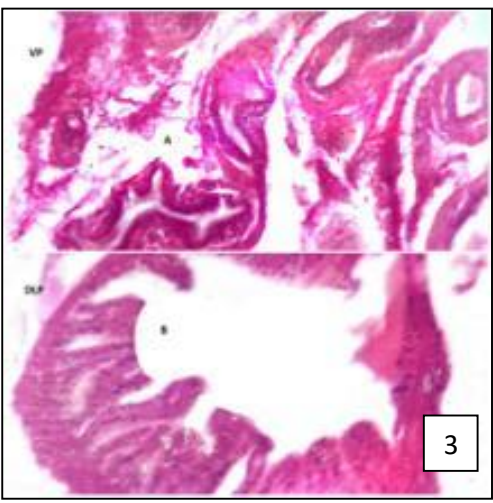
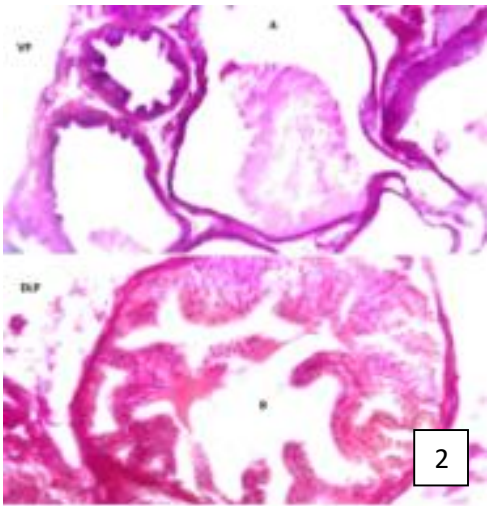
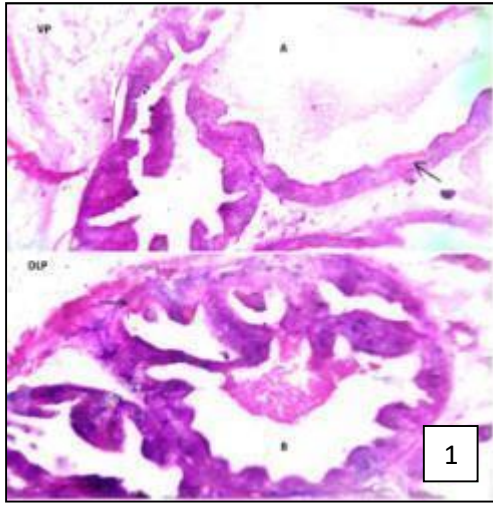
Table-I: Weight of the rats before &after castration

		Mean weight (± Standard Error) of rat (gm)									
Groups	A	B		C		D		E		F	
Day	0	7		14		21		30		100	
		Pre castration	Post Castration	Pre Castration	Post Castation	Pre Castration	Post Castation	Pre Castration	Post Castation	Pre castration	Post Castration
Castrated rat (n=4)	357.5 ±69	238.7±16.3	241.2±13.5	190±18.3	195±23.4	285±42	306±49	352±65	383±75	302±54	365±49
Control rat (n=4)	196±12	330±90	332±86	195±21	198±16	289±31	296±29	330±47	336±44	300±56	309±57
Elderly rat	340±72										

Table-II: Weight of the different lobes of the Prostate

		Mean weight (± Standard Error) of Prostate gland (mg)																	
Groups	A			B			C			D			E			F			
Day	0			7			14			21			30			100			
Lobes of the Prostate	VP	LP	DP	VP	LP	DP	VP	LP	DP	VP	LP	DP	VP	LP	DP	VP	LP	DP	
Castrated rat (n=4)	37 5.2 ±8 7	10 7± 32 1	13 1.7 ±2 1	59. 5± 5.4 3	31. 3± 378 1	34. 5± 1 3	43. 25 ±3. 43	22 ±3. 43 6	26 ±4. 6 5	45. 5± 10. 7	26. 25 ±4. 5	35. 5±1 1.1 1.5	40 ±1 1.5 8.6	25. 5± ±4. 3	34 ±4. 3 1.6	21 ±1 1.6 5	21. 2± 5	24.7 ±9	
Control rat (n=4)	21 2± 16	56 ±1 0	73. 3± 5	222 ±1 2	60 ±5	74 ±7	214 ±2 4	57 ±9 4	75 ±3	313 ±6 7	84. 5± 17	107 ±29	356 ±4 1	100 ±2 3	128 ±1 9	300 ±7 4	86 ±1 2	110 ±40	

Elderly rat (n=4)	VP	LP	DP
	178±33	64±33	78±23



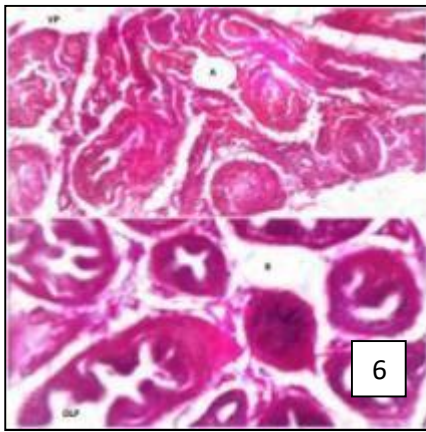
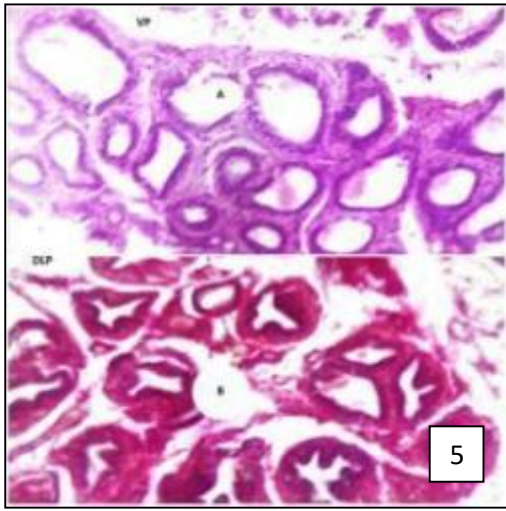
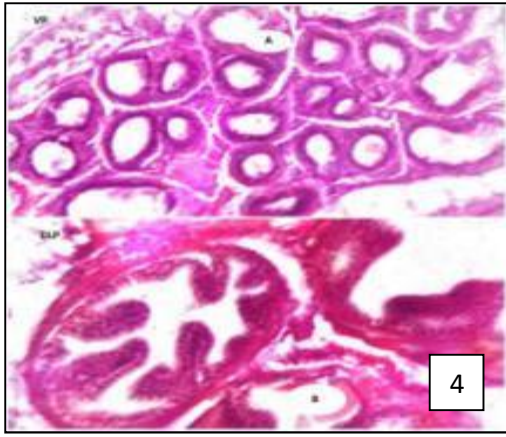


Fig-1: Transverse section of Ventral (VP-A) & Dorsolateral (DLP-B) prostate of control rat (0 day) (H & E Stain) X100

Fig-2: Transverse section of Ventral (VP-A) & Dorsolateral (DLP-B) prostate of castrated rat (7th day) (H & E Stain) X100

Fig-3: Transverse section of Ventral (VP-A) & Dorsolateral (DLP-B) prostate of castrated rat (14th day) (H & E Stain) X100

Fig-4: Transverse section of Ventral (VP-A) & Dorsolateral (DLP-B) prostate of castrated rat (28th day) (H & E Stain) X100

Fig-5: Transverse section of Ventral (VP-A) & Dorsolateral (DLP-B) prostate of castrated rat (30th day) (H & E Stain) X100

Fig-6: Transverse section of Ventral (VP-A) & Dorsolateral (DLP-B) prostate of castrated rat (100th day) (H & E Stain) X100

Discussion

The present study reveals that after castration each group of rat has gained weight. The gain may be attributed to this fact that castration tends to deposit fat in the body (Dorsiet al., 1964⁵). According to Huttunen et al., 1981⁶; Kiplesund et al., 1988⁷ & Amatayakul et al., 1988⁸ prostate gland loses weight in post castrational period. After seven days of castration VP loses 76%, DP-59% & LP-56% of wet weight as observed in present study is in agreement with observation made by Kiplesund et al., 1988⁷. After thirty days of castration VP loses 89.5%, DP-75.6% & LP-76.6% of wet weight as observed in present study is in agreement with the finding of Huttunen et al., 1981⁶. This also corroborates the observations made by Marts et al., 1987⁹ & Amatayakul et al., 1971⁸. The maximum weight loss after seven days of castration may be attributed to this fact that maximum cell loss as observed by Stien & Helpap (1981)¹⁰ occurs between 4-8 days of castration. As noted by Coffey et al., 1976¹¹, 80 % cells are lost within 10 days of castration.

Regarding the nature of secretion, the present study has shown that the acini of both lateral & dorsal lobes contain fine granular eosinophilic secretions. No spheroidal bodies or large number of nuclei as observed by Gunn & Gould (1957)¹² and Harkonen et al., 1964¹³ are found in the present study. The present study has observed no appreciable histological difference between dorsal and lateral lobes. Moore et al., 1930¹⁴ supported this observation. Post castrational changes as observed in present study in two lobes do not differ much. The prostate gland atrophies after castration as observed many workers (Moore¹⁴, Mann 1964³; Brandes 1974¹⁵; Stanistic et al., 1978¹⁶;) and the present study supports the findings of previous researchers. The glandular and stromal components do not respond to castration equally and simultaneously. Castration causes atrophy of glandular component first, which is followed by muscular component. The earliest changes as observed in the present study is the disappearance of supranuclear light zone from the glandular epithelium of both VP & DLP. Moore et al., 1930¹⁴ noted the same finding as early as fourth day of castration.

According to Coffey 1976¹¹, after castration stromal/epithelial ratio increased. Sugimura et al., 1986¹⁷ reported that after castration the architecture of the prostate returned to that of 15-day-old gland in which epithelial ducts are embedded in a thick condensed mesenchyme which had similarity with our findings.

Normally a thin sleeve of periacinar collar of stroma consisting of one to five layers remain tightly adhere to each other and to the basal lamina of glandular epithelium (Danjacour et al., 1987¹⁸). In the present study above mentioned features were found only in control animals but also in 7-day castrates. The connective tissue sleeve intimately adhered around the acinus showed some separation from each other and from the basal lamina in 14-days of castration (According to Sugimura et al., 1986¹⁷). The present study also showed this separation but it is more pronounced in 30-day and 100-day castrate. The present study described that increased density of periacinar and interacinar collar was more extensive in VP than DLP and the observation was supported by Marts et al, 1987⁹.

Conclusion

Ventral lobe of prostate reacts more rapidly than dorsolateral lobe. The glandular component becomes atrophied whereas stroma gets increased. The columnar epithelium lining the subcapsular convoluted acini is more susceptible to castration than cuboidal epithelium. In longer day castrate collagen content becomes prominent than the muscular component. On the basis of present study, it may be suggested that castration may help in conditions of prostatic growth where epithelial elements preponderate whereas no benefit is likely to be obtained

in conditions where stromal elements predominate. The nature of the growth should therefore be ascertained prior to castration.

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