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A Comparative Study on Seminiferous Tubule Diameter of Different Mammals Testes

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Abstract:
Background*: Testes are ovoid or walnut shaped bodies that have the organization of compound tubular glands with a thick fibrous capsule. Testes having both exocrine and endocrine function and various cell types. Though many studies have been done still some important values need further investigation in this field for future reproductive science.* ***Materials and Methods****: The study was conducted in the Department of Anatomy, Gauhati Medical College during the period of May,2012 to May,2014. The study was conducted on the testis of human, pig, goat and albino rat. They were divided into four mammals group Group-I, Group-II, Group-III, and Group-IV respectively consisting of 6 to 9animals. The diameters of the seminiferous tubules were measured with the help of an ocular and objective micrometer and statistical analysis were done.* ***Results****: The average diameter of the seminiferous tubule in right & left testis in mammals were 151.56 µm and 151.48 µm, 157.56 µm & 156.48 µm, 142.46 µm & 142.54 µm, 148.25 µm & 244.42 µm in Group-I, Group-II, Group-III, and Group- IV respectively.* ***Conclusion:*** *The seminiferous tubules from both testes in each species were studied under light microscope in low and high magnification. The diameter of albino rat seminiferous tubule shows highest value while that of goat shows lowest. The human being and pig having some similarity in respect to diameter of the seminiferous tubule.*

Key Word*: Seminiferous tubule; Human Testes; Mammals testes.*

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I. Introduction

Testes are ovoid or walnut shaped bodies that have the organization of compound tubular glands[1] with a thick fibrous capsule i.e tunica albuginea[2]. The testes are suspended in the scrotal region by the support of scrotal tissue including non striated dartos muscle and spermatic cord[3].

The testes secrete hormones associated with the reproductive system after puberty[4].Testes having both exocrine and endocrine function and various cell types has vital inter-relationship and extremely sensitive to changes in its environment[5].

The testis is one of the organ which has capability to adapt in environment change, but its extreme sensitivity alter its function in some manner. The cell components of the testes interdependent each other, multiply at an astonishing rate during puberty, though it varies from species to species[6].

The histomorphological studies were carried out by various workers from the ancient time in different mammals including human being. Though many studies have been done still some important values need further investigation in this field for future reproductive science. It is difficult to study the all cell type of the testes in mammals in same time due to their different metabolic and physiological function including interdependency, so these limits the values of studies conducted only one type.

II. Material And Methods

The study was conducted in the Department of Anatomy, Gauhati Medical College during the period of May,2012 to May,2014. The study was conducted on the testis of human, pig, goat and albino rat. They were divided into four mammals group consisting 6 to 9 animals in its group as follows:-

Table no1: Shows the different mammals divided into different groups with number of animals

Sl. No	Name of the mammal	Group	No. of animals
1	Human	I	7
2	Pig	II	8
3	Goat	III	6
4	Albino rat	IV	9

Group- I: The testes were collected from cadavers, after excluding all possible history of abnormality of the testes within 1-2 hours of death. The testes of 7 cadavers that were placed for dissection in the department of Anatomy, Gauhati Medical College were also examined. There was no difference in the size and shape of the testes compared to the testes obtained within 1-2 hours of death. No significant shrinkage was found in the testes.

Group-II: The testes were collected from the local slaughter's House immediately after death of the animal at Beltola market, Guwahati and preserved.

Group-III: The testes of the goat were obtained from the slaughter's House immediately after death of the animal at Narengi Market, Guwahati and preserved.

Group-IV: Albino rat were anaesthetized and the testes were obtained after careful dissection.

The testes were cut by a sharp razor into approximately 4-5 mm pieces were fixed in 10 % neutral buffered formalin solution[7]. The fixed tissues were processed for histomorphological observation according to Carleton[8]. All the paraffin embedded blocks of tissues were serially cut with the help of a rotary microtome into 4-5 m(micron) thickness as per method described by Luna[7]. The sections were stained with Haematoxylin and Eosin method of Luna(Loc Cit)[7]. 20 clearly visible transversal seminiferous tubules from each testis, selected at random were examined under compound microscope for diameter following the method outlined by Baishya et al[9].

The number of sertoli cells was counted on the basis of average number(selected at random) of the H&E stained section from each testis of each mammals following the method outlined by Santamarina E. et al [10].

The diameter of the seminiferous tubules were measured with the help of an ocular and objective micrometer. Biometrical values were analyzed statisticscally according to Snedecov et al[11].

Calculation of the micrometer scale:[8]

One division of the ocular micrometer scale was equivalent to 3.33 mm at 400 times magnification.

15 divisions of ocular micrometer coincide with 5 divisions of objective micrometer.

Therefore, 1 division of ocular scale = 5/15 division of objective micrometer scale.

As 1 division of the objective micrometer measures 0.01mm.

Therefore 5/15 div. = 5/15x 0.01 = 0.0033mm = 3.33mm (10^{-3}mm = 1µm)

Therefore, 1 division of ocular micrometer scale = 3.33 µm.

III. Result

The diameter of the seminiferous tubule was seen from 50 clearly seen transversal seminiferous tubule in each species of mammals in both side testis which was almost round and they were selected randomly. The average diameter of the seminiferouys tubule in group I to IV was noted and has been given in table no2.

Table no2: The average diameter of the seminiferous tubule in right & left testis in mammals.

GROUP	RIGHT	LEFT
Group I	151.56 µm	151.48 µm
Group II	157.56 µm	156.48 µm
Group III	142.46 µm	142.54 µm
Group IV	148.25 µm	244.42 µm

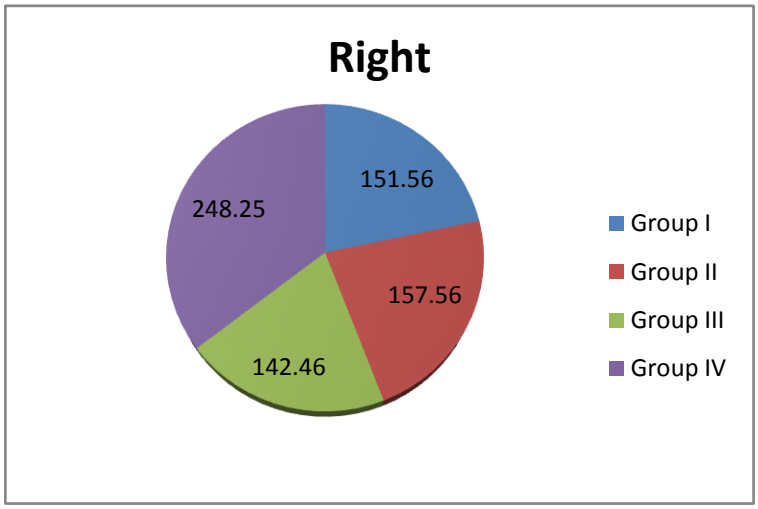

Fig no1:. Pie diagram showing inter-species seminiferous tubule diameter ratio in right testis.

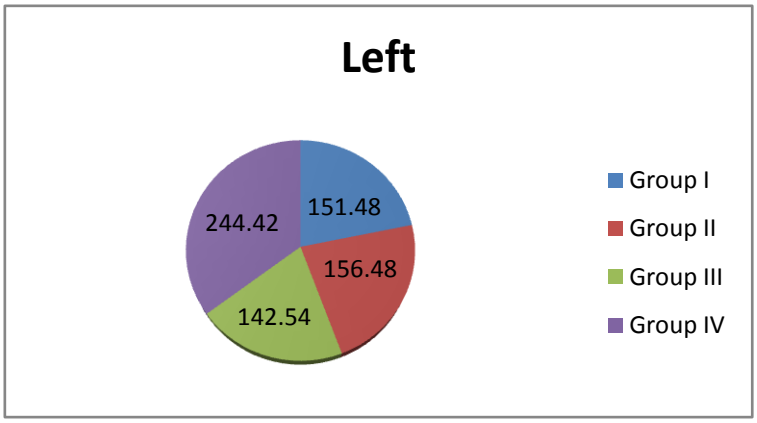

Fig no 2: Pie diagram showing inter-species seminiferous tubule diameter ratio in left testis.

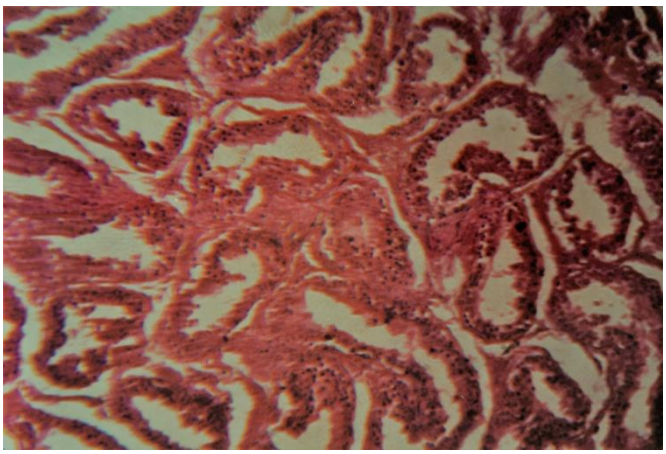

Fig no3: Photograph of human seminiferous tubule with its lumen and different cell types including intertubular cell(H& E ×100)

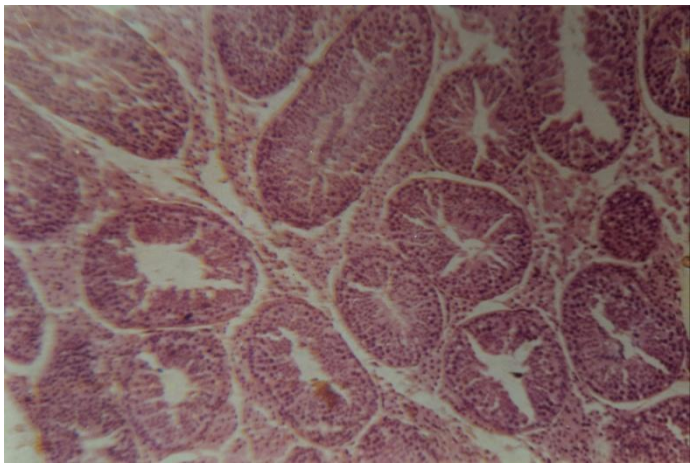

Fig no4: Photograph of pig seminiferous tubule with its lumen and different cell types including intertubular cell(H& E ×100)

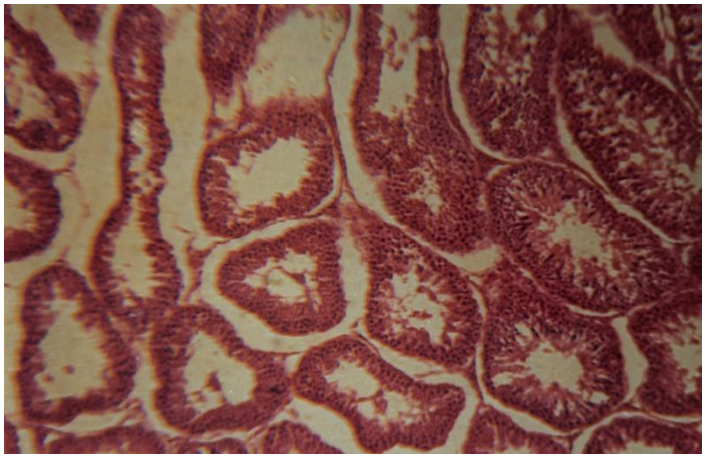

Fig no5: Photograph of goat seminiferous tubule with its lumen and different cell types including intertubular cell(H& E ×100)

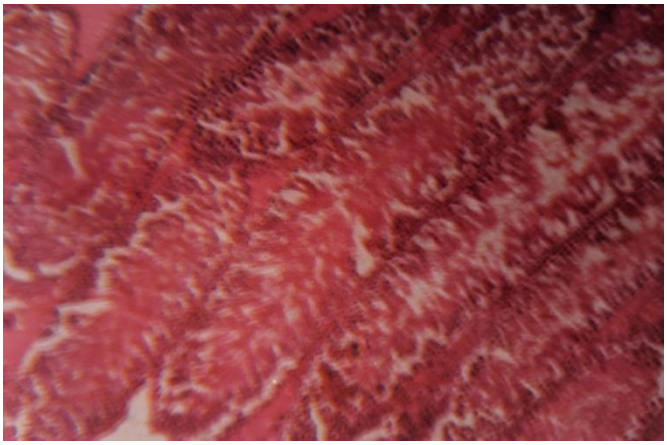

Fig no6: Photograph of albino rat seminiferous tubule with its lumen and different cell types including intertubular cell(H& E ×100)

The interspecies variation of the diameter of seminiferous tubule of right & left testis has been shown with the help of Pie diagram (Fig:2 & 3).The diameter of the seminiferous tubule is found highest in albino rat and lowest in goat. The right and left have been no significant different is found statistically.

IV. Discussion

The diameter of seminiferous tubule have been reported in human as 150 µm to 300 µm, 150 to 250 µm,250 to 300 µm and 120 to 300 µm, Baily[1], Bloom et al[2], Hemilton[12] and Lawrence et al[13] respectively. The diameter of seminiferous tubule of human being in present investigation were 151.56 µm and 151.48 µm for right and left testis at an average, which in conformation with Baily[1], Bloom et al[2] and Lawrence et al[13].

The diameter of seminiferous tubule in pig were reported as 160.4 µm and 260 to 270 µm (157.75 ± 2.69 µm)by Growth et al[14] and Goswami[15] respectively. It is found quite similarity in cases of diameter of seminiferous tubule of pig testes with the finding reported by Goswami[15].

In case of diameter of seminiferous tubule of goat testes, the values were high with present finding to Yao et al[16] and high with the values to Baishya et al.[17]. It is probably due to age variation.

The diameter of seminiferous tubules of albino rat were 144 µm, 202.50 µm, 225 µm, ± 250 µm by Clermont et al[18] , Paufler et al[19], Amman[20], Clermont et al[21] respectively. The seminiferous tubule diameter in case of rat having a good similarity to Clermont et al[21] with the present finding.

From this investigation the diameter of albino rat seminiferous tubule shows highest value while that of goat shows lowest. The human being and pig having some similarity in respect to diameter of the seminiferous tubule.

The gestational period of rat is very short than any other mammals in present investigation. As fertilization occurs more frequently probably due to that reason the seminiferous tubule produce more spermatozoa and as a result the diameter of the seminiferous tubule also increased. It needs a further investigation about the relation of production of spermatozoa and tubule diameter.

The large organs of human body having some similarities with the organs of pig, so due to the same reason, diameter of seminiferous tubule of pig having some extent similarity with that of man. The lowest value of diameter of seminiferous tubule in case of goat probably due to sample variation. It should need further study to evaluate the reason, why rat having higher value and goat having lower value in respect to diameter of seminiferous tubule concerning its functional status.

V. Conclusion

The seminiferous tubule from both testes in each species were studied under light microscope in low and high magnification. The diameter was selected randomly and noted per cross section from several seminiferous tubule which were almost rounded. The diameter of the seminiferous tubule was found highest in albino rat and lowest in the goat.

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