

Original research article

Histological Observation of Uterine Tubes in Premenopausal and Postmenopausal Women

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Abstract

Background: The uterine tubes, also called as oviducts or fallopian tubes, lie in the mesosalpinx in the upper free edges of the broad ligaments of uterus. These paired structures measure 8-14 cm in length and approximately 1-5 mm in diameter, which is variable along the length of the tube.

Material and methods: Samples of uterine tubes were collected from 50 Patients. 27 samples were collected from patients belonging to pre-menopausal age group and 23 samples were collected from the women of post-menopausal age group. Samples of uterine tubes for study were collected from premenopausal and postmenopausal women attending the department of obstetrics and gynaecology, PMCH, Patna during the period extending from the year 2015 to 2017.

Conclusion: The lumen of the tube gradually widened towards the fimbriated end and the wall of the tube thickened progressively towards the uterus. The blood vessels in the muscularis were present in all the four parts of the tube. These were found abundantly in the isthmic and the intramural regions. These were moderately found in the region of the ampulla but in the infundibular region they were comparatively bigger taking into consideration the thin wall of the muscularis.

Keywords: Intramural Regions, Ampulla, Infundibulum, Fallopian Tube.

Introduction

The uterine tubes are paired structures that extend laterally from uterine horns and open into the peritoneal cavity. They are situated in the upper free margin of the broad ligament of uterus. Each uterine tube measures about 10 cm in length. They develop from paramesonephric duct or mullerian duct at around 6 to 10 weeks of intrauterine life. The major functions of uterine tubes are; transport of ova and sperms to the site of fertilization and provision of a favourable environment for the process of fertilization and early development of a fertilized ovum to take place¹. According to various surveys, the percentage of women reporting some form of fecundity impairment due to tubal pathologies rose manifold in the past two decades. Considering the growing incidence of various tubal pathologies and the fact that, at present the etiology and pathophysiology of many tubal diseases are imperfectly understood, the present study may provide an opportunity to extend some valuable information in this area². Moreover, uterine tubes are the organs not easily accessible for study and clinical examination, with

ultrasonography or any other cross sectional imaging studies, providing only a limited visualization of the normal tubes, making histological study of the resected samples, a major way of studying, in detail, the normal anatomy of the tubes. For most of these studies, lower animals or, subhuman primates have remained favoured experimental animal models, with very limited studies based on human's fallopian tubes' specimens. We have been depending heavily upon animal experimentation for much of our understanding of these structures, but owing to species differences and ethical constraints, these studies have not proved themselves to be promising enough. Hence the present study is intended with the aim of documenting in detail the ultra-structural features and histology of uterine tubes by careful examination of histological specimens collected from premenopausal and postmenopausal women³. The uterine tubes, also called as oviducts or fallopian tubes, lie in the mesosalpinx in the upper free edges of the broad ligaments of uterus. These paired structures measure 8-14 cm in length and approximately 1-5 mm in diameter, which is variable along the length of the tube. The anatomy and physiology of the fallopian tube play an important role in egg transport, sperm passage and fertilization. Egg transport is the movement of the oocyte from the moment of expulsion from the ovarian follicle to entry into the distal segment of the fallopian tube before fertilization takes place⁴. Once fertilized in the ampullary segment of the fallopian tube, the embryo spends about five days travelling into the remaining anatomical oviductal districts and arrives into the uterine cavity at the blastocystic stage. Another common type of inflammation is tuberculous inflammation. Novak (1950) found in his study of tuberculous genital lesions, that these cases are quite frequent. Tuberculosis still remains one of the major health hazard in India and more so in Bihar. Karan (1960) while working in south Bihar, found the incidence of tuberculous tubal infection to be about 2% in the city dwellers and 1.65% in the rural population. The present study is, hence aimed at thoroughly examining the histological pattern of fallopian tubes in each gynaecology specimen received for histopathology as, this small organ has taken a centre stage not only in the issues related to female infertility but also as a site of origin of various carcinoma of the ovary and peritoneum⁵. All these conditions are curable if the predisposing or the precursor tubal pathology is detected and treated in time.

Aim and Objectives

Aim of the present study was to examine histological pattern of fallopian tubes in each gynaecology specimen received for histopathology. Histological changes in tubal epithelium due to IUCD or oral contraceptive pills and sterilization procure had been compared and discussed. The cycles as well as early pregnancy had been studied.

Review of Literature

Uterine tubes also called as "Fallopian Tubes" was named after an Italian anatomist who first described the fallopian tubes as paired organs resembling small trumpets (*tubae*)⁶. Since then uterine tubes have remained a major area of study and research by numerous anatomists and physicists all around the world. Uterine tube is an important structure interposed between ovary and uterus. Its functions may be divided broadly into two categories- firstly transport of male and female gametes i.e. sperms and ova, and secondly provision of a favourable environment for the process of fertilization, which takes place within the tube and for the fertilized ovum during its early development which occurs in the uterine tube before it is implanted in the uterus. These anatomical observations have provided a basis for the earlier observations of whose name is almost as intimately associated with the uterine tube as that of the Fallopius himself viewed the muscular movements of the uterine tube during ovulation via an abdominal window in the rabbit and by means of a laparoscope in the monkey. In both the species fimbriae actually embrace the ovary during ovulation. In the rabbit the movements of

the fimbriated end of the oviduct were dramatic. Recently this has been documented with cinematography. The fimbriae actually moves to and fro over the surface of the ovary and in that way ovum pick up is practically assured. advocated that the human uterine tube is divided into four parts; interstitial or intramural part is only 1-2 cm in length and is the part which traverses the uterine wall. It has a very narrow lumen (1mm in diameter) and is different from the remainder of the tube in that it is without a peritoneal coat and in that the outer longitudinal muscle coat has disappeared to cover the uterus. Isthmus is straight and narrow portion of the tube lying adjacent to the uterus and measures 2-3 cm. This part has a thick wall, but the lumen is so narrow that it will admit only the finest probe (1-2 mm on diameter) on cannulation) described that near the uterine end of the tube, the muscular wall is thicker than towards the ovarian end and in the isthmus it forms the chief part of the wall. The diameter of the tube is variable along its length varying from 1 mm at interstitial portion to about 5 mm at the fimbriated end. said that intrauterine portion of uterine tubes measures at least 0.5 cm described that uterine tube is about 12 cm long. Its diameter varies from 1mm in interstitial portion to 5 mm at the fimbriated end. Novak, E.R Jones, G.S & Jones, H.W. (1973) described that the uterine tube is about 11-12 cm in length. said that uterine tube when straightened, is 10 cm in length. described that except for a narrow strip opposite to the broad ligament, the extrauterine part of the uterine tube is covered with peritoneum. stated that the intrauterine portion of the uterine tube measures at least 0.5 cm. Novak E.R. et al¹⁰. (1973) described that on histological examination, fallopian tube shows three distinct layers: Serosa, the outermost layer, middle muscular layer and the innermost, mucous layer. The mucosa or the endosalpinx is thrown into characteristic longitudinal folds called as plicae or rugae, the number of which goes on increasing as one approaches the fimbriated portion of the tube. Lisa et al⁹. (1954) demonstrated the presence of a sphincter at the intramural part of the uterine tube and its junction with the uterus. Otherwise the muscular layer is composed of visceral muscle fibres arranged in external longitudinal and an internal circular layer. Mitra L.N. and Prasad G.K. (1978) also working along the same lines described the uterine tubes as having four parts, Infundibulum, ampulla, isthmus and intramural part. On histological study, the ampulla of the tube consists of an outer serous coat, middle muscular coat and an innermost mucous coat. **Hellman (1949)** showed that this lesion is more prevalent in the pregnant state and puerperium, especially from the 3rd to 6th days post-partum. It is not related to the occurrence of fever in the puerperium or to syphilis. Khorsed (1966)⁷ described the perivascular round cell infiltration in the purperial tubes. was of the opinion that the height of the ciliated cells may show cyclic variations but the atrophied cells still bear cilia. Jungueira L.C., Carneiro J. & Kelly⁸ R.O. (1989) described that the epithelium lining the mucosa of the tube is of simple columnar type and contains two types of cells.

Material and methods

Samples of uterine tubes were collected from 50 Patients. 27 samples were collected from patients belonging to pre-menopausal age group and 23 samples were collected from the women of post-menopausal age group. Samples of uterine tubes for study were collected from premenopausal and postmenopausal women attending the department of obstetrics and gynaecology, PMCH, Patna during the period extending from the year 2015 to 2017. Size of the samples in the present study has been kept such that it can be dealt with greatest efficiency and reliability, being economical and practical under genuine limitations at the same time.

The cases for study have been taken at random so that it may be a representative of the cross section of the population. As bias and experimental errors are difficult to be completely eliminated from any research work, maximum precautions have been taken to reduce them to a bare minimum as far as possible. The resected samples, after being collected were handled

with greatest care and precautions as even a slightest negligence by injudicious handling may cause damage to the samples collected rendering them extremely difficult to interpret. The tissue after removal was immediately placed in a bottle containing 10 % formal saline, which is the most commonly used fixative for all the native purposes in various laboratories across the world. The bottle was labelled indicating various details of the patient like, name, registration no, name and date of the procedure, date of sample collection etc. The specimen so collected was immediately transported to the laboratory of the histology section of the department of Anatomy, PMCH, Patna.

Observation and Results

50 samples were taken from patients undergoing various gynaecological operations in the department of obstetrics and gynaecology, PMCH, Patna. 31 specimens out of 50, belonged to women in premenopausal age group, while the rest 19 samples were taken from women in postmenopausal age group. Since fallopian tubes are seldom the site of primary disease, most of the fallopian tubes specimens were received as a part of the standard surgical protocols with the primary pathologies lying elsewhere in the female genital tract. The specimens were collected either as salpingectomies, as a part of pan hysterectomy operation, sterilization procedures (tubal ligation), or, from the surgeries for the removal of tubo-ovarian masses, from the department of obstetrics and gynaecology and from the department of pathology, PMCH, Patna.

Table 1: age distribution of cases

SL.No.	Age Group in Years	No. of Patients	Percentage
1.	15 to 20	0	0%
2.	21 to 25	2	4%
3.	26 to 30	4	8%
4.	31 to 35	11	22%
5.	36 to 40	5	10%
6.	41 to 45	3	6%
7.	46 to 50	5	10%
8.	51 to 55	13	26%
9.	56 to 60	4	8%
10.	61 to 65	3	6%
	Total	50	100.00

The distribution of age among the cases from where the samples were received is depicted in. The youngest patient was 19 years old while the oldest was 63 years old. The distribution pattern clearly indicates two peaks in the graph, one showing clustering of cases in the age group between 31 to 35 and other in the age group between 51 to 55. The pattern is an obvious indicator of the fact that women in reproductive age group of 31-35 have mostly completed their family and desire some sort of contraception, which in these cases is mostly tubal ligation. The second peak shows the piling of cases in the age group 51 to 55, indicates that most of these women have achieved menopause by then and are mostly coming with complains of dysfunctional uterine bleeding which is the manifestation of many underlying gynaecological disorders.

Table 2: stages of menstruation among pre-menopausal women:

SL. No.	Stage of menstrual cycle	No. of Patients	Percentage
1.	Interval phase	14	51.85%
2.	Pre-menstrual phase	3	11.11%
3.	Menstrual phase	0	0%
4.	Post-menstrual phase	4	14.81%
5.	During pregnancy	6	22.22%
Total		27	100%

phase of the menstrual cycle these pre-menopausal women were in, when they underwent the operation. The graph clearly depicts that most of the samples were obtained when the pre-menopausal women were in the interval phase of their menstrual cycle. The interval phase is the most preferred stage of the cycle when any gynaecological surgery is planned.

Table 3: history of IUCD

SL. No.	Category of Patients	Past history of IUCD use	Present history of IUCD use
1.	Pre-menopausal	4	7
2.	Post-menopausal	6	0

past history of I.U.C.D. use in patients whose samples were taken. --- Premenopausal women gave the history of iucd use while ----post-menopausal women gave the history of iud use during their reproductive years. Although past history of iud use does not affect the study of post menopausal women's fallopian tube samples much, but its role does hold importance when it comes to the study fallopian tube samples of premenopausal women. Macroscopic features were studied thoroughly in all the cases; uterine tubes are paired structures extending from uterus to ovary in a fold of peritoneum. It shows four regions namely; lateral most, the infundibulum, which is a funnel shaped part of the tube having its lateral opening into the peritoneal cavity. The margins of infundibulum are drawn into numerous folds, called Fimbria. Uterine tubes are tubular organs, resembling hollow viscera. It consists of an outer serosal layer, a middle muscle layer and the innermost mucosal layer.

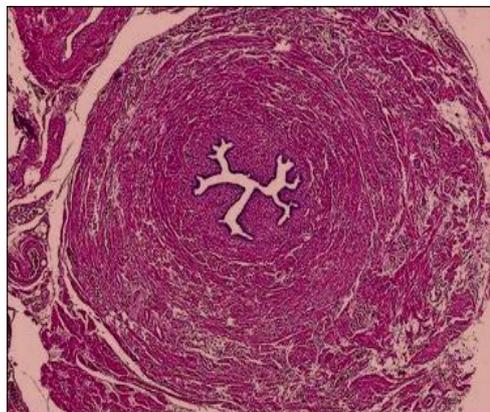


Figure 1: microphotograph of fallopian tube (isthmus) showing lumen with few tiny folds of mucosa with thick muscular layer

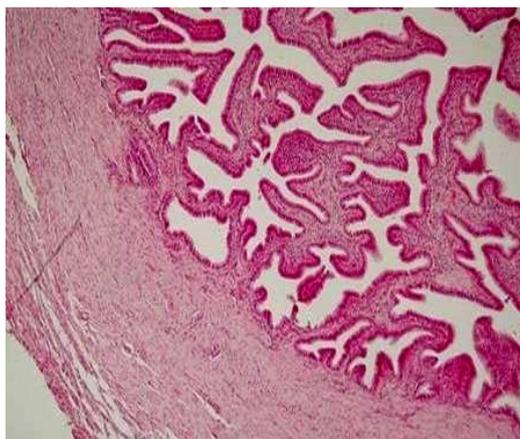


Figure 2: microphotograph of the infundibulum of the uterine tube showing the ostium of the fallopian tube through which it opens into the peritoneal cavity.

Discussion

The present study was undertaken on 50 surgically removed fallopian tubes specimens, received from women attending the department of obstetrics and gynaecology, PMCH, Patna. The surgical procedures which these women underwent included-Total abdominal hysterectomy with b/l salpingo-oophorectomy, tube-ligation, tube-ligation with caesarean section, removal of tubo-ovarian masses (u/l salpingo-oophorectomy). Haematoxylin-eosin stained slides prepared from each specimen of fallopian tubes so collected, were thoroughly analysed and meticulously studied under microscope to evaluate the normal histological features of the fallopian tubes, with special attention being given to mucosal folding patterns or plicae, the characteristics of the lining epithelium of the mucosa along with its different cellular contributions and architecture of the muscularis layer. As previously stated the fallopian tube, from medial to lateral, consists of four parts, which are; intramural, isthmus, ampulla and infundibulum. Studying the cross section of the tubes it was found to have mainly three layers from inside-out, these are- mucosa, muscularis and outermost serosa. stated that, in the region of isthmus, the mucosa is less complexly folded. There are about three to six primary folds. Similar findings have been advocated by Ham¹⁷ (1979). He also confirmed in his work that there are about 3 to 4 primary folds in the isthmic region and there are a little more ridges present in the intramural part. Similar findings were observed in the present study. The mucosa of the fallopian tube is complexly folded in the region of the ampulla and this pattern continues in the infundibular part. As already stated, the findings, that the mucosa is thrown into a series of major plicae or folds into the lumen, each of which displays secondary and tertiary projections, is in accordance with the findings of William and Warwick (1980); Ham and Cormack (1979); Romanes¹⁹(1987); Leeson and Leeson¹⁸(1976); Novak (1979); Kelley, Wood and Enders¹² (1984) and Whitefield¹⁵(1980). The epithelium of the uterine tube has been described as columnar and ciliated by many authors and investigators like, There are secretory or “peg” cells in between the columnar ciliated cells, which have also been mentioned by the aforementioned authors. The peg cells are non-ciliated. The height of the epithelium and the proportion of ciliated to non-ciliated secretory cells vary considerably in different parts of the tube). These two types of cells undergo changes according to the phases of the menstrual cycle under the effects of estrogen and progesterone. With dark stained nucleus, a few clear cells remain scattered in the epithelial membrane close to the basement membrane, studied by A.W Ham¹⁷ (1979), William & Warwick¹⁶ (1980). Similar cells close to the basement

membrane have also been encountered in the present work. It is quite possible that these are young secretory cells, giving rise to mature peg cells at a later date. Another type of cell, called as intercalary cells have also been mentioned in the literature (Pauestein & Woodruff¹², 1979). They opined that these cells may be the precursors of the secretory cells or exhausted remnants of them. such intercalary cells have not been encountered in the present study. In the isthmic part of the tube, the muscular wall is thick and well developed in most of the cases. This finding is in accordance with the findings of *Lisa et al (1954)*, *Sweeny (1962)*¹¹, and *Ham & Cormack (1974)*. *Sweeny (1962)*, stated that in the intramural part an additional internal longitudinal layer of smooth muscle fibres is added to the existing outer longitudinal and middle circular layer. This particular observation could not be found in any of the specimen, in the present work. Many authors such as, *Verhasge et al*¹³ (1979), *Ham & Cormack (1979)*, *Novak (1979)*, has stated that the muscularis gradually becomes thinner and thinner as we trace the muscle coat from interstitial to the fimbriated end of the tube. This finding was confirmed in the present work. The accumulation of lymphocytes and plasma cells around the blood vessels of the muscular layer, has been found in both the pregnant tubes as well as the non pregnant tubes by many workers like *Hellman (1979)*¹⁴ and *Khorsed (1966)*, who found it in 30 to 40% of the tubes. In the present work although, round cell infiltration could be found in very few of the cases, moreover of those which showed such findings, it was only minimal.

Conclusion:

The lumen of the tube gradually widened towards the fimbriated end and the wall of the tube thickened progressively towards the uterus. The blood vessels in the muscularis were present in all the four parts of the tube. These were found abundantly in the isthmic and the intramural regions. These were moderately found in the region of the ampulla but in the infundibular region they were comparatively bigger taking into consideration the thin wall of the muscularis.

References

1. Andrews ; Mason C. (1951) : Am.J. Obst & Gynae, 62:28
2. Annelone Wollen & Per R. : Brit. J. Obst. & Gynae;Vol I 3d74 Flood institute of Anatomy; 91.p. 1123-1128
3. Black Schaffer (1994) Am. J. Obst. & Gynae; 48:
4. Bose, Sudhir (1959) : J. Obst. & Gynae of India. 10:12
5. Baird, Dugald. Sir (1962):Combined textbook of Obst Gynae, 7th Ed. & D., Livingstone, London,751.
6. Boyd.W. (1970): A Textbook of Pathology, 8th Ed. Lea & Febiger, p-988-989
7. Khorsed; Pasricha; Ghosh. D.N. (1966). : J. Obst & Gynae., India; 16:66
8. Kelley. D.E.,Wood, R.L. and Enders, A.C. (1984). : Bailey's Text Book of Microscopic Anatomy, p. 742-743
9. Lisa, J.R.; Gioia, J.D. and Rubin. I.C. (1954) : Observation on Interstitial Portion of the FALLOPIAN TUBE: Surgery Gynae & Obst.p.159-169.
10. Novak, E.; Novak. E.R. (1979) : Gynaecologic & Obstetric Pathology. 8th Ed., Philadelphia W.B. Saunders, p.306-332
11. Sweeny, W.J. (1962) : The Interstitial Portion of the Uterine Tubes, its Gross Anatomy Course and Length, Obst. & Gynae.,19,1-8.
12. Woodruff J.D. & Pauerstein C.J. (1969) : The Fallopian Tube, Williams & Wilkins Co., Baltimore.
13. Verhage. Et al.(1979) : Am. J. of Anatomy,156:505-522
14. Heynemann, T. (1933) : Handbuchder Gynaecology Munich, J.F. Bergmann; Quoted By Tom Barnes.

15. Whitefield C.R. (1988) : Dew Hurst's Text Book of Obst. & Gynae. For P.G. Ed.,pp. 127- 128.
16. William P.L. and Warwick, R. (1980) : Gray's Anatomy, 36th Ed. p. 1426-1427.
17. Ham, A. W. and Cormact. D.H. (D1979) : Textbook of Histology, 8th Ed. p.849
18. Leeson. R.C. and Leeson T.S. (1976) : Text Book of Histology, p.488-490
19. Romanes, G.J. (1987) : Cunningham's Text Book of Anatomy, 12th Ed., Oxford Univ. Press, 567.