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Original Research Article

A MORPHOLOGICAL STUDY ON FALLOPIAN TUBE

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ABSTRACT

Background and Aims: The fallopian tubes, also known as, uterine tubes, are pair of fine tubes leading from the ovaries of female mammals into the uterus, via the uterotubal junction. Optimal fallopian tube function is necessary to provide a proper environment for early human life. Fallopian tube plays an essential role in gamete transport, fertilization and the early development of the embryo which can be affected by a wide range of factors and conditions that may impair fertility. The study of normal morphological structure of fallopian tube in different age groups may help in different disease condition of fallopian tube.

Materials and Methods: The study focused on morphological study of the fallopian tube, the specimens were divided in three age groups (0 to 13 years, 14 to 49 years and e"50 years) with 10 specimen each group.

Results: The average length of the fallopian tube was found to be 7.89 cm in left and 7.65 cm, in right, 10.5 cm in left and 10.27 cm in right and 9.87 cm in left and 9.57cm in right respectively, while the average outer diameter of left and right side were at isthmus 3.01 mm and 2.85 mm, 6.87 mm and 6.05 mm and 6.18 mm and 5.33 mm respectively, average outer diameter of left and right side were at ampulla 4.78 mm and 4.43 mm, 10.56 mm and 9.25 mm and 9.24 mm and 8.23 mm respectively, average outer diameter of left and right side were at infundibulum were 3.63 mm and 3.44 mm, 9.39 mm and 8.24 mm and 7.69 mm and 7.02 mm respectively in different age groups.

Conclusion: The length and outer diameter showed significant difference in right and left side and in different age groups. Knowledge of normal values might be helpful in different disease condition of the fallopian tube.

KEY WORDS: morphology, fallopian tube, uterotubal junction.

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INTRODUCTION

Fallopian tubes have a subtle role in promoting human fertility. Optimal fallopian tube function is necessary to provide a proper environment for early human life [1]. The wall of the uterine tube is composed of three layers. The uterine tube wall resembles the wall of other hollow viscera, consisting of an external serosal layer, an intermediate muscular layer, and an internal mucosal layer. However, there is no submucosa [2].

The oviducts transport the germ cells in two directions: Sperm ascend toward the ampulla and the zygote descends toward the uterus. This requires coordination between smooth muscle contraction, ciliary movement and fluid secretion, all of which are under hormonal and neuronal control [3].

Ectopic pregnancy is a common, life threatening condition affecting one in 100 pregnancies. This condition currently is the leading cause of pregnancy related death during the first trimester, accounting for 9% of all pregnancy related

deaths usually from fallopian tube rupture with excessive bleeding into abdominal cavity [4].

With the progress in IVF, the contribution of the Fallopian tube towards successful reproduction has been comparatively overlooked. It is clear from the success of IVF, which of course bypasses tubal transport that exposure to the tubal milieu is not an absolute requisite for fertilization or implantation to occur. Thus, the fallopian tube is often now thought of as little more than a mere conduit. However, in fertilization in vivo, the fallopian tube plays an essential role in gamete transport, fertilization and the early development of the embryo. It is becoming increasingly evident that the mechanism of tubal transport is much more complex than first thought and can be affected by a wide range of factors and conditions that may impair fertility [5].

Hence in this modern era of advancement it has become a necessity to study in details about fallopian tube. Studies on fallopian tube have been reported by various workers [6, 7].

The morphological parameters of the fallopian tube is not completely covered in the standard text books. Hence this study is focused on in important morphological features like length and outer diameter of the fallopian tube. The correlation of these parameters may help in better understanding of diseases associated with fallopian tube.

MATERIALS AND METHODS

The study on human fallopian tubes was conducted in the Department Of Anatomy, Gauhati Medical College, Guwahati from May 2013 to September 2014. The study was approved by Institutional Ethics Committee of Gauhati Medical College and Hospital. 30 fallopian tubes were studied. They were grouped into three age groups: "A" (0 to 13 years), group "B" (14 to 49 years) and group "C" (50 years and above), each group with 10 specimen each.

The fallopian tubes were collected from the unclaimed autopsied bodies in the Department of Forensic medicine, Gauhati Medical College. The whole uterus was also taken out with fallopian tubes from the cadavers to get accurate measurement of the length of fallopian tubes. The specimen collected from the autopsied were 3 to 4 days old as a body can be declared unclaimed only after 3 days. Samples were also collected from patients who had undergone total abdominal hysterectomy or vaginal hysterectomy (after obtaining informed consent) in the Department of Obstetrics and Gynaecology, Gauhati Medical College. Specimen were collected and examined immediately after the operation. Specimens with obvious pathological changes and decomposition were excluded.

Fig. 1: Photograph showing method of measuring length of fallopian tube.

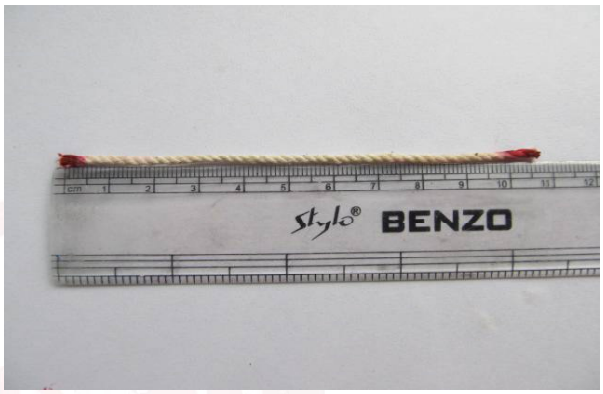

Fig. 2: Photograph showing method of measuring length of fallopian tube.

Fig. 3: Photograph showing method of measuring outer diameter of fallopian tube.

Length was measured before fixing the specimen in 10% formalin. Since the fallopian tubes were tortuous, to measure the length first a flexible soft cotton thread was placed along the curve of the tube starting from the fimbriated end to the morphological uterotubal junction. Then the length was measured in centimeters (fig.1 and fig. 2). But the intramural part lies inside the uterine tissue and it was difficult to measure its whole length. According to several workers [8, 9] (Sahana 1985, Bannister and Dyson, 1995) the length of the intramural part was 1 cm. Thus this 1 cm of the intramural part was added to complete the total length measurement. The numbers of convolutions of the fallopian tubes were also recorded. Outer diameter was also measured by means of a Vernier Caliper (fig. 3). at isthmus, ampulla and infundibulum excluding the intramural parts since the intramural part gets submerged in the substance of uterus.

RESULTS AND DISCUSSION

Results obtained in the present study were compared with the established findings of other authors. In the present study, the average length of the fallopian tube was found to be 9.29 cm (calculated by mean length of both right and left side of the fallopian tube of prereproductive, reproductive and postreproductive age groups) which was comparable with the reports of other workers (Table 1).

In all the age group the left side of the fallopian tube length is higher than right side. It is highest average value observed in the left side of the reproductive group (10.5 cm) and lowest in the right side of the prereproductive group (7.65 cm).

The average length of the fallopian tube 'was found to be 7.89 cm in left and 7.65 cm in right in Group "A", 10.5 cm in left and 10.27 cm in right in group "B" and 9.87 cm in left and 9.57cm in right in group "C" (Table 5).

The prereproductive group consists of 10 number of specimen from 0 to 12 years. The length of both left and right fallopian tubes ranges from 7.0 cm to 8.4 cm with a mean value of 7.89 and 7.65 cm; standard deviations (S.D.) ± 0.3984 and ± 0.3894 and standard error of mean (S.E.M.) ± 0.1259 and ± 0.1231 respectively (Table 2).

The reproductive group consists of 10 number of specimen from 13 to 49 years. The length of both left and right fallopian tubes ranges from 9.6 cm to 11.4 cm with a mean value of 10.5 and 10.27 cm; standard deviations(S.D.) ± 0.44969 and ± 0.43217 and standard error of mean(S.E.M.) ± 0.1422 and ± 0.1366 respectively (Table 3).

The postmenopausal group consists of 10 number of specimen from above 50 years. The length of both left and right fallopian tubes ranges from 8.8 cm to 10.6 cm with a mean value of 9.87 cm and 9.57 cm ; standard deviations(S.D.) ± 0.5271 and ± 0.4831 and standard error of mean(S.E.M.) ± 0.1666 and ± 0.1527 respectively (Table 4).

The average outer diameter of the fallopian tube in the left side was found to be 0.68 cm on the left side and 0.6 cm on the right side. It correlates with the finding of others like Gompel and Silverberg, 1985[10] found it to be 0.4 to 0.9 cm, Dawn, 2004,[11] found it to be 1 cm and Ledger et al., 2010[12] found it to be 0.5 to 1 cm.

The average outer diameter in all groups found to be highest at the ampulla and lowest at the infundibulum. The outer diameter of the left side were higher than the right side in all age group. The outer diameter was highest in reproductive age group and lowest in the prereproductive age group. The highest average outer diameter was observed in the reproductive age group at the ampula of the left side (10.56 mm) and lowest average value observed in the isthmus of the right side of the reproductive age group (2.85 mm).

The mean value, standard deviation(S.D.) and standard error of mean(S.E.M.) for outer diameter in prereproductive group at isthmus of left and right side were 3.01 mm and 2.85 mm; ± 0.31429 and ± 0.32059; ± 0.09939 and ± 0.10138 respectively (Table 6).

The mean value, standard deviation(S.D.) and standard error of mean(S.E.M.) for outer diameter in prereproductive group at ampulla of left and right side were 4.78 mm and 4.43 mm; ± 0.49844 and ± 0.49227; ± 0.15762 and ± 0.15567 respectively (Table 6).

The mean value, standard deviation(S.D.) and standard error of mean(S.E.M.) for outer diameter in Prereproductive group at infundibulum

of left and right side were 3.63 mm and 3.44 mm; ± 0.38601 and ± 0.42216; ± 0.12207 and ± 0.13350 respectively (Table 6).

The mean value, standard deviation(S.D.) and standard error of mean(S.E.M.) for outer diameter in Reproductive group at isthmus of left and right side were 6.87 mm and 6.05 mm; ± 0.85771 and ± 0.71802; ± 0.27123 and ± 0.22706 respectively (Table 7).

The mean value, standard deviation(S.D.) and standard error of mean(S.E.M.) for outer diameter in Reproductive group at ampulla of left and right side were 10.56 mm and 9.25 mm; ± 1.17941 and ± 1.02563; ± 0.37296 and ± 0.32433 respectively (Table 7).

The mean value, standard deviation(S.D.) and standard error of mean(S.E.M.) for outer diameter in Reproductive group infundibulum of left and right side were 9.39 mm and 8.24 mm; ± 1.52324 and ± 1.61820; ± 0.48169 and ± 0.51172 respectively (Table 7).

The mean value, standard deviation(S.D.) and standard error of mean(S.E.M.) for outer diameter in Postreproductive group isthmus of left and right side were 6.18 mm and 5.33 mm; ± 0.56184 and ± 0.52132; ± 0.17767 and ± 0.16486 respectively (Table 8).

The mean value, standard deviation(S.D.) and standard error of mean(S.E.M.) for outer diameter in Postreproductive group in ampulla of left and right side were 9.24 mm and 8.23 mm; ± 0.98596 and ± 0.98916; ± 0.31179 and ± 0.31280 respectively (Table 8).

The mean value, standard deviation(S.D.) and standard error of mean(S.E.M.) for outer diameter in Postreproductive group in infundibulum of left and right side were 7.69 mm and 7.02 mm; ± 0.91706 and ± 0.85056; ± 0.29000 and ± 0.26897 respectively (Table.8).

Table 1: Comparison of the length of the fallopian tube by different authors.

Sl. No.	Name of Workers	Years	Length of the fallopian tube
1	Ham and Cormack [14]	1979	12 cm
2	Sahana [8]	1985	10 cm
3	Anderson and Genadry[15]	1996	10 cm
4	Bannister et al[9]	2000	10 cm
5	Moses et al[15]	2005	10 cm
6	Cunningham et al [17]	2005	8 to 14 cm
7	Moore et al [18]	2010	10 cm
9	Present study	2015	9.29 cm

Table 2: Table showing length of fallopian tubes in "Prereproductive" group.

AGE	LENGTH OF FALLOPIAN TUBE (cm)	
	LEFT	RIGHT
5 Years	7.2	7
6 Years	7.4	7.2
7 Years	7.7	7.4
8 Years	7.7	7.5
8 Years	7.8	7.7
9 Years	8	7.8
10 Years	8.2	7.6
10 Years	8.2	8
11 Years	8.3	8.1
12 Years	8.4	8.2
Mean	7.89	7.65
S.D.	± 0.3984	± 0.3894
S.E.M.	± 0.1259	± 0.1231

Table 3: Table showing length of fallopian tubes in "Reproductive" group.

AGE	LENGTH OF FALLOPIAN TUBE (cm)	
	LEFT	RIGHT
16 Years	9.8	9.6
19 Years	10	9.8
22 Years	10.5	10.3
23 Years	10.7	10.2
25 Years	10.2	10
27 Years	11.4	11.1
32 Years	10.5	10.3
35 Years	10.7	10.5
37 Years	10.8	10.7
40 Years	10.4	10.2
Mean	10.5	10.27
S.D.	± 0.44969	± 0.43217
S.E.M.	± 0.1422	± 0.1366

Table 4: Table showing length of fallopian tubes in "Postmenopausal" group.

AGE	LENGTH OF FALLOPIAN TUBE (cm)	
	LEFT	RIGHT
51 Years	10.6	10.4
52 Years	10.2	9.8
55 Years	10.4	9.6
57 Years	9.2	9
60 Years	10.3	10
62 Years	10	9.7
62 Years	9.7	9.6
65 Years	9.5	9.1
67 Years	9.8	9.7
70 Years	9	8.8
Mean	9.87	9.57
S.D.	± 0.5271	± 0.4831
S.E.M.	± 0.1666	± 0.1527

Table 5: Table showing mean length of fallopian tubes in three age groups.

GROUPS	MEAN LENGTH OF FALLOPIAN TUBE	
	LEFT	RIGHT
Pre Reproductive	7.89	7.65
Reproductive	10.5	10.27
Post Menopausal	9.87	9.57

Table 6: Table showing outer diameter of fallopian tubes in "Prereproductive" group.

AGE	OUTER DIAMETER OF FALLOPIAN TUBE (mm)					
	ISTHMUS		AMPULLA		INFUNDIBULUM	
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT
5 Years	2.5	2.4	4.1	3.8	3	3
6 Years	2.7	2.5	4.3	4	3.2	3
7 Years	2.8	2.4	4.4	4.2	3.6	3.4
8 Years	2.8	2.7	4.6	4	3.5	3
8 Years	3.1	3	4.6	4.3	3.6	3.5
9 Years	3.2	3	4.5	4.1	3.7	3.4
10 Years	3.4	3.2	5.2	5	4.2	4.2
10 Years	3.1	3.1	5.4	5.1	4	4
11 Years	3	3	5.2	4.8	3.4	3.2
12 Years	3.5	3.2	5.5	5	4.1	3.7
Mean	3.01	2.85	4.78	4.43	3.63	3.44
S.D.	± 0.31429	± 0.32059	± 0.49844	± 0.49227	± 0.38601	± 0.42216
S.E.M.	± 0.09939	± 0.10138	± 0.15762	± 0.15567	± 0.12207	± 0.13350

Table 7: Table showing outer diameter of fallopian tubes in "Reproductive" group.

AGE	OUTER DIAMETER OF FALLOPIAN TUBE (mm)					
	ISTHMUS		AMPULLA		INFUNDIBULUM	
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT
16 Years	5	4.5	8.5	7.05	6.5	5.05
19 Years	6	5.35	9.05	8.35	7.55	6.2
22 Years	6.5	5.85	10	9	9.05	8.15
23 Years	7	6	10.5	9	9.15	7.5
25 Years	7.25	6.45	10.05	9.45	9.5	8.5
27 Years	8.05	7.15	12	10.2	11.05	9
32 Years	7.5	6.5	11	10	10	9.5
35 Years	7.35	6.25	12	10.5	11.1	10
37 Years	7.05	6.1	11.5	10	9	8.5
40 Years	7	6.35	11	9	11.05	10.05
Mean	6.87	6.05	10.56	9.255	9.395	8.245
S.D.	±0.85771	±0.71802	±1.17941	±1.02563	±1.52324	±1.61820
S.E.M.	±0.27123	±0.22706	±0.37296	±0.32433	±0.48169	±0.51172

Table 8: Table showing outer diameter of fallopian tubes in "Postmenopausal" group.

AGE	OUTER DIAMETER OF FALLOPIAN TUBE(mm)					
	ISTHMUS		AMPULLA		INFUNDIBULUM	
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT
51 Years	7	6.5	10	9.5	8.5	8
52 Years	6.55	5	9.55	8	8.5	7
55 Years	6.5	5.1	10.5	9.5	8.3	8
57 Years	6.7	6	10	9.05	8.7	7.5
60 Years	6.1	5.5	10.1	9	8.3	8.1
62 Years	5.5	5	8.5	7	7.5	6.05
62 Years	6.5	5	8.25	7.15	7	7
65 Years	6.05	5.15	9.5	8.1	7.5	6.5
67 Years	5.5	5.05	8.5	8	6.5	6
70 Years	5.4	5	7.5	7	6.1	6.05
Mean	6.18	5.33	9.24	8.23	7.69	7.02
S.D.	±0.56184	±0.52132	±0.98596	±0.98916	±0.91706	±0.85056
S.E.M.	±0.17767	±0.16486	±0.31179	±0.31280	±0.29000	±0.26897

CONCLUSION

The present work was done on human fallopian tube on three different age groups i.e. prereproductive, reproductive and postmenopausal with emphasis on its morphology. . The study showed important age related variations of the fallopian tube while the length and outer diameter of the fallopian tube increases from prereproductive to reproductive age group then it gradually decreases in postmenopausal period. In all the three groups length and outer diameter were found more on left sided fallopian than the right sided. In all the groups luminal diameter of both left and right uterine tubes was found to be narrowest at the isthmus and widest at the ampulla. Intergroups comparison of fallopian tube luminal diameter within the same segment showed that the narrowest luminal diameter was recorded in reproductive age group and widest in postmenopausal. reproductive and then it gradually decreases in postmenopausal period. various parameters of fallopian tube may help in finding different diseases like salpingitis, ectopic pregnancy, infertility though rare, still further study will be needed in this subject. Even in the period of advancement like gamete intrafallopian transfer and zygote intrafallopian transfer this natural conduit between ovary and uterus will be needed to study in terms of its morphology different periods of women's life.

Conflicts of Interests: None

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