



ORIGINAL RESEARCH PAPER

Pathology

THE FALACIOUS INTRICACIES AND TRANSMOGRIFICATION OF FALLOPIAN TUBES AFTER TRANSECTION/STERILIZATION WITH CORRELATION TO AGE AND COMORBIDITIES-A 3 YEAR STUDY IN SECONDARY CARE CENTRE IN NORTH EAST INDIA

KEY WORDS: Transected fallopian tubes, gynecological conditions, histomorphological changes

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ABSTRACT

Tubal diseases are important causes for female infertility, the aetiology and pathophysiology of many tubal diseases are confusingly understood. There are only few studies documenting histologic changes in fallopian tubes removed for all reasons. The histopathological study of spectrum of lesions encountered in fallopian tubes, had tubal pathology with inflammatory lesion forming major group followed by tubal ectopic pregnancy and rare atypia's of the lining epithelium. Tubal carcinomas were infrequent. The main aim of this study was to study about the lesions that were encountered in relation to the transected specimens correlating with the age of occurrence of the female patients. 306 cases of transected serial and longitudinal fallopian tubes either sent alone or as a part of another gynaecological specimen were assessed. Many of these patients had pregnancies following their sterilizations. The histologic findings at the previous surgical sites were compatible with what would be expected for a normal healing process. Maximum cases of tubal pathology were that of inflammatory lesions in the age group of 21-30 years. The histopathological findings of proximal luminal dilatation, plical attenuation, chronic inflammatory infiltrates, pseudo polyp formation, and the findings of plical thickness in the segment of remaining tube after an interruption type of procedure seem to be associated with the length of time from the sterilization procedure.

INTRODUCTION:

Fallopian tubes are intricate structures that present relentlessly unobserved tubal diseases. They are the platform of several interactions and conducive environment. The Fallopian tube is a common specimen in the Pathology laboratory which may be examined either alone or as salpingectomy, tubal ligation specimen or as part of hysterectomy. Fallopian tube is one of the common specimen in histopathology laboratory which may be seriously compromised or destroyed by inflammation or tubal pathology¹.

Though tubal diseases are important causes for female infertility, the etiology and pathophysiology of many tubal diseases are imperfectly understood. The literature search reveals that there are only occasional studies documenting histologic changes in fallopian tubes removed for all reasons. This prompts for the further study. The histopathological study of spectrum of lesions encountered in fallopian tubes, had tubal pathology with inflammatory lesion forming major group followed by tubal ectopic pregnancy. Primary carcinoma was a rare finding.² But recent contributions have progressively pin-pointed tubal epithelium as the potential origin of tubal, ovarian and peritoneal carcinoma.³

MATERIALS AND METHODS:

Fallopian tubes required for the study will be obtained from patients undergoing either salpingectomy alone, salpingo-oophorectomy or hysterectomy with salpingo-oophorectomy in our tertiary care hospital, and specimen received from civil hospital, private practitioners in and around Shillong which are sent for Histopathology to the Department of Pathology from January 2015 to January 2018.

The total sample size may be approximately about 306 fallopian tube specimens.

The data will be presented in terms of numbers and percentage and descriptive picto graphs and bargraphs. The resected tubes after receiving were fixed in 10% formalin. After adequate fixation over a period of 24 to 48 hours, specimen were subjected to thorough gross examination noting the size and shape. The serosa and wall were examined. The tubes were cut and contents of the lumen, thickness of the wall and the patency will be noted, cysts of

the fallopian tube and Para ovarian region will be evaluated for size thickness of the wall, and content etc. In cases of suspected ectopic pregnancy, embryo or placenta, amount of haemorrhage and rupture were noted. Mass when present was evaluated for size, appearance and invasion. Minimum of one bit was taken from each tube and will be processed routinely and 5µ thick sections obtained from paraffin blocks stained with haematoxylin and eosin will be studied microscopically. Special stains like periodic acid Schiff (PAS) was done whenever necessary.

RESULTS

The average patient age was 48.5 years (range, 18–79 years). The surgical procedures included bilateral tubal ligation(96 patients, average age 29 years) and total abdominal hysterectomy/bilateral salpingo-oophorectomy (56 patients, average age 52 years), as well as unilateral salpingo-oophorectomy and salpingectomy (38 patients, average age 43 years). Desired infertility and other gynecological benign and neoplastic lesions were the most common reasons for surgery (88 and 28 specimens, respectively). The frequencies of the various histologic findings are listed in the Table 1. Fibrosis of the tubal plicae was noticed in 35.5% of the specimens and was graded as mild, moderate, or severe(Fig1). The degree of fibrosis increased proportionately with patient age, with mild to moderate fibrosis occurring at an average age of 28 years and severe fibrosis at an average age of 42 years (P , .001). Edema dissecting between smooth muscle fibers in the wall of the fallopian tube was present in 12.5% of cases. Intramuscular edema was present in a younger population and was associated with a clinical history of recent pregnancy (P , .001). The lumen of 8.4% of fallopian tubes contained cellular elements, such as macrophages, neutrophils, and hemorrhage. Ectopic decidua was found in 3% of the specimens and could be seen in both subserosal and plical areas, and was found only in postpartum patients. Pigmentosis tubae, the presence of hemosiderin-laden macrophages within the plicae, was noted in 5.1% of cases (Fig 2). Metastatic carcinoma was noted in 1.4% of fallopian tubes. Metastatic tumor cells were found as serosal implants, intralumina tumor, or infiltrating the plicae and muscularis propria (Fig 3). An incidental adenomatoid tumor was also found in 1 specimen. Intraepithelial vacuoles were observed in 19 specimens (6.6%). These vacuoles were usually single, varied in size, and could be seen in both the apical and basal portions of the cell (Fig 4). Neither mucin nor glycogen could be demonstrated by periodic acid-Schiff or mucicarmine stains. The vacuoles were distinct from

the halos seen surrounding intraepithelial lymphocytes. Intraepithelial vacuolization was seen more frequently in older patients (P .001). Epithelial metaplasia was seen in 4.2% of specimens. Eleven cases exhibited pink-cell (eosinophilic, oncocyctic) metaplasia characterized by a glassy eosinophilic color and loss of cytoplasmic borders. The usual mixture of ciliated, secretory, and intercalated cells was lost in the metaplastic areas. One case showed mucinous metaplasia resembling endocervical epithelium (Fig 5). A mucicarmine stain confirmed the presence of mucin. Cytologic atypia of the epithelial cells was noted in 7.3% of cases. The nuclei were enlarged, at least twice the size of normal adjacent cell nuclei, and had prominent nucleoli. Epithelial tufting or stratification was observed in 3.5% of cases (Figs 6 and 7). These areas had crowding of the nuclei, loss of nuclear polarity, and papillary tufts of epithelial cells protruding into the lumen. Cytologic atypia and epithelial tufting were associated with each other (P .001), and together were more common in an older population. None of the specimens exhibited mitotic activity greater than 1 per 10 high-power fields. Beyond the ubiquitous intraepithelial lymphocytes, inflammatory infiltrates were not uncommon in our specimens. Inflammatory infiltrates were only included if they were composed of clusters of inflammatory cells occurring in significant numbers. Marginated neutrophils around vessels were specifically excluded; they were thought to be procedure- or pregnancy-related findings. Infiltration of neutrophils (acute salpingitis) in the epithelium was seen in 10.5% of specimens and was associated with a younger age (P, .02). A plasmacytic infiltrate was documented in 19.9% of specimens. Lymphoid follicles were observed within plicae in 2.1% of specimens. Neither plasma cell infiltrates nor lymphoid follicles were associated with fibrosis or age. In addition, 69% of specimens demonstrated a minimum of 1 intramuscular mast cell per high-power field. Simple mesothelial inclusion cysts were observed in 7.7% of specimens. Walthard nests, the solid or cystic proliferations of transitional epithelium, were found in the subserosal tissue of 5.2% of specimens. Wolffian duct remnants were noted in 4.5% of specimens, characterized by clusters of tubules lined by cuboidal to low columnar cells and surrounded by smooth muscle. The presence of Wolffian duct remnants was more common in an older population (P, .001). Endosalpingiosis, glands lined by tubal type epithelium, was demonstrated in the mesosalpinx of 2.4% of examined fallopian tubes.

Table 1: Distribution of cases according to clinical Diagnosis and age

Age	Ectopic preg	Tubo ovarian mass	Tb / hepatitis / HTN/ Pregnancy related disorders	Dub/fibr/oids/prolapse	Chronic cervicitis	Salpingitis
21-25	1	-	06		-	34
26-30	4	-	23		-	29
31-35	2	3	25	13	11	26
35-40	-	5	14	15	36	18
>40	-	8	05	10	17	01
Total	7	16	73	38	64	108

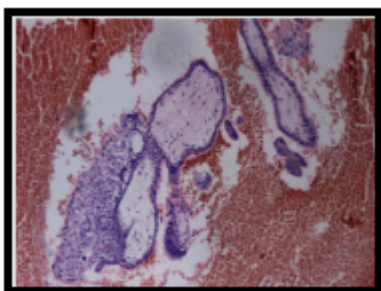


Fig 1-ECTOPIC-CHORIONIC VILLI IN FT

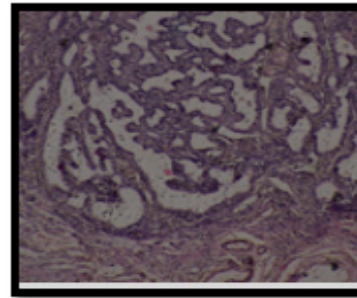


Fig2-SALPHINGITIS

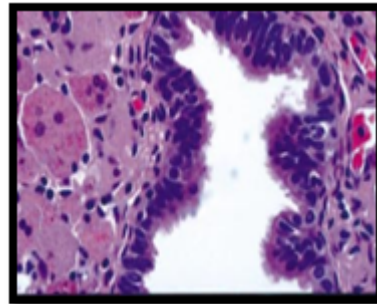


Fig3-Hemosiderin laden macrophages in tube

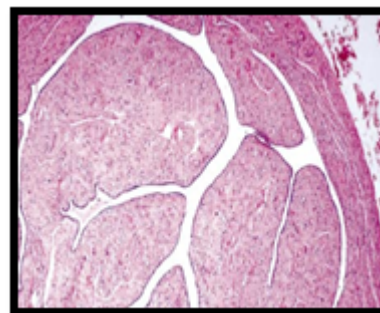


Fig4-Fibrosis with distortion of plicae

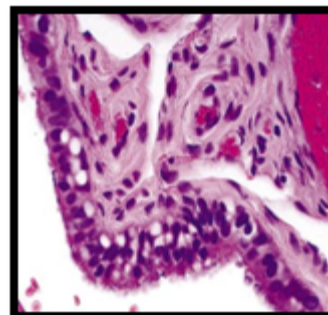


Fig 5-Fallopian tube epithelium-vacuoles

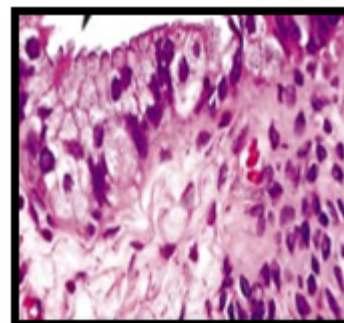


Fig 6-Mucinous metaplasia

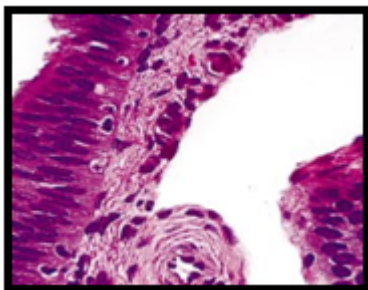


Fig7-Epithelial tufting

Table 2-Distribution of Tubal morphology with age and tubal lesions:

Morphological changes	21-25	26-30	31-35	35-40	>40	Total
Normal	8	5	4	2	1	20
Stromal Alteration						
Hyalinisation/ Fibrosis (mild to moderate/severe)	1	1	2	7	27	38
Intramuscular edema	1	1	7	2	2	13
Cellular luminal contents	2	1	2	3	5	13
Inclusion cysts	-	1	1	2	7	13
Walthard nests	-	-	1	2	2	5
Pigmentosis tubae	-	-	-	2	3	5
Wolffian duct remnants	-	-	-	2	3	4
Decidualized stroma	-	1	1	1	-	3
Epithelial characteristics						
Atypia	-	-	-	1	2	3
Vacuolization	-	-	-	2	4	6
Metaplasia	-	1	1	3	3	8
Epithelial tufting/stratification	-	--	-	1	2	3
Plasma cells/mast cells	4	6	8	6	15	39
Neutrophils	10	4	4	1	-	19
Lymphoid follicles	1	-	3	3	2	9
Salpingitis acute/chronic	10	07	1	1	-	39
Suture granulomas	-	3	1	1	-	5
Hydrosalpinx	-	1	1	1	2	5
Decidual reactions	-	2	1	1	-	4
Walthard cell rests	-	-	1	1	2	4
Ectopic pregnancy	-	1	1	-	-	2
Endometriosis	-	1	1	-	-	02
Benign epithelial proliferation	-	-	-	-	1	01
Tumors /atypical changes	-	-	-	-	1	01
Tubal cysts	-	-	1	1	1	13
Total						306

DISCUSSION

Study of fallopian tubes opens doors to much yielding facts. Several histologic findings in the fallopian tube are associated with age. As clinically expected, metastatic carcinoma was found in an older population and acute salpingitis in a younger population. Previous studies have 4-7proposed that fibrosis increases with age, a finding that was supported by our results. In addition, we found

that optically clear intraepithelial vacuolization increased with age. These vacuoles do not stain with periodic acid-Schiff or mucicarmine stains, and are likely to be degenerative cytoplasmic changes. Endosalpingiosis is the ectopic placement of glands lined by tubal epithelium. In the mesosalpinx, some authors 8-12 have proposed that chronic damage to the fallopian tube is the etiology of endosalpingiosis. Another study 9,10, however, indicates that endosalpingiosis is a form of endometriosis with metaplastic epithelium. Pigmentosis tubae, or the presence of hemosiderin-laden macrophages within the plical stroma, has also been implicated as a sign of chronic tissue damage, such as in patients with internal and external radiation to the pelvis 11-14. In our study, neither endosalpingiosis nor pigmentosis tubae correlated with a clinical history of radiation or chemotherapy, or with histologic findings of fibrosis or plasma cell infiltrates. In fact, the frequency of pigmentosis tubae was higher in operations performed for sterilization, chronic pain, and benign masses (P, .02). Several unusual histologic features occurred with a high frequency in the fallopian tube. We found that intramuscular edema is associated with the clinical postpartum period (P, .001). In addition, approximately 20% of all cases had 4 or more intramuscular mast cells per high-power field. We did not find any statistically significant association between the mast cells and age or clinical history,

unlike mast cells in the myometrium, endometrium, and cervix, which decrease with age. Epithelial atypia and stratification, along with mitotic activity, have been analyzed by several studies of the fallopian tube. In a study by Stern et al 5, 39 patients with atypical epithelial proliferations were monitored. A retrospective study of female genital tuberculosis revealed significant number of cases involving fallopian tubes. Hence tuberculosis is still an important cause for infertility 5 In the fallopian tubes of 10 of these patients, high mitotic activity, stratification between 3 and 5 cells thick, and moderate to severe atypia were identified. There was no evidence, however, of progression of any lesion to invasive carcinoma, and the histologic findings were associated with either exogenous or endogenous estrogen correlating to other studies 15,16,17.

Two additional studies found that epithelial hyperplasia, atypia, and stratification, or so-called proliferative lesions, were associated with salpingitis. 18,19

A morphologic analysis of the tubal epithelium at different times in the menstrual cycle demonstrated cytologic enlargement and prominent mitotic activity during the proliferative phase of the menstrual cycle. 20 Proliferative lesions of all degrees of severity were almost ubiquitous in one large series, but those that were moderate to severe were rarely found in fallopian tubes removed during sterilization procedures.

Epithelial cytologic atypia and tufting occurred with frequencies of 7.3% and 3.5%, respectively, in our study. These histologic findings did increase in frequency with age; however, there were no fallopian tube malignancies in the group of specimens that we studied. No significant increase in mitotic activity (.1 per 10 high-power fields)

was noted in any of our studied cases. Metaplasia of the tubal epithelium has been described 21,22 as occurring infrequently. In the current study, tubal epithelial metaplasia occurred in 4.2% of the specimens examined and included both pink-cell metaplasia and mucinous metaplasia. Decidual reaction in the plical stroma was observed in 10% of the postpartum tubal ligation specimens in our series, which is similar to the 12% reported by Tilden and Winstedt. 10, 11, 23 Single intraepithelial T lymphocytes have been shown to be normal residents of the tubal epithelium, histologically appearing as "clear" cells. In one study based on immunolabeling and electron microscopy, a form of mucosa-associated lymphoid tissue (MALT) was proposed. The small sample of 12 cases in that study did not demonstrate

intraepithelial lymphoid follicles. Our findings demonstrated lymphoid follicles with the plical tips in 2.1% of specimens, which

may provide additional support for the exis Wolffian duct remnants, Walthard nests, and peritubal cysts have all been described histologically as nonciliated epithelial elements in tissues surrounding the fallopian tube. The frequency of each of these findings was approximately equal. Wolffian duct remnants were found more often in an older age group, but this age relationship is confounded by sampling differences due to the more extensive operations performed in the older population. Previous studies of the histology 22,23of the surgically removedfallopian tube have sporadically described some of the histologic features presented in our data. There has been, however, a lack of data to describe the frequency of their occurrence in a general surgical pathology practice,

and few attempts have been made to statistically correlatethe histologic changes with age or with each other. Recent contributions have progressively pin pointed tubal epithelium as the potential origin of tubal, ovarian and peritoneal carcinomas not only in the BRCA mutation setting but also in sporadic adnexal epithelial tumors, which has heightened the suspicious index 3,13,23

CONCLUSION

This study describes the various metaplastic, reactive, and developmental changes seen in fallopian tubes and reports correlations between the findings, patient age, and clinical history. This study provides data that may be valuable for surgical pathologists.

The fallopian tube may be unique location where early ovarian cancers can be found, prophylactic removal of tubes during hysterectomy or sterilization would rule out subsequent tubal pathology such as hydrosalpinx. The histologic notations of proximal luminal dilatation, plical attenuation, chronic inflammatory infiltrates with pseudopolyp formation, and thefindings of plical thickening in the distal segment of remaining tube after an interruption type procedure seem to be associated with the length of time from the sterilization procedure. The routine histopathological study of all fallopian tube specimens is necessary because of possible effect on fertility,Morbidity and timely management.

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