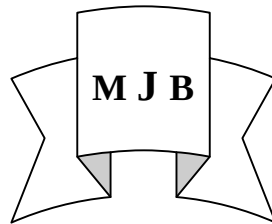


Morphological Changes of Proximal Segment of Fallopian Tube after Injury

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Abstract

The type of regeneration of the fallopian tube was different in various oviduct segments with regards to their response to tissue injury i.e. the proximal segment (isthmus) regenerated by activation of epithelium which invade the submucosa or muscularis layer leading to the formation of fistula. This type of regeneration of tubal epithelium affect the prognosis of tubal surgery on both proximal and distal segment and its relation to ectopic pregnancy after tubal injury.

الخلاصة

ان الاختلاف في انبوب فالوب يختلف حسب قطع الانبوب وذلك حسب استجابتها للاصابة. ففي الجزء الداني (القريب) يتم الاختلاف بزيادة فعالية الخلايا الطلائية وغزوها حتى لمناطق الطبقات العضلية في جدار الانبوب. ان نوع الالتئام يؤثر على نتائج الجراحة الانبوبية في كل من الجزء القريب والجزء البعيد للانبوب وعلاقة هذا الالتئام بحصول الحمل الانبوبي بعد الاصابات.

Introduction

The uterine tube (fallopian) tube lies in the free edge of the broad ligament and convey ova from the ovaries to uterus [1].

They are described as having four parts:

- 1- The uterine part.
- 2- The isthmus – this long and narrow leading to ampulla.
- 3- The ampulla – this is wide dilated tortuous part at the outer end where fertilization of ova usually occurs.
- 4- The infundibulum.

These four parts differs histologically, particularly in their proportions of

muscle and epithelium, and the degree of the convolution of their epithelium.

Histologically, the smooth muscle wall of uterine tube is composed of inner layer appear to be circular and outer layer appear to be longitudinal [2, 8].

There are two types of epithelial cell lining, the uterine tube, ciliated cells (cc) and secretory cells (sc), there are two other type of cells, the peg cell and reserve basal cell [9]. (Fig. 12).

The present study was undertaken to study the regeneration, healing of proximal segment of fallopian tube after different type of trauma and

response of proximal segment to injury after one moth.

Material and Method

- ◆ 20 sexually mature female rabbit were included in this study. They were age between 4-8 months and weighting between 1000-2000 gram, they are in different stage of oestrus cycle, stages of cycle can be shown by doing vaginal smear for each rabbit and stain by papanicolous method [3].
- ◆ Also include in this study 5 human fallopian tubes obtained from obstetric and gynecology unit at the medical center.
- ◆ Each of these animals subjected to different type of trauma, especially the crush injury performed by applying standard pressure using artery forceps for 1 minute.
- ◆ The right oviduct was subjected to crushing injury, while the left oviduct in same animal was serve as control.
- ◆ Then the midline incision was closed, in layer with cutcut, and silk.
- ◆ Then relaprotomy was performed on these animal after one month. oviduct on right side was resected and 1 to 2 cm section of oviduct including crushing site was removed and immediately fixed in 10% formalin for light microscope and in 1% glutaraldehyde for electron microscope.
- ◆ The normal left oviduct, and human oviduct (for control) was also resected and treated in same manner as right oviduct.

Results

After one month of injury

After one month, gross pathology of injured tube was almost always normal. i.e. there was no anatomical disturbances such as distortion, adhesion

formation, and no evidence of infection was shown at site of injury.

Histologically

By light microscope

- ◆ Muscosal fold pattern was normal at site of injury (Fig. 1, 2).
- ◆ The cells were regularly arranged, no different in size of cells, shape of cells were columnar at site of injury.
- ◆ There were well differentiated ciliated and non-ciliated cells.
- ◆ There were several mucosal folds reunite during healing process without pocketing of tubal mucosa into muscularis layer of oviduct (Fig. 3, 4). These gland like space lined with single layer of columnar cells (Fig. 4, 5, 6).

By electron microscope

- ◆ The epithelial cells which covered mucosal fold were columnar ciliated and secretory cells (Fig. 7, 8).
- ◆ The apical border of ciliated cells contain large of ciliary based bodies with normal arrangement of cilia.
- ◆ The apical border of secretory cells have several microvilli and definite secretory granules (Fig. 9, 10, 11).
- ◆ Both ciliated and secretory cells contain numerous mitochondria, rough endoplasmic reticulum and numerous vacuoles, no definite secretory granules (Fig. 10).
- ◆ Invasion of epithelial like cells which are more differentiated cells i.e. ciliated and secretory cells to the muscularis layer.
- ◆ The basement membrane was intact (Fig. 11).

Discussion

- ◆ The process of regeneration is very important not only biological and histological point of view but also of clinical and practical importance and because this process has not been sufficiently studied, this work was

undertaken in the hope that it would be enable us to establish a baseline for future studies on healing process of fallopian tube after injury and study the factors which affect this process and type of medication that could influence epithelial regeneration.

- ◆ In case after 1 month of injury, the mucosal folds at site of injury were normal (Fig. 10, 11). These folds were covered by normal columnar ciliated and secretory cells (Fig. 10, 11). There were no change in population of ciliated and non-ciliated cells at the site of injury (Fig. 3, 4).
- ◆ In proximal segment, there was a tendency of several mucosal folds to reunite during healing process with minimal disruption of normal morphology of tubal epithelium (Fig. 4, 5).
- ◆ An interesting evidence of regenerative process of proximal segment was the appearance of out pocketing of tubal mucosa into myosal pinx, there gland like space lined with layer of columnar cells with well differentiated cells i.e. ciliated and secretory cell (Fig. 3, 4, 5).
- ◆ The appearance of basement membrane was normal, tight junction (desmosomes) between cells are intact and unimpaired (Fig. 11).
- ◆ In proximal segment, the intraluminal fibria or clot has disappeared, this suggest that oviduct has a high fibrinolytic activity (Fig. 1, 2).

These findings does not support Castall, & Wainer (1953), Mackey & Khoo (1972), who claimed that regenerative process of tubal epithelium was slow and recovery of this tubal epithelium apparent at 10-16 weeks after surgical trauma to the tube.

While these observation were similar to observation of other investigators like Sernal, et.al., (1984), and Patton & Halbert (1979) by using both light and electron microscope.

Conclusions

- 1- The oviduct has rapid regeneration or healing after injury.
- 2- There is different in response of proximal segment from distal segment after injury.
- 3- The proximal segment responds to injury by activation or invasion of tubal epithelium to submucosa or muscularis layer, leading sometimes to formation of fistula.

Recommendations

Regarding rapid healing process of proximal segment of fallopian tube we must:

- 1- Encourage the fertility surgeon to do reconstructive surgery even under the most adverse circumstances.
- 2- Avoid injury to proximal segment to prevent activation of tubal epithelium to the tubal wall.
- 3- Consider the proximal segment is the best site for sterilization and reanastomosis in future.

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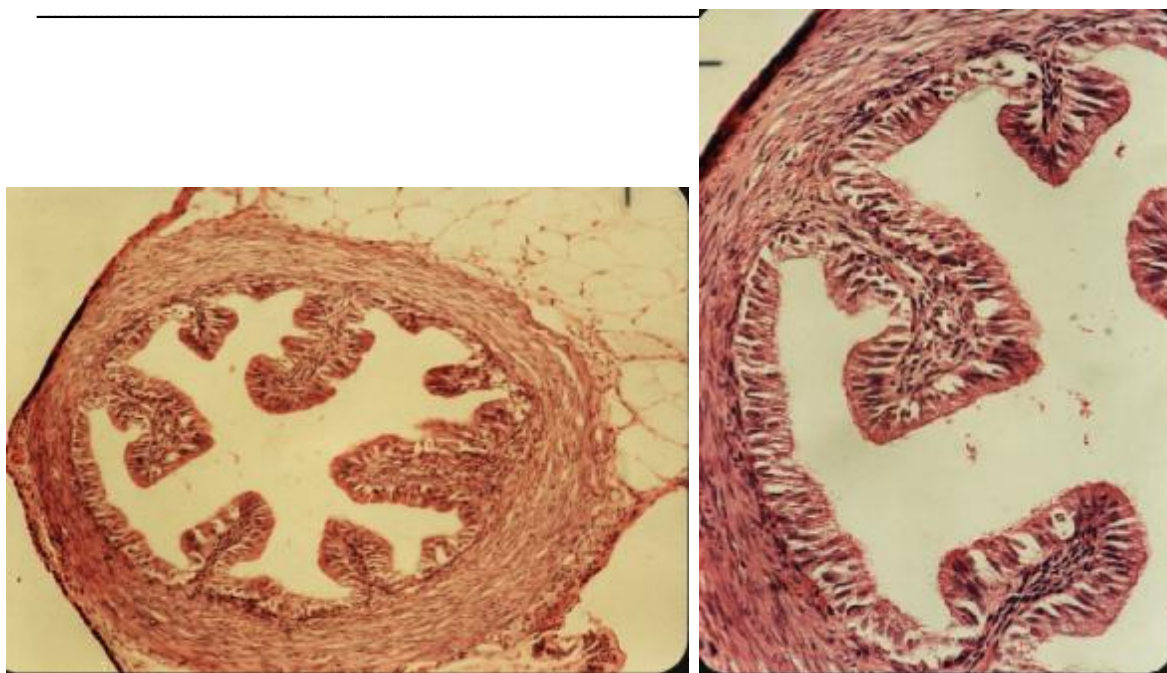


Fig. 1, 2 Cross-section of normal proximal oviduct showing the normal mucosal fold pattern and normal arrangement of ciliated and non-ciliated cells in mucosal fold, thickness of muscularis layer in proximal segment. (paraffin section stained with hematoxylin-eosin X160, X400 respectively).

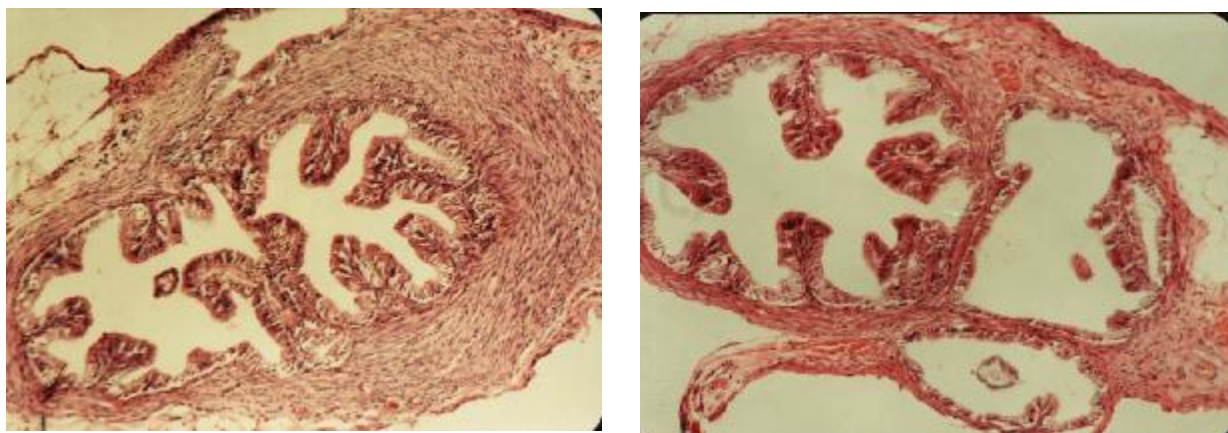


Fig. 3, 4 Cross-section at site of injury in rabbit oviduct (proximal segment) after 1 month of injury showing normal mucosal pattern at site of injury, with tendency of several mucosal folds to reunite during healing process without pocketing of tubal mucosa into myosalpinx. (paraffin section stained with hematoxylin-eosin X160, X160 respectively).

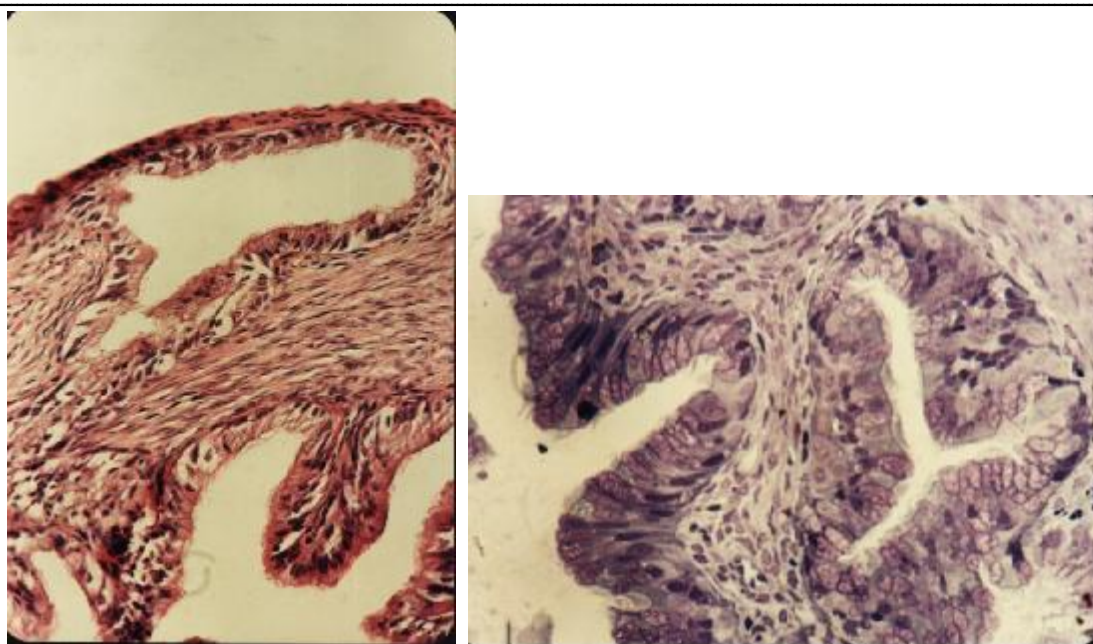


Fig. 5, 6 Site on injury in proximal rabbit oviduct after 1 month of injury showing the well-differentiation of ciliated and non-ciliated cells. The gland like space which invades the myosal pinix lined with layer of columnar cells can be seen at submucosa, muscularis and seaso layers.

(paraffin section stained with hematoxylin-eosin with semi thin section of araldite embedded stained with toluidin blue X630, X630 respectively).

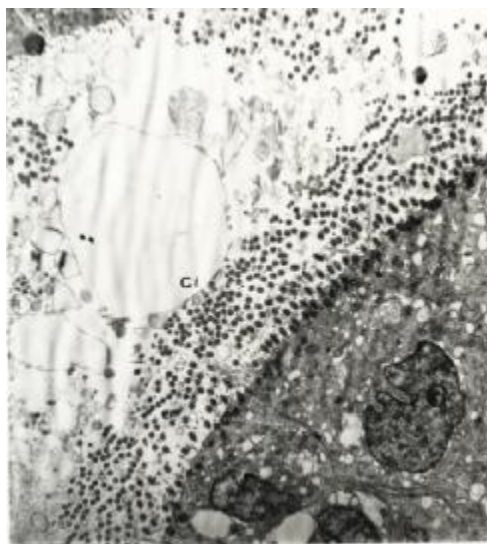


Fig. 7 Transmission electron micrograph of rabbit oviduct (proximal segment) showing normal arrangement of epithelial cells (ciliated cells) with both longitudinal and cross section of cilia (ci)
(Magnification X3400)



Fig. 8 Transmission electron micrograph of rabbit oviduct (proximal segment) after 1 month showing columnar shape of epithelial cells that covered the site of injury, these cells are well differentiated cells i.e. ciliated and secretory cells.

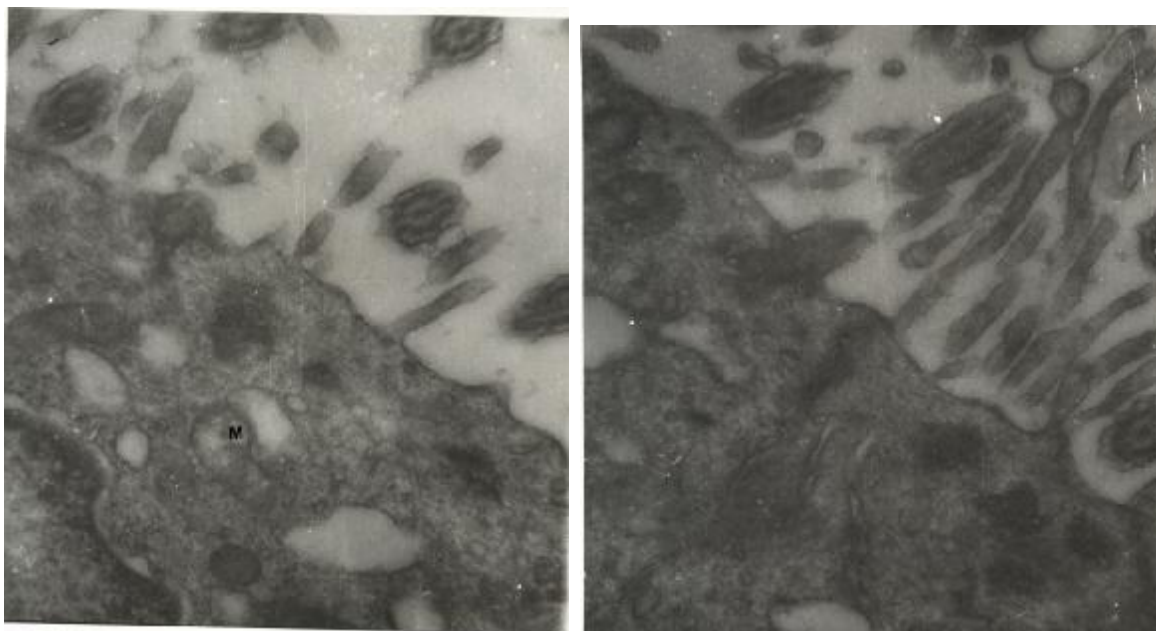


Fig. 9, 10 Transmission electron micrograph of rabbit oviduct (proximal segment) after 1 month of injury showing apical border of both ciliated and secretory cells, containing numerous mitochondria and endoplasmic reticulum, with normal arrangement of microtubules (Cilia). The light junction between the epithelial cells are intact and unimpaired.
(Magnification X18000).



Fig. 11 Transmission electron micrograph of rabbit oviduct (proximal segment) after 1 month of injury showing that the appearance of basement membrane was intact. (Magnification X6000)

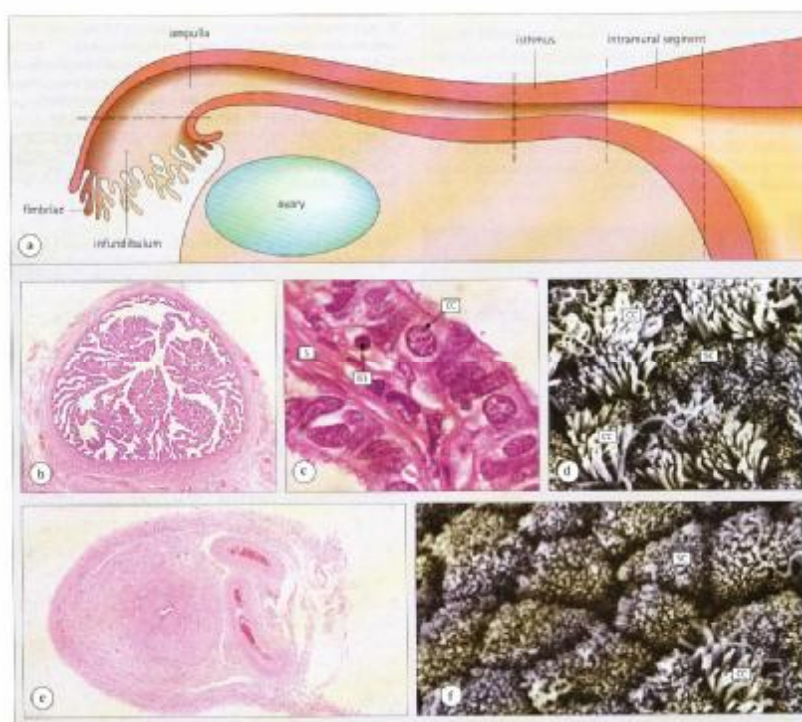


Fig. 12