



## Reproductive and Postmenopausal Histological Changes of Human Endometrial Cells: Electron Microscopic Study

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### ABSTRACT

**Background:** The ability of women to reproduce is well known to decline with age. Advanced maternal age is related to reduce fertility and adverse pregnancy outcomes. There is evident decline in human fertility with age due to several histological changes occur with progressive age.

**Objective:** The research was intended to know that some cellular modifications happen during the reproductive and post-menopause phases in human endometrial cells.

**Materials and methods:** 30 womb samples each from reproductive and postmenopausal women were collected from unembalmed human cadavers. Before being taken to electron microscopy, samples were resolved in glutaraldehyde solution and osmium tetroxide as fixative. Small sizes of endometrial specimens were drawn into a unique fixative (i.e., 5% glutaraldehyde in a buffer of 0.1M phosphate (PH 7.4), then washed three times in a buffer solution. The moved to prepare thin sections for electron microscopy. Samples were integrated at 60c° for two days in Arledit – Rezen capsule. Thin parts for E.M. were then ready study Ultra-structural cell of endometrium

**Results:** Many differences were clear and evident when comparison was made between reproductive and postmenopause stages of endometrial cell ultrastructurally. The structural changes involved shape, density, cell organelles aggregation in general, and were assigned to age, as well as degeneration, deposition, and irregularity.

**Conclusion:** Present work results indicated that, increase the amount of cell organelles in uterine cells of young women, while the old ages characterize by less number of organelles and degenerated.

### INTRODUCTION

It is well known, the capacity of female mammals reproduction changes with age (Adams,1970;Miller *et al.*, 1997;Edwards. Etal,1991;Stovall *et al.*, 1991). The reasons beyond these changes are varied(Jones,et.al,2010;Laplot, et.al1990;Day et.al1991). Age increasing is associated with many and large spectral changes including, histological, hormonal, physiological and pathological (Bergman. *et a.l*,1991;Stoval *et.al.*,1991;Mulholland *et.a.l*,1992;Gray *et.al.*,2001;Burton et.al,2002,2007;Hempstock et.al2004;Wang et.al2005;Wooding and Burton *et al.*, 2008;Baily *et al.*, 2010; Bevilacqua et.al 2010;Jones et al 2010). This work try to compare some of the ultrastructural changes occur at reproductive and postmenopausal women endometrial cells.

## MATERIALS AND METHODS

This study was carried out during the period from January 2018 to June 2019. Samples from reproductive and postmenopausal women endometrium were collected, fixed in glutaraldehyde solution with Osmium tetroxide prior to be taken to the electron microscope (E.M) department. Small size samples(2mm) were taken from the study groups and kept in special fixative (5% glutaraldehyde in 0.1μ phosphate buffer(PH 7.4) for about four hours. Then it was washed three times by buffer phosphate solution, one hour for each change. Then was fixed in osmium tetroxide for one and half hour and washed twice with D.W for five minutes. Samples were then dehydrated in ascending concentrations of alcohol and at the 100% alcohol was washed twice for 15 minutes. Then placed twice in 100% Acetone. The samples were then placed in a mixture of equal volume of Arldit and acetone and placed in a shaker for one and half hour. Finally, samples were taken and embedded in plastic capsules of Arldit-Rezen in an oven at 60°C for two days. The rezen capsules were sectioned and dyed and was then ready for E.M study.

## RESULTS

### Reproductive Age:

For the exchange of materials between the cytoplasm and nucleus, various nucleus shapes and sizes surrounded by a nuclear envelope with clear nuclear pores were evident. The nucleus that contains profound staining chromatin organized under the nuclear membrane or lined it. It was situated on the nuclear envelope with both profound staining heterochromatin and the light staining euchromatin occupies the other components. Also in the

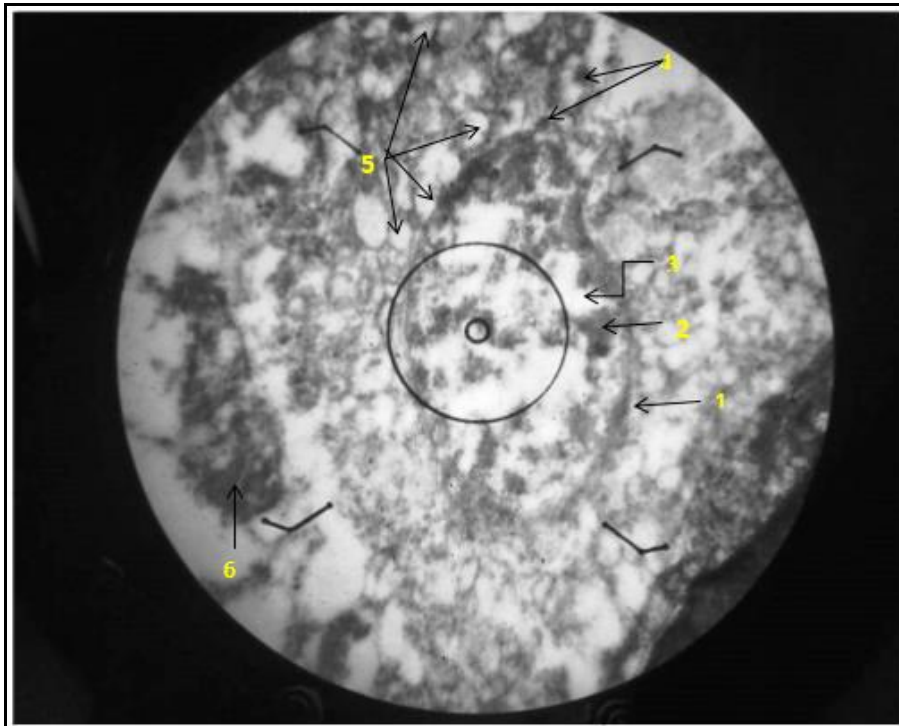
kernel, a dens-staining nucleolus was shown. There were also clear stacks of granular rough endoplasmic reticulum (RER) cristae and so many free-ribosomes. There are evident prominent Golgi tubes pointing to cell activity. There is also a clear view of intermediate thread bundles and collagen fibers.

In the cytoplasm, mitochondria of different sizes and shapes are distributed between the rough endoplasmic reticulum (RER), including round and elongated. The mitochondrial membranes as well as the mitochondrial cristae (shelf-like), indicating normal protein-synthesis cells, were evident. In addition to light-faded vesicles or vacuoles, some dense-fading round structures have also been demonstrated (Fig 1).

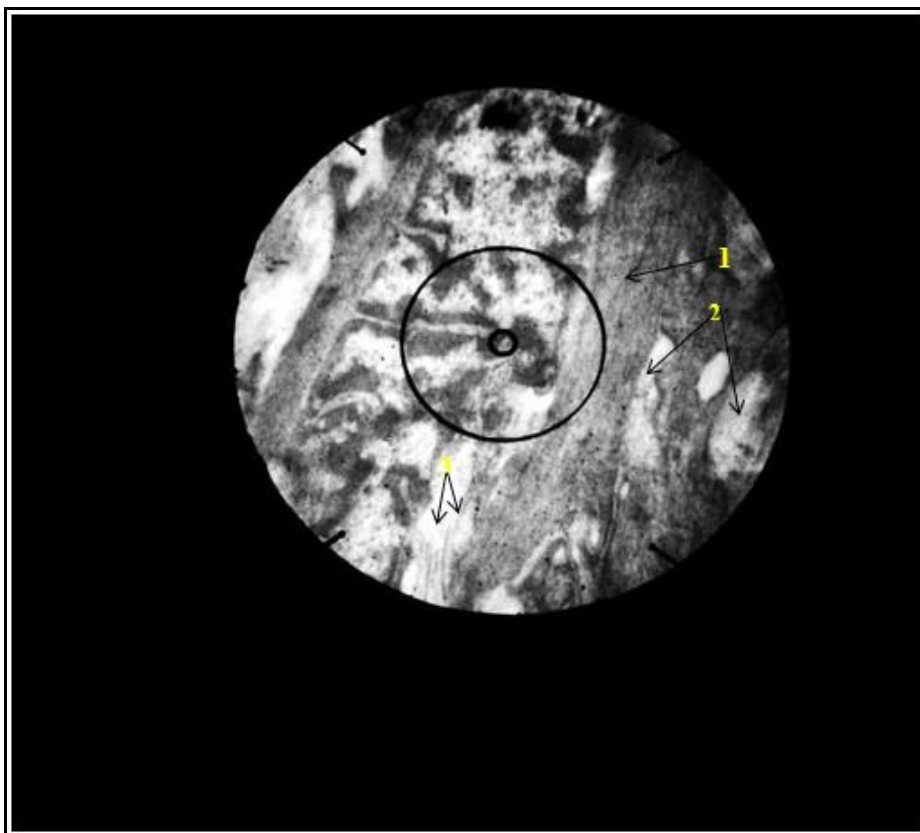
### Postmenopausal Age Stage:

Postmenopausal uterine cells of women defined by more collagen fibers and a significant increase in fibrils. With increasing age, the thickening of fibers has been pronounced. In the postmenopausal phase, atrophies of the framework are pronounced due to the decrease in ovarian steroid hormone secretion.. The cytoplasm shows a bundle of fine filaments and debris as well as numerous lysosomes. Shrinkage and loss of organelles are clear. There is a clear free zone or area of organelles. Golgi bodies and mitochondria are almost not seen or disappeared. There are also some spots with dense irregular shaped of deep stain. In addition to aggregation of lipid droplets are clear (Fig-2).

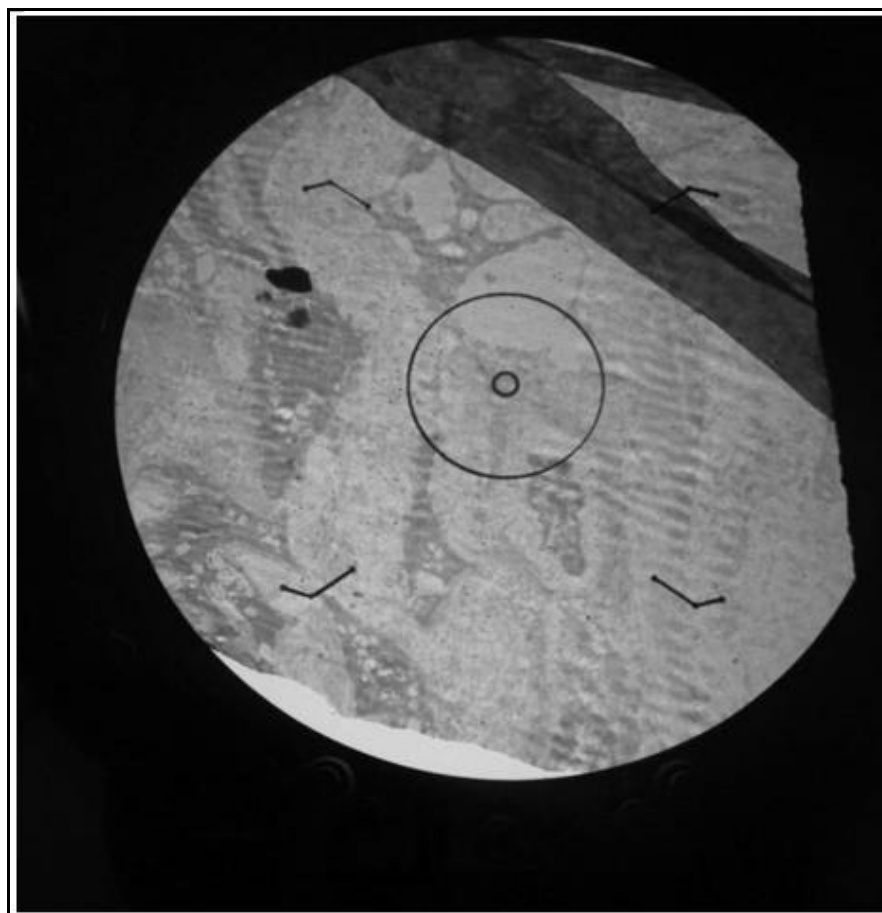
Figure 3 Illustrates apoptotic and karyolytic endometrial cells, mitochondrial degeneration, vacuole cytoplasm.



**Fig.1:**Electron micrograph of reproductive uterine endometrium shows ultrastructure of nucleus, nuclear envelope (1), Heterochromatin (2); Euchromatin (3), Nucleolus (small o); Dense secretory granules (4); tubules of rough endoplasmic reticulum (5); Mitochondria (6). (31000x).



**Fig.2:** Electron micrograph of uterine endometrium shows the degenerative cell structure devoid of organelles with bundles of filaments (arrows 1); anchoring fibrils (2); vacuoles (3); abnormal structure (large circle O). (24500).



**Fig-3.** Electron micrograph of postmenopausal uterine endometrium clarify the degenerative cell structures.( 6200 x).

### DISCUSSION

#### Reproductive Stages:

Okada *et al.* (1994) indicated that, owing to the activity of Golgi bodies and mitochondria, activity synthesis and secretion of the uterine glands are highly transported into cell activity. Secretions of the uterine glands are very necessary in the cell activity leading to the operation of Golgi bodies and mitochondria. Cell viability has a good vital role in the secretion of the uterine glands. physiological activities of the uterine gland is an important factor in the young age.

The excretion expulsion of the uterine gland at a young age is helped by the involvement of smooth muscle, which supplies the young age fetus with plenty and adequate nutrition. (Burton *et al.*, 2002).

#### Postmenopausal Stage:

Stromal cells contained deposits of ingested substances was recorded by (Burton *et al.*, 2002) in an old age rats as well as small lysosomes were obvious. He also recorded that, the amount of fibrils increased with age. Increased in amount was also recorded in earlier works of (Wang *et al.*, 2005 and Jones *et al.*, 2010 ). In aged rats, the rough endoplasmic reticulum was fragmented and evident, Golgi apparatus was not apparent, and droplets of secretory and tiny lysosomes were present, as well as fibrils bundle aggregation (Wang *et al.*, 2005 ), rarely seen in young animals. (Mulholland *et al.*, 1992)

Other scientists indicated modifications in essential glycoprotein and its interaction with other specific substances (Aplin *et al.*, 2001)(Deloia *et al.*, 1998). Hormone replacement at

menopause has a good effect on the cellular endometrial structures and functions (Daayana & Holland, 2009), and Roberts & Bazer has reported the importance of uterine secretion function (Roberts & Bazer, 1988). (Wang *et al.*, 2005) focused on that, increase cell organelles and playing a part in the function of cell secretion

**Conclusion:**

From the results of the current study, it can be concluded that the great amount of cell organelles is characteristic of uterine cells of the reproductive period. The cell contains abundant rough endoplasmic retinaculum and abundant heterochromatin and euchromatin nucleus. Mitochondria and Golgi bodies were characteristic of young age, while old age has degenerated and fewer mitochondria and cytoplasm vacuolated.

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