

HISTOLOGICAL STUDY OF THE AGE-RELATED CHANGES OF THE CERVIX

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ABSTRACT

BACKGROUND

The uterine cervix is one of the common site of pathology in female worldwide and especially in the developing countries. The study was undertaken in Gauhati Medical College with the view to see the age-related changes in the histological structure of the cervix.

METHODS

The specimens were divided into three groups, viz. pre-reproductive, reproductive and postmenopausal. Twenty specimens were collected of each group. The results were statistically analysed and 't' test were employed to find out the significant difference between the mean values.

RESULT

Histological structure of the cervix of each group viz. pre-reproductive, reproductive and postmenopausal was observed. The wall of the cervix contains three layers, namely inner mucosal, middle muscular and outer serosal layers. The mucosal thickness was measured and statistically analysed.

CONCLUSION

A study was done to find the histological structure of each group viz. pre-reproductive, reproductive and postmenopausal as the cervix is a common site of malignancy and other pathologies. The study was done with the view to help in the diagnosis and treatment of diseases of the cervix.

KEYWORDS

Cervix, Age-Related Changes.

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INTRODUCTION: The cervix is the terminal end of the uterus. It is divided into two parts by the vagina, viz. supravaginal and vaginal part. The cervical canal opens into the exterior. As the cervix protrudes into the vagina, it is vulnerable to infection and trauma; hence, it is a common site of pathology. The wall of the cervix consists of three layers viz. inner mucosal, middle muscular and outer serosa. The mucosa in the upper part is composed of columnar epithelium with tubular glands overlying a fibrocellular connective tissue stroma. In the lower part of the canal, the mucosa is non-keratinised stratified squamous epithelium. The intermediate layer is composed mainly of dense collagenous and elastic fibres among which fibroblast and variable number of smooth muscle cells is distributed. The outer layer of the cervix is composed of peritoneum (mesothelium overlying a connective tissue lamina propria). The histological study of cervix was conducted with the view to aid clinicians deal

with patients who are at risk of cervical malignancy, which is predominant among the women worldwide.

MATERIALS AND METHODS: The study of the human cervix was conducted in the Department of Anatomy, Gauhati Medical College. The cervixes were grouped into three according to the age namely, Pre-reproductive (newborn to 13 yrs.), Reproductive (14 yrs. to 49 yrs.) and Post-menopausal (50 yrs. and above). The results were statistically analysed and 't' test were employed to find out the significant difference between the mean value. The cervixes were collected from the autopsies done in the Forensic Medicine Department, Gauhati Medical College.

Specimens were collected from the cadavers following all legal formalities when autopsies were done within stipulated time limit. Care was taken to collect the non-pathological specimen. Rape and poisoning cases were excluded. Specimen were also dissected out from fresh full-term intrauterine dead and neonatal dead babies collected from the Obstetrics and Gynaecology Department, Gauhati Medical College following all legal formalities. The collected specimens were grouped after noting the age and the history (menstrual and parity) of the cadaver. The cervix was dissected out from the rest of the uterus. From the different dissected specimen, approximately 3-5 cu mm. pieces were made and fixed in 10% formalin and was labelled carefully. The tissues were kept in 10% formalin for 24-48 hours. The fixed tissues were then processed for

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embedding in paraffin and sectioned at 5 micrometer thickness in a 'rotary microtome' and the sections were stained by routine H and E according to the standard method.

The sections of the tissue were than studied under both low power and high power objective and different layers of the wall of the uterine cervix was observed. The mucosal thickness was measured with the 'spencer ocular' lens and objective micrometre scale.

OBSERVATIONS AND RESULTS: The wall of the cervix has three layers namely, mucosal layer, muscular layer and serosal layer. The mucosal layer of the cervix is thrown into folds similar to the branches of a tree. The mucosal layer can be divided into two parts, the epithelial lining and the stroma. The epithelial lining in the upper part is seen to be simple columnar epithelium. The columnar cells are tall in the reproductive group with light-stained cytoplasm and basally-placed nuclei. In the lower part of the canal, the epithelium is stratified squamous epithelium of non-keratinised variety. The squamocolumnar junction is abrupt in most of the tissue and is found to be higher in the postmenopausal. In the upper part of the canal, there are patchy areas of cilia, which are maximum in the reproductive age group. The stroma contains cervical glands, which open into the luminal surface of the epithelium. The proportion of glands is more in the reproductive group (Fig. 8) and in the newborn (Fig. 6) of the pre-reproductive age group. The number of glands decreases in the postmenopausal group (Fig. 10 and Fig. 11). The cervical glands are lined by simple columnar epithelium without cilia. The stroma contains blood vessels and fibromuscular tissue. The average mucosal thickness are 1.915 mm, 3.053 mm, 1.909 mm in the pre-reproductive, reproductive and postmenopausal group, respectively. Intergroup variation of the mucosal thickness has been shown with the help of a bar diagram (Fig. 2.1).

The muscle layer contains smooth muscle cells along with dense connective tissue containing both collagen and elastic fibres. It has been noticed that the muscle cells are maximum in the reproductive age group and is comparatively less in the pre-reproductive and menopausal group. In the menopausal group, the elastic and collagen fibres are replaced by fibrous tissue. The serosal layer of the cervix is present only posteriorly over the supravaginal part of the cervix. It is observed that in all the age groups, the serosal layer contains mesothelium over a connective tissue lamina propria.

Reproductive Status	Number	%
Pre-Reproductive	20	33.33
Reproductive	20	33.33
Postmenopausal	20	33.33

Table 1: Distribution of Samples According to Their Reproductive Status

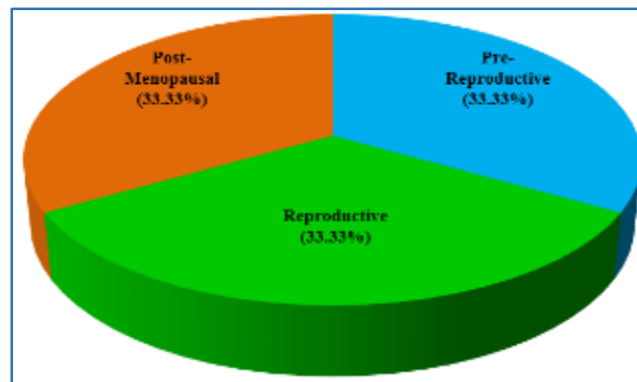


Fig. 1.1: Pie Diagram Showing the % Distribution of Sample Women According to Their Reproductive Status

Reproductive Status	Mean±SD	95% CI
Pre-Reproductive	1.915±0.3103	1.770, 2.060
Reproductive	3.053±0.5124	2.813, 3.293
Postmenopausal	1.909±0.2925	1.772, 2.046

Table 2: Mean and SD Values of Mucosal Thickness of Cervix among Sample Women w.r.t. Their Reproductive Status

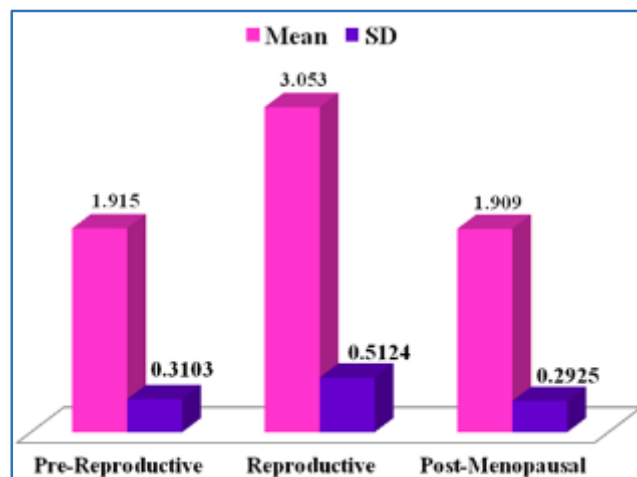


Fig. 2.1: Graph Showing the Mean and SD Values of Mucosal Thickness of Cervix among the Sample Women w.r.t. Reproductive Status

Comparison: A comparative analysis of the mucosal thickness of cervix among the three groups was done. To fulfil this purpose, 't'-test was employed.

Reproductive Status	Mean	SD	d.f.	t-value	Significance Level
Pre-Reproductive	1.915	0.3103	38	8.496**	p<0.01
Reproductive	3.053	0.5124			

Table 3: Mean and SD Scores of Mucosal Thickness of Cervix among the Pre-Reproductive and Reproductive Groups with 't'-Value

**→ highly significant; d.f.→ degrees of freedom.

(The Critical Value or p-value of t for 38 d.f. at 0.01 level of significance is 2.71).

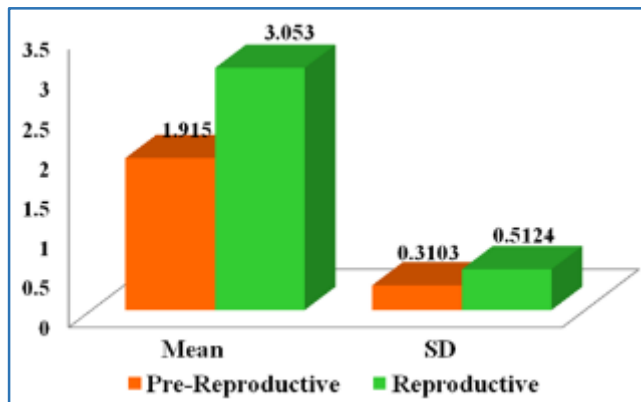


Fig. 3.1: Graph Showing the Mean and SD Values of Mucosal Thickness of Cervix among the Pre-Reproductive and Reproductive Women

Reproductive Status	Mean	SD	d.f.	t-value	Significance Level
Reproductive	3.053	0.5124	38	8.671**	p<0.01
Postmenopausal	1.909	0.2925			

Table 5: Mean and SD Scores of Mucosal Thickness of Cervix among the Reproductive and Postmenopausal Groups with 't'-Value

**→ highly significant; d.f.→ degrees of freedom

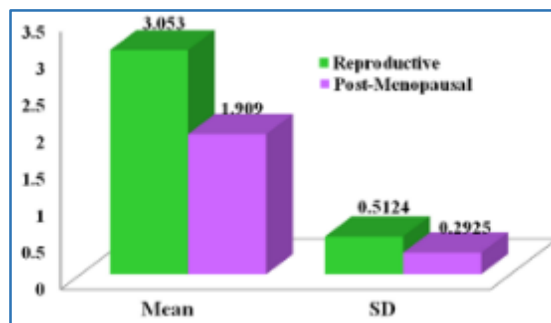


Fig. 5.1: Graph Showing the Mean and SD Values of Mucosal Thickness of Cervix among the Reproductive and Postmenopausal Women

Reproductive Status	Mean	SD	d.f.	t-value	Significance Level
Pre-Reproductive	1.915	0.3103	38	0.0629	N.S. (p>0.01)
Postmenopausal	1.909	0.2925			

Table 4: Mean and SD Scores of Mucosal Thickness of Cervix among the Pre-Reproductive and Post-Menopausal Groups with 't'-Value

N.S. → Not Significant

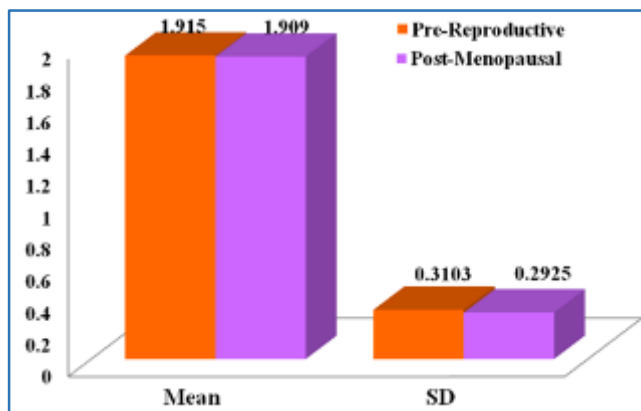


Fig. 4.1: Graph Showing the Mean and SD Values of Mucosal Thickness of Cervix among the Pre-Reproductive and Postmenopausal Women

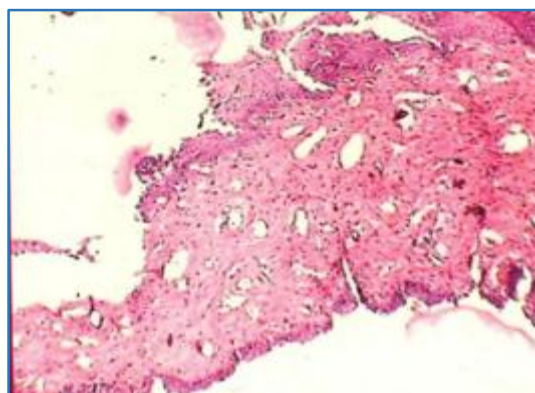


Fig. 6: Photo Micrograph of the Cervix showing the Cervical Glands in the Newborn (Low Power Magnification)

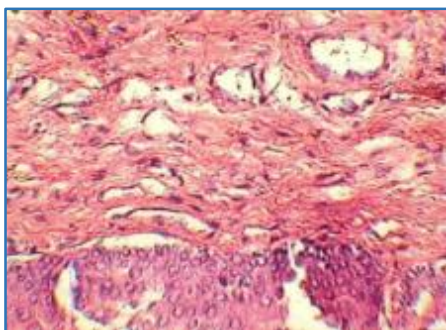


Fig. 7: Photomicrograph of the Cervix showing the Glands in the Newborn (High Power Magnification)

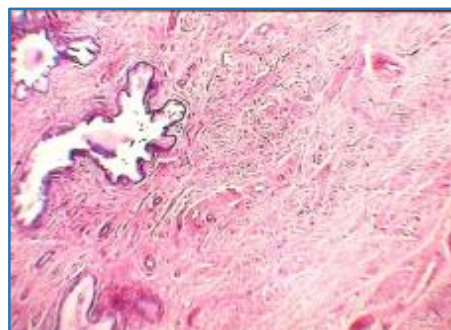


Fig. 11: Photomicrograph of the Cervix showing the High Power Magnification of the Cervical Glands in the Menopausal Age

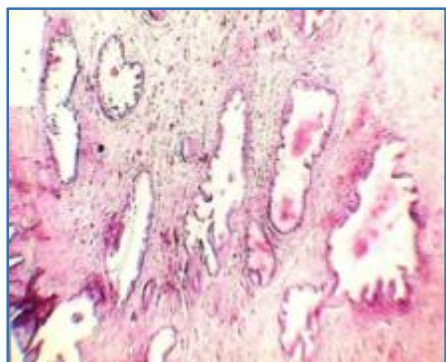


Fig. 8: Photomicrograph of the Cervix showing the Maximum Number of Cervical Glands in the Reproductive Age (Low Power Magnification)

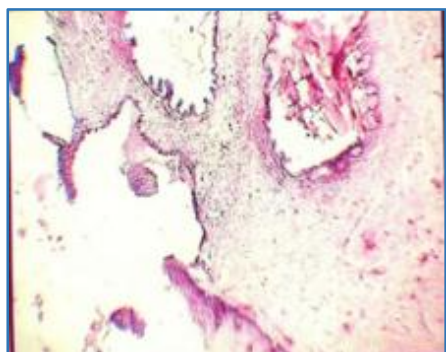


Fig. 9: Photomicrograph of the Cervix showing the Squamocolumnar (Low Power Magnification)

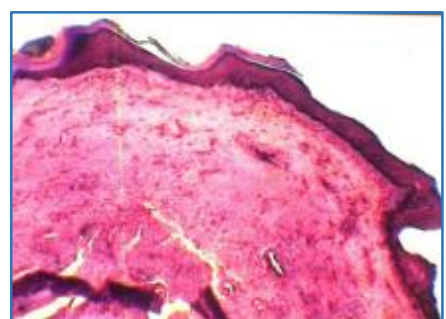


Fig. 10: Photomicrograph of the Cervix in the Postmenopausal Age showing Decreased Number of Cervical Glands (Low Power Magnification)

DISCUSSION: The mucosal layer of the cervix is thrown into folds that resemble the branches of a tree; this is analogous with the findings of Bloom and Fawcett¹ 1978, Ham and Cormack² 1979, Odeblad E³ 1996, Grays⁴ 2008 and Singh⁵ 2014. The mucosal thickness in the upper part of the canal is 1.915 mm, 3.053 mm and 1.909 mm in the pre-reproductive, reproductive and postmenopausal group, respectively. The mucosal thickness being maximum in the reproductive. This is similar to the findings of Bloom and Fawcett¹ 1978, Bannister and Dyson⁶ 1995 and Moghissi⁷ 1999.

The epithelial lining in the upper part of the canal is seen to be simple columnar epithelium. The cells have lightly stained cytoplasm and dark stained basally placed nucleus. This is analogous with the reports of Copenhaver⁸ 1964, Bloom and Fawcett¹ 1978, Tindall⁹ 1994 and Anderson J. B. and Genadry¹⁰ 1998, Dutta¹¹ 2014. In the upper part of the canal, there are patchy areas of cilia which are more in the reproductive age group; this is similar to the findings of Copenhaver⁸ 1964, Bloom and Fawcett¹ 1978, Ham and Cormack² 1979 and Brudenell¹² 1987 and Singh⁵ 2014. There is an abrupt change of the epithelium from columnar to non-keratinised stratified squamous towards the lower part of the cervix, this is analogous to the findings of Copenhaver⁸ 1964, Grays⁴ 2008, Ross¹³ 2011 and Singh⁵ 2014, Dutta¹¹ 2014. The site of squamocolumnar junction is variable, in the menopausal, it is higher, this is similar to the observation of Anderson and Genadry¹⁰ 1998 and Grays⁴ 2008. The muscular layer contains smooth muscle along with dense connective tissue, which is similar to the findings of Bannister and Dyson⁶ 1995. The muscle fibres are more in the reproductive age and in the postmenopausal, elastic and collagen fibres are replaced by fibrous tissue, this corresponds to the observation of Blaikley JB¹⁴ 1963. The serosal layer in the present was seen only over the supravaginal part in all the age group and consists of mesothelium overlying a connective tissue lamina propria, this observation is akin with the reports of Bannister and Dyson⁶ 1995.

CONCLUSION: The study has detected certain differences in the histological architecture in the pre-reproductive, reproductive and postmenopausal age groups. As pathology of this part of the uterus is common, the observations of the study may facilitate in the diagnosis and treatment of diseases related to the cervix. Further study in this field can be undertaken by observing the tissue under electron microscope.

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