

Histology of vermiform appendix in human fetuses at different gestational ages

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Abstract

Background: Vermiform appendix develops as a narrow diverticulum, at the distal end of caecal bud, during the sixth week of intrauterine life. The lymphoid tissue starts appearing in the wall of the appendix around the 17th week of intra uterine life. With further development of fetus, the number of lymphocytes in the appendix increases. **Aim-**The present study has been conducted to know the histology of vermiform appendix at different gestational ages of fetuses. **Materials & Methods-** 38 human foetuses (n=38) of 11-40 wks gestational ages, were procured from Dr. Sushila Tiwari Hospital, Haldwani. Fetuses were dissected, illeocaecal region was displayed and vermiform appendix was studied histologically to assess the microscopic changes with increasing gestational age. **Results-** Lining epithelium is cuboidal to pseudostratified columnar from 11 weeks (gestational ages) onwards. It further changed into simple columnar with interspread goblet cells from 20 weeks onwards. Villi, which are present in the early stage became shorter, smaller and lesser with increasing gestational age and disappeared from 27 weeks onwards. Lymphocytes appeared in the lamina propria earlier and later on in the submucosa. Lymphoid nodule formation was detected at 20 weeks. Even at 40 weeks the lymphoid nodules were still of primary type (i.e. without germinal centres). Muscularis mucosa was detected at 19 weeks and became distinct at 24 weeks. Muscularis externa was already present at 11 weeks and at 14 weeks it began to assume the adult pattern. Serosa was distinguishable from 11 weeks onwards. Microanatomy of the vermiform appendix of 27 weeks to 40 weeks fetuses resembles that of adults, except that the lymphoid nodules are primary type having no germinal centres and only one or two nodules are seen in cross section. Thus, not forming a complete ring of lymphoid nodules in the wall. **Conclusion-** The lymphoid nodule formations of appendix are necessary for certain local protective reactions and already in the fetus they begin to participate in the organism's immunogenesis.

Key words- lymphoid nodule, villi, germinal centre, serosa.

INTRODUCTION

The vermiform appendix is an abdominal organ with considerable significance in clinical practice [1,2]. It arises from medial wall of the caecum, it is attached to the ileum by the meso-appendix and it is located 2cm below the ileocaecal junction. [3,4] It consists of serous, muscular, submucous and mucous coats from outside to luminal side.

The serosa forms a complete covering, except along the mesenteric attachment. The longitudinal muscular fibres form a complete layer of uniform thickness, At the base of the

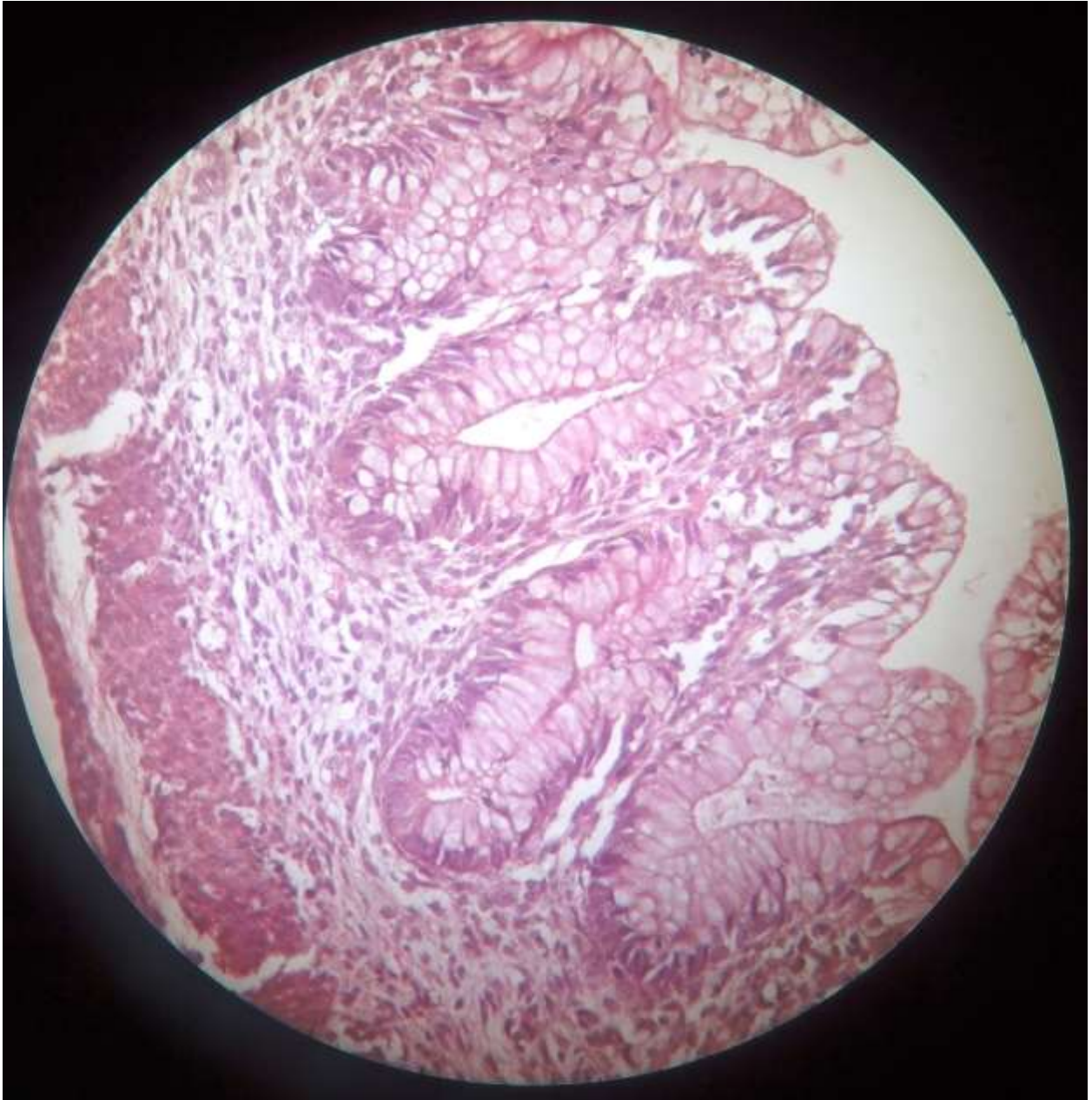
appendix, the longitudinal muscle thickens to form rudimentary taeniae that are continuous with those of the caecum and colon. The submucosa typically contains many large lymphoid aggregates that extend from the mucosa. These aggregates also cause the mucosa to bulge into the lumen of the appendix, so that lumen narrows irregularly. Lumen may be widely patent in early childhood but often partially or completely obliterated in adults. The mucosa is covered by a columnar epithelium as it is elsewhere in the large intestine, and the epithelium that overlies the mucosal lymphoid tissue contains M cells. Glands (crypts) are similar to those of the colon but are fewer in number and so are less densely packed. The submucosal lymphoid tissue frequently exhibits germinal centres within its follicles.[5,6,7,8]

Lymphoid follicles may be absent at birth but accumulate over the first 10 years of life to become a prominent feature of the appendix. Due to the presence of extensive lymphoid tissues in the mucosa and submucous coats forming lymphoid follicles, vermiform appendix has been called 'Tonsil of the abdomen'. [9,10,11,12]

The present study has been conducted to know the histology of vermiform appendix at different gestational ages of fetuses and thus to determine the histological development of the vermiform appendix. This study was done as a very few literature was available on these aspects in Indian population.

MATERIALS AND METHODS

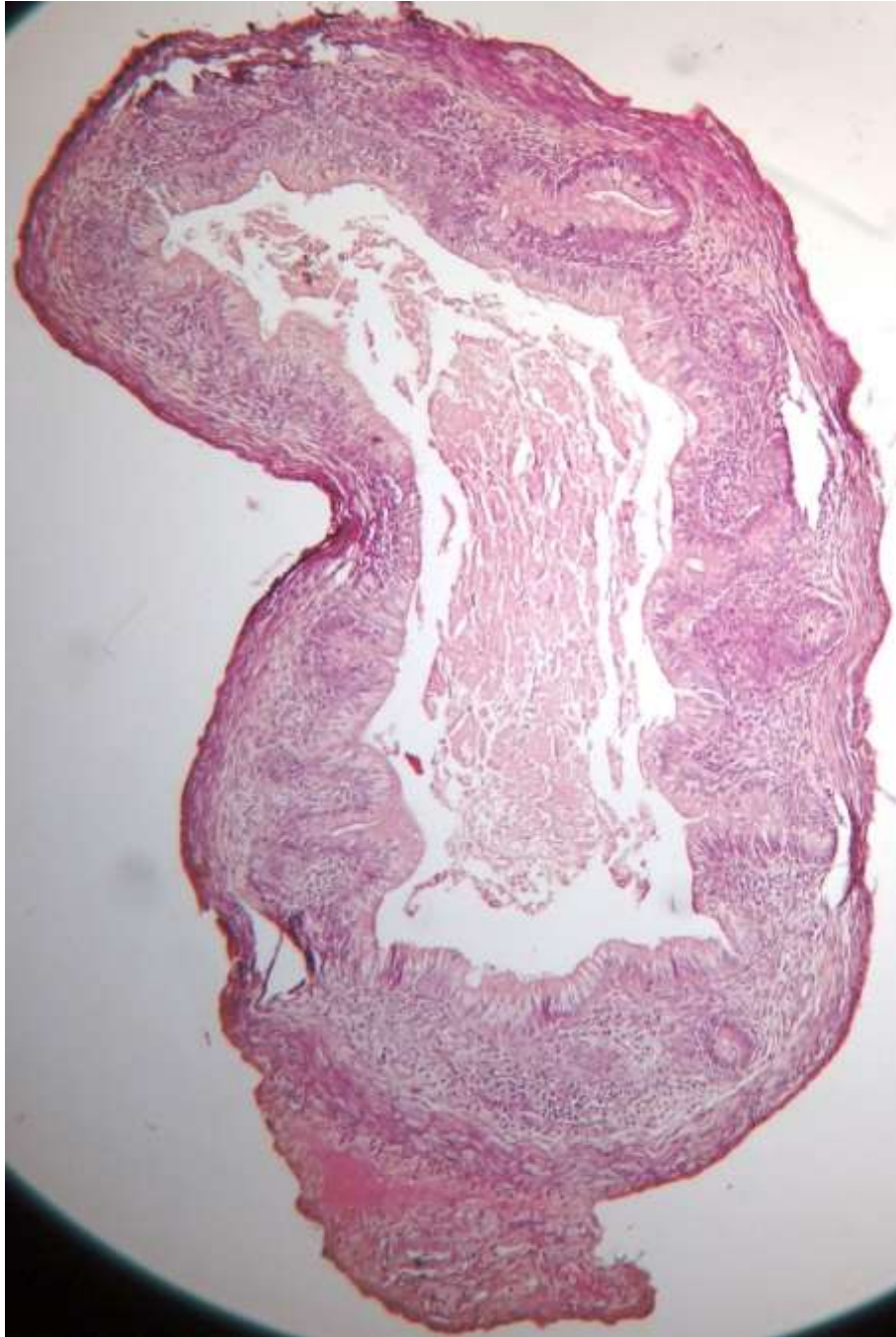
It was carried out on 38 human fetuses that exhibited neither external pathology nor anomaly and whose gestational ages were between 11 and 40 weeks. Fetuses were obtained from Dr. Sushila Tiwari Hospital and District Mahila Hospital, Haldwani, with relevant obstetric records available in the department. After procurement of fetuses with due regard on ethical ground fetuses were preserved in 10% formalin. Fetuses were dissected. Ileocaecal region was displayed and Caecum along with vermiform appendix was exercised. The specimens were then cleaned and washed. Tissue was preserved in 10% formalin. Tissue was taken for histological processing and was processed for light microscopic studies. Hematoxylin and eosin stain were used for demonstration of microscopic anatomy. Photographs were taken for various observations for histological studies.



PICTURE 1--Photomicrograph of transverse section of appendix of human fetus of 16weeks gestational age, showing its general microscopic architecture. H & E stainin g ,40X)

Lining epithelium- pseudostratified columnar epithelium.

Submucosa,muscularisexterna,serosa can be distinguished .



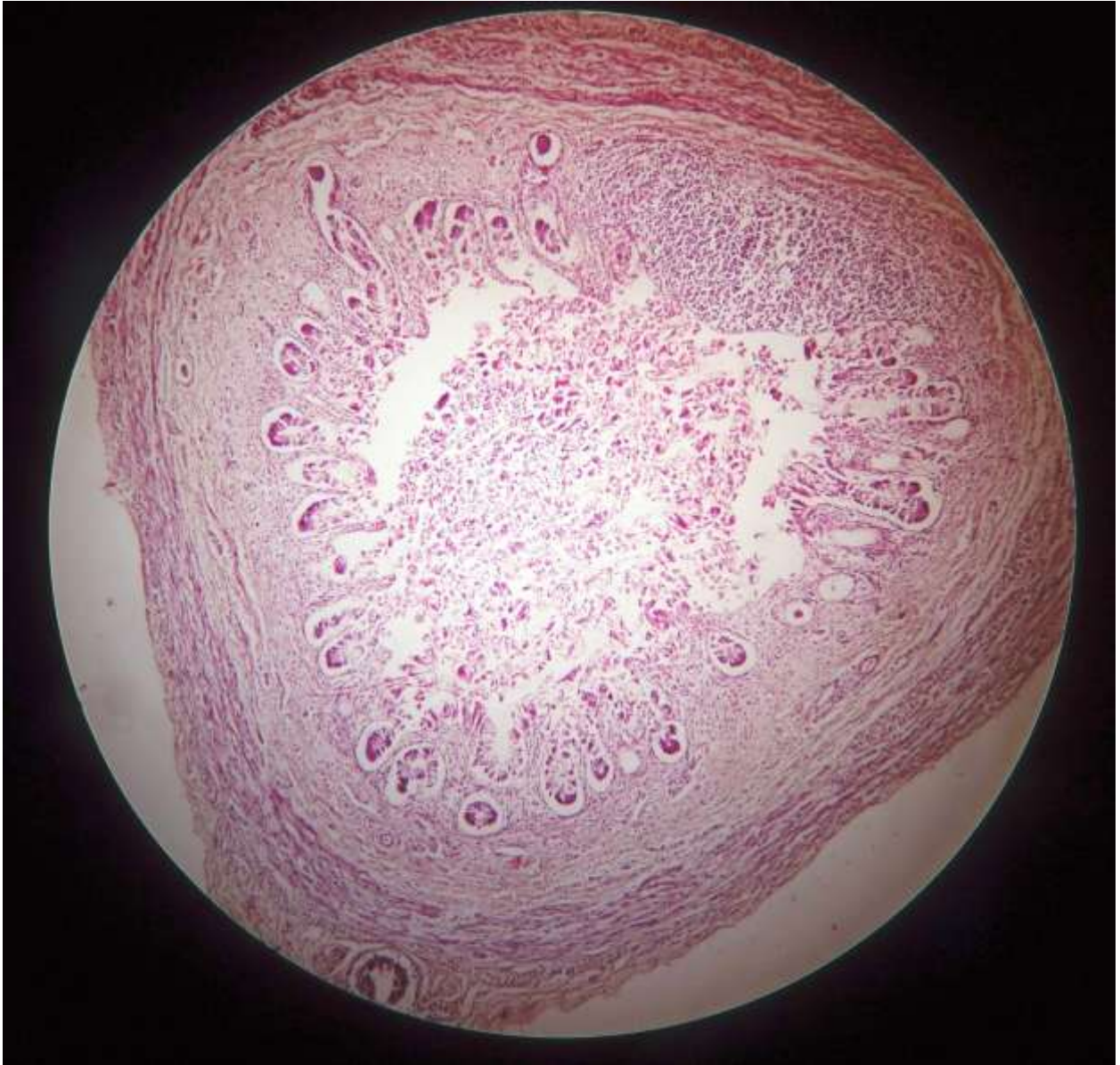
PICTURE 2-Photomicrograph of transverse section of appendix of human fetus of 23 weeks gestational age, showing its general microscopic architecture. H & E staining, 10X)

Lining epithelium- simple columnar with interspread goblet cells. Lymphocytes appeared in the lamina propria and in the submucosa.



PICTURE 3-Photomicrograph of transverse section of appendix of human fetus of 20 weeks gestational age, showing its general microscopic architecture. H & E staining ,40X)

Lining epithelium- pseudostratified columnar epithelium. Submucosa, muscularis externa, serosa can be distinguished. Villi are present and they are shorter, smaller and less in number.



PICTURE 4-Photomicrograph of transverse section of appendix of human fetus of 34 weeks gestational age, showing its general microscopic architecture(H & E staining, 10X) Lining epithelium- simple columnar with interspread goblet cells. Lymphocytes appeared in the lamina propria and in the submucosa. One LYMPHOID FOLLICLE IS SEEN IN LAMINA PROPRIA. It has no germinal centre.



PICTURE 5-Photomicrograph of transverse section of appendix of human fetus of 40 weeks gestational age, showing its general microscopic architecture. (H & E stainin g, 4X)

Lining epithelium- simple columnar with interspread goblet cells
.Submucosa,muscularisexterna,serosa can be distinguished. Villi are shorter and smaller .Lymphoid follicles can be seen but they are of primary type (without germinal centres)

RESULTS AND DISCUSSION

Cut section of vermiform appendix at base middle and tip were subjected to histological analysis .After detailed study under microscope results were-

Lining epithelium is cuboidal to pseudostratified columnar from 11 weeks (gestational ages) onwards. . Muscularis externa was already present at 11 weeks and it began to assume the adult pattern at 14 weeks. Serosa was distinguishable from 11 weeks onwards.Muscularis mucosa was detected at 19 weeks and became distinct at 24 weeks .Lining epithelium further changed into simple columnar with interspread goblet cells from 20 weeks onwards. Villi,

which are present in the early stage became shorter, smaller and lesser with increasing gestational age and disappeared from 27 weeks onwards. Lymphocytes appeared in the lamina propria earlier and later on in the submucosa. Lymphoid nodule formation was detected at 20 weeks. Even at 40 weeks the lymphoid nodules were still of primary type (i.e. without germinal centres). Microanatomy of the vermiform appendix of 27 weeks to 40 weeks fetuses resembles that of adults, except that the lymphoid nodules are primary type having no germinal centres and only one or two nodules are seen in cross section. Thus not forming a complete ring of lymphoid nodules in the wall.

CONCLUSION

The appendix of fetuses has same four layers that are serosa, muscularis externa, submucosa, and mucosa), its outer layer of longitudinal smooth muscle layer is complete, and the **mucosa and submucosa have lymphocytes aggregations in fetuses of higher gestational ages. Even at 40 weeks the lymphoid nodules were still of primary type (i.e. without germinal centres).** Whereas, in fetuses of less gestational ages lymphocytes are diffusely present in mucosa and submucosa. Villi, which are present in the early stage, became shorter, smaller and lesser with increasing gestational age. The lymphoid nodule formations of appendix are necessary for certain local protective reactions and already in the fetus they begin to participate in the immunogenesis.

Vermiform appendix in human being has been regarded as a vestigial remnant of a more developed distal caecum. However, in view of its histological differentiation, the vermiform appendix has been accepted as a complex and highly specialized organ rather than a degenerated vestigial structure.

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