Fallopian Tubes

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Introduction

The fallopian tubes and uterus have a common embryologic origin, so it is not surprising that they have a similar anatomic organization. During fetal life, the layers of the wall of the fallopian tubes mature and differentiate in a similar fashion to the uterus. In the second and third trimesters, the fallopian tubes typically exhibit a markedly convoluted gross appearance. Similar to the adult fallopian tube, the fetal fallopian tube can be divided into four segments: the intramural segment, within the wall of the uterine cornu; the adjacent isthmus, with a thick, stout wall and narrow lumen; the ampulla, which is thin-walled and tortuous; and the infundibulum, which opens into the peritoneal cavity by way of the fimbriated end.

Embryology

The fallopian tubes, the uterus, and much of the vagina are derived from the paramesonephric (Müllerian) ducts, the development of which is described in the Part IV introduction. Each duct has two curves, which divide it into three segments:

- The first segment, the most rostral, is vertical and extends from the abdominal ostium (the future fimbriated end) caudally along the posterolateral border of the ovary and mesonephros to the first curve [1]. This segment becomes the fallopian tube. The first curve, which bends medially under the caudal end of the ovary, is attached to the caudal end of the ovary by the ovarian ligament and by the round ligament to the inguinal canal.
- The second segment is horizontal and extends medially from the first curve to the midline, where it meets and fuses with the opposite duct and curves caudally (the second curve). This segment becomes incorporated into the ipsilateral lateral wall of the uterus.
- The third segment is vertical; after fusing with the opposite duct, it extends caudally to its attachment to the posterior wall of the urogenital sinus at the level of the Müllerian tubercle. This segment becomes the uterus and vagina.

The fallopian tube immediately develops a lumen that is continuous with that of the abdominal ostium. The epithelium of the abdominal ostium derives from the coelomic epithelium, whereas that of the remainder of the tube is of paramesonephric origin. The undifferentiated mesenchyme of the wall is derived from paramesonephric mesoderm and possibly partially from mesonephric mesoderm. The mucosa and muscularis remain undifferentiated until later in fetal life [1, 2].

Histology

Three layers can be identified in sections of the mature fallopian tube: the mucosa, the muscularis (myosalpinx), and the serosa [3]. The tubal mucosa is invaginated into the lumen, forming longitudinal branching folds or plicae, which increase in complexity from the isthmus to the infundibulum (Fig. 16.1). During the early midtrimester, the mucosal stroma blends into the muscularis, and there is no clear distinction between the two (Figs. 16.2, 16.3, 16.4, and 16.5). The lumen is lined by undifferentiated simple or slightly pseudostratified cuboidal to columnar epithelium [4]. Cilia can be observed in well-preserved specimens, but not all cells are ciliated. Two other cell types have been described: secretory cells and intercalated cells. However, secretory cells are difficult to discern in the immature epithelium of the fetus,

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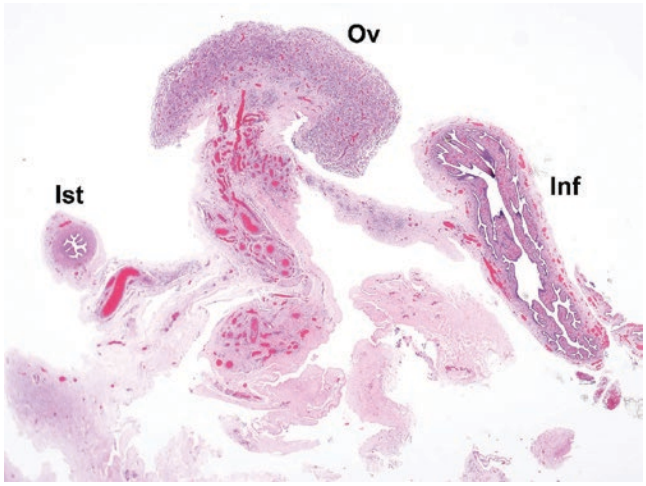

Fig. 16.1 Fallopian tube at 23 weeks. This slide includes two cross sections of the fallopian tube and the ovary (Ov) in the middle. On the left is the isthmus (Ist); on the right is the infundibulum (Inf). Notice how the complexity of the plicae increases and the thickness of the muscular coat decreases from the isthmus to the infundibulum (see Fig. 16.9) (hematoxylin and eosin (H&E), 1×)

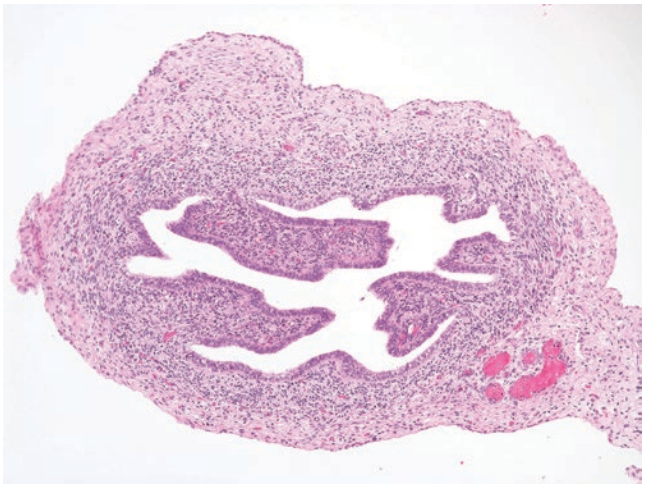

Fig. 16.2 Fallopian tube at 19 weeks. Plicae are already developed, but the muscular layer is indistinct and blends with the stroma of the mucosa. Note the relatively thick connective tissue of the serosal layer (H&E, 10×)

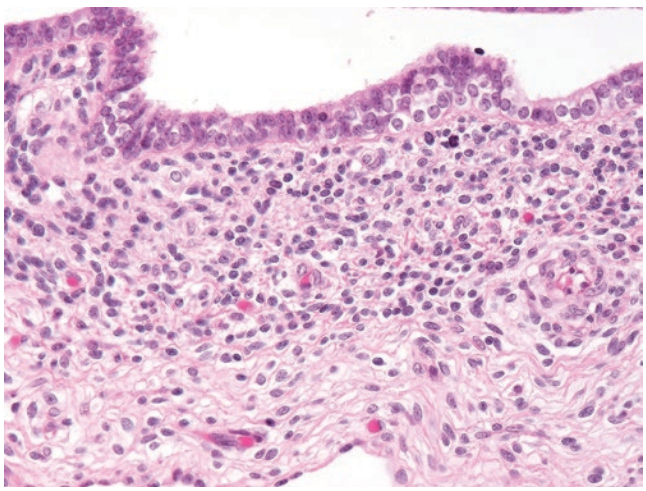

Fig. 16.3 Fallopian tube at 19 weeks. This closer view shows a single layer of columnar cells with focally crowded nuclei along the mucosal surface. Cilia are barely discernible in some cells. The mucosal stroma blends into the developing muscular layer (H&E, 40×)

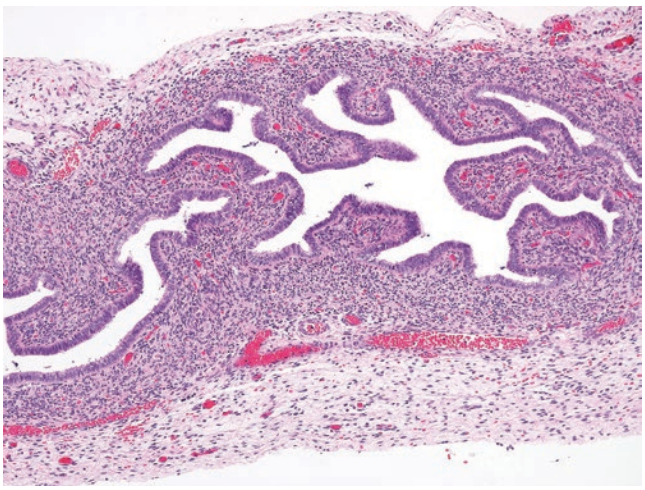

Fig. 16.4 Fallopian tube at 21 weeks. The demarcation between mucosal stroma and smooth muscle remains indistinct, as shown. Note the relatively thick connective tissue of the serosal layer (H&E, 10×)

and intercalated cells are modified secretory cells seen during the menstrual cycle after puberty [5, 6]. Toward the end of the midtrimester, the muscularis gradually becomes distinct (Fig. 16.6). The muscular layer is composed of an external longitudinal layer and an internal circular layer arranged in a basket-weave fashion (Figs. 16.6, 16.7, and 16.8). The muscular coat is always thicker toward the uterine end of the tube (Fig. 16.9). The serosa comprises the peritoneum and underlying loose connective tissue. This layer is particularly thick during the midtrimester (see Figs. 16.2 and 16.4), but it also remains relatively prominent at term. The mucosal epithelium changes little during gestation (Fig. 16.10).

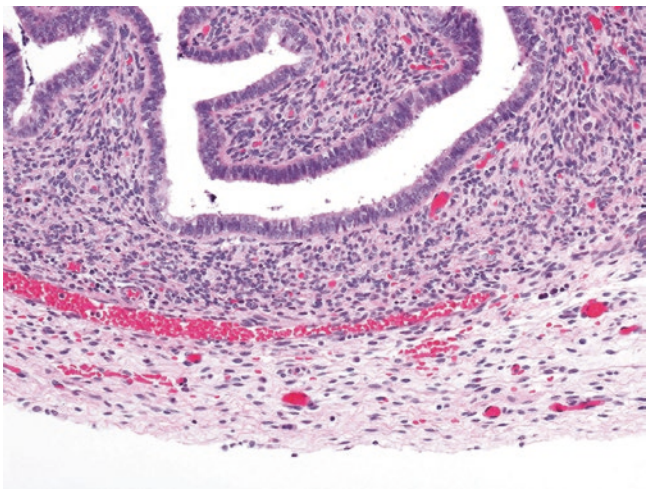

Fig. 16.5 Fallopian tube at 21 weeks. This closer view shows no significant smooth-muscle differentiation. The epithelium consists of a single layer of columnar cells (H&E, 20×)

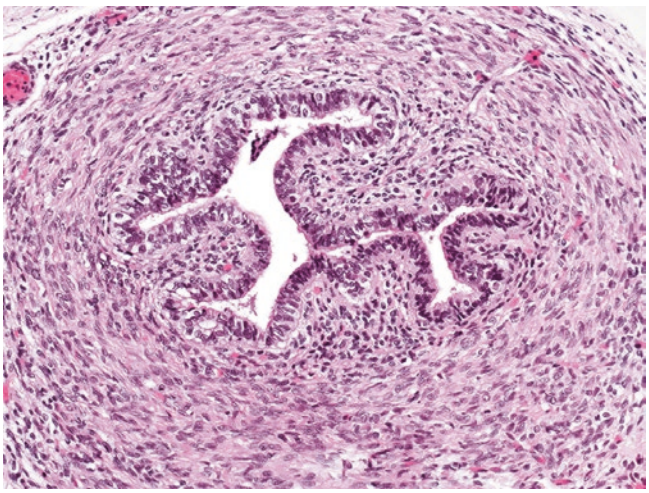

Fig. 16.6 Fallopian tube at 23 weeks. The myosalpinx becomes more distinct as the smooth-muscle fibers show better differentiation. The epithelium between plicae now almost rests on top of the muscular coat (H&E, 20×)

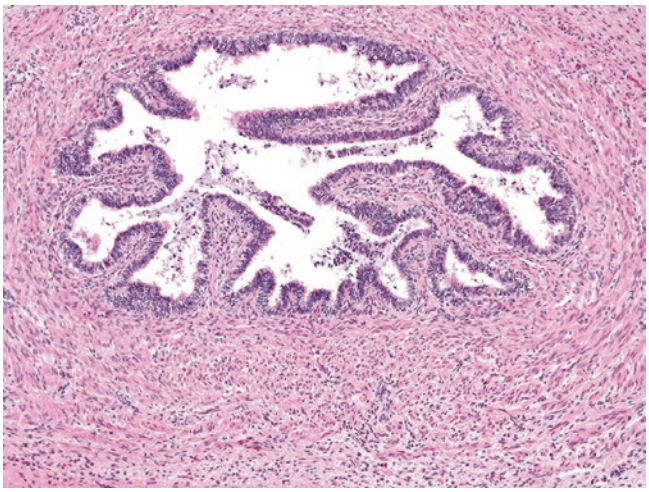

Fig. 16.7 Fallopian tube at 32 weeks. The mucosal stroma has more collagen, and the smooth-muscle fibers begin to be oriented in different directions (H&E, 10×)

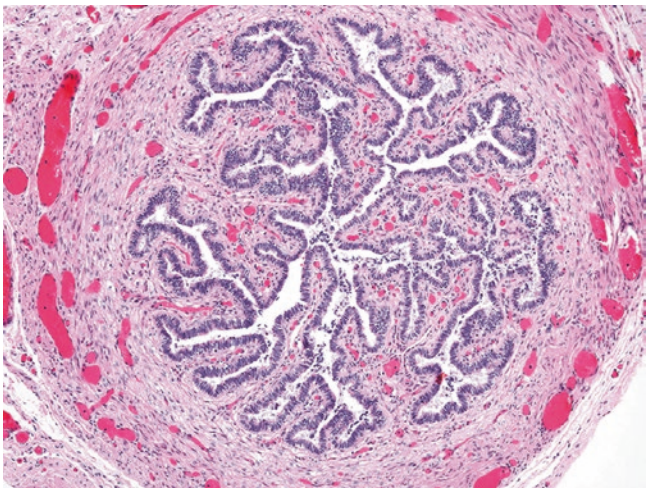

Fig. 16.8 Fallopian tube at 38 weeks. This section closer to the ovarian end of the tube demonstrates increased complexity of the plicae and thinning of the muscular coat (H&E, 10×)

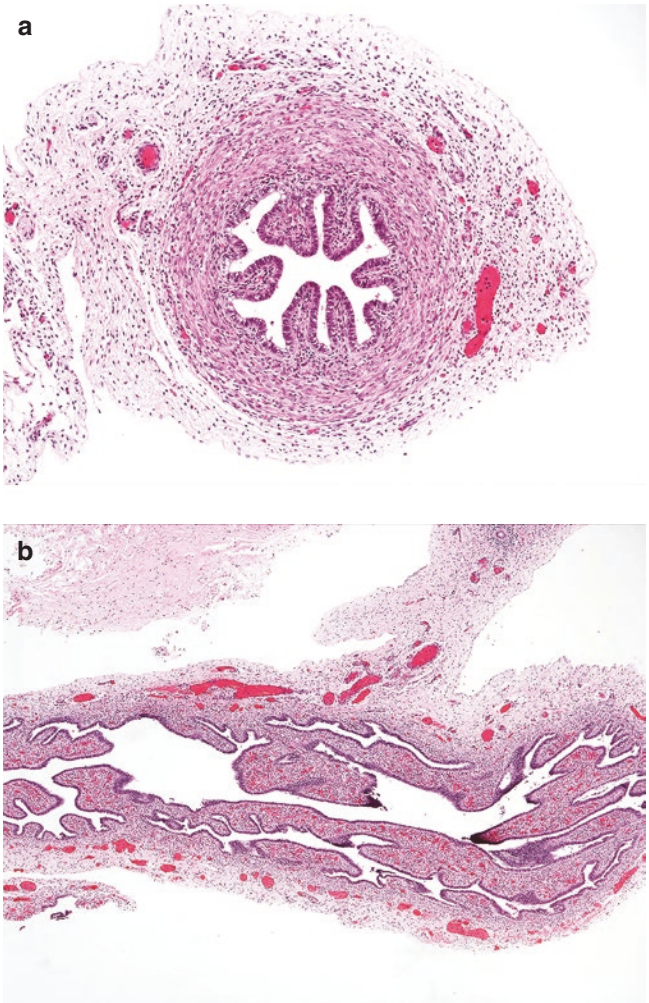

Fig. 16.9 Fallopian tube at 23 weeks. This closer view is of the same segments of fallopian tube as depicted in Fig. 16.1. The muscularis is thicker in the isthmus (**a**) than in the infundibulum (**b**) (H&E; **a** 10×; **b** 4×)

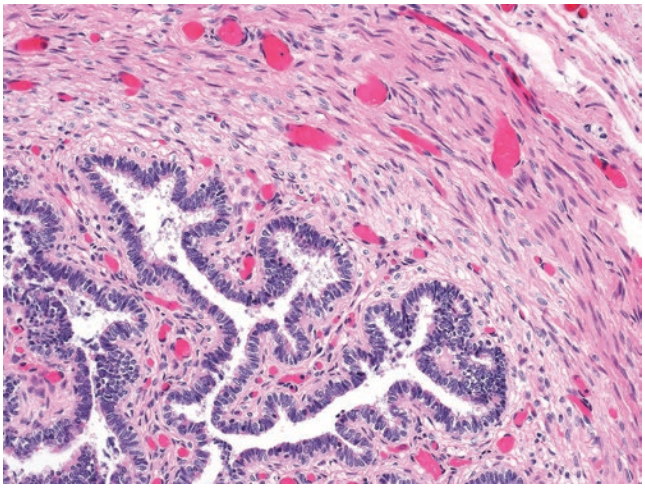

Fig. 16.10 Fallopian tube at 38 weeks. As shown, the epithelium changes little during gestation, remaining a single layer of columnar cells (H&E, 20×) (Compare with Figs. 16.3 and 16.5)

References

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