DEVELOPMENT OF THE MESENTERY AND PERITONEUM

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Early in development, the human abdomen comprises a wall and enclosed space (coelom). A partition (mesentery) subdivides the cavity into left- and right-sided spaces (Figure 65.1 The mesentery comprises a cell body (mesodermal mesentery) lined on either side by a sheet of mesothelial cells (65.2). At first the cell body is continuous with the posterior abdominal wall, and the mesothelial covering of the mesentery is continuous with that lining the inner surface of the posterior abdominal wall. Soon after this arrangement has developed, the cell body of the mesentery separates from the posterior abdominal wall but remains in contact with it (65.1 surface mesothelium of the mesentery remains in continuity with that of the posterior abdominal wall (Figure 65.2 The mesentery remains continuous throughout develop ment, following birth and into adult life (65.2). Early during development, the mid-region of the mesentery forms a fold that subdivides the mesentery into upper (pre-fold), mid- (fold) and lower (post-fold) regions (Figure 65.1). The upper region develops as a sack overlapping the mid-region. As it develops, the spleen, stomach and liver emerge. The mid-region fold has left and right sides (on either side of the midline). The mid-region nearest the posterior abdominal wall is termed the central zone (Figure 65.1). The remainder of the fold is termed the peripheral zone. Soon after the mid- region fold first emerges, the sides of the periphery (but not of the central zone) switch position relative to the superior mesenteric artery (SMA). After the switch, the original right side of the mid-region commences on the right side centrally but continues peripherally on the left of the SMA. The original left side commences peripherally on the right side of the vessel then returns centrally on the left of the SMA (65.1). Failure of switch formation occurs in malrotation (see Rotational disorders). During development of the upper region of the mes entery , the region of the mesodermal mesentery that is nearest the posterior abdominal wall adheres to the wall (This process progresses from the midline laterally to the left. Adhesion of both displaces the mesothelial junction between the mesentery and the adjacent posterior abdominal wall (Figure 65.2). At completion of development the posterior wall of the upper region (the dorsal mesogastrium) is fully adherent). to the abdominal wall of the left upper quadrant (LUQ). The spleen is located at the lateral part of the upper region sac, Figure in the LUQ. The original mesothelial junction remains as the peritoneal reflection linking the surface lining the mesenteric domain (in this case the spleen) with the surface lining of the adjacent non-mesenteric domain (in this case the LUQ). During development of the mid-region fold, the region of the mesodermal mesentery that is nearest the posterior). The abdominal wall (i.e. the central zone) progressively adheres to the posterior

abdominal wall. With continued adhesion,). the periphery of the mid-region fold also adher es (65.2 - and 65.3). Adhesion occurs inferolaterally to the right, and from the central to peripheral zones. The mesothelial junction between the mid-region mesentery and abdominal wall is displaced in tandem, inferolaterally to the right. At completion of development the mid-region fold is adherent to the posterior abdominal wall at the right mesocolon. The original mesothelial junction is at the periphery of the fold and persists as a peritoneal reflection bridging the surface lining of the mesenteric and non-mesenteric domains (Figure 65.2) (65.3). Incomplete adhesion of the mid-region fold is associated with increased mobility of the ileocaecal region and volvulus (see Volvulus of the intestine and adjoining mesentery). During development of the lower region of the mesentery , the part nearest the posterior abdominal wall progressively adheres to the wall (65.1). This proceeds from the mid - line laterally to the left. The overlying mesothelial junction is Figure displaced in tandem (Figure 65.2). At completion of develop - ment, the lower region has fully adhered at the left mesocolon, medial mesosigmoidal and mesorectal levels. The lateral part - of the mesosigmoid remains mobile. The mesothelial junction remains as a peritoneal reflection bridging the surface lin - 65.1). ing of the mesenteric and adjacent non-mesenteric domain

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(65.3). Incomplete adhesion (and hence anchorage) of the lower region is associated with sigmoid volvulus (see Volvulus of the intestine and adjoining mesentery).

R L Central zone (e) (f) Peripheral zone Figure 65.1 Switching of the mid-region of the mesentery during development. to switching of the sides of the mid-region fold. (a, c, e) Three-dimensional reconstructions of the mesentery before switching. The intestine develops within the mesentery. (b, d, f) Three-dimensional reconstructions of the intestine. The mesentery has been removed to expose the developing intestine. (a1, c1, e1) Digital reconstructions of the developing mesentery after switching of the sides of the mid-region fold. The mesentery is coloured yellow. (b1, d1, f1) Three-dimensional reconstructions of the intestine after the mid-region switch. The mesentery has been removed to expose the developing intestine. Yellow, the mesentery; red, upper region of intestine; green, developing mid-region; blue, lower region of the intestine. The superior mesenteric artery (blind-ending red tube) has been included for reference. (a) (b) (c) Posterior abdominal wall Mesentery Fascia (d) (e) (f) Figure 65.2 (a-f) Adhesion and displacement. Development of the junction between the mesentery (*) and the posterior abdominal wall. The peritoneal re /f_l ection (thick arrows) is displaced towards the periphery during adhesion of the mesentery to the abdominal wall. L R Central zone (e1) (f1) R L Peripheral zone (a–f) Digital reconstructions of the developing mesentery prior

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