Structural and haemovascular aspects of placentation in young and aged mares

Abd-Elnaeim M. M. M., R. Leiser, Sandra Wilsher and W. R. Allen

Abstract:

This investigation was carried out to study the equine placenta from early gestation to near term, with special reference to morphological changes associated with the development of the vasculature of the fetal component of the microcotyledons. Pregnant uteri were removed post mortem from five Thoroughbred mares between 110 and 309 days of gestation, two of which were aged, multiparous animals suffering age-related degenerative changes in their endometrium (endometrosis), while the other three were young, and had primigravid normal healthy uteri. Pieces of endometrium with placenta attached were fixed for light microscopy and fetal vascular casts were made by injecting the placental arteries with a mixture of Mercocx and methylmethacrylate. The casts were examined under the scanning electron microscope. In an aged, endometrotic mare at 110 days of gestation, most of the microplacentomes were irregular in shape with a mean±sem diameter of 399±30.53μm. Capillaries with variable diameters made up widely meshed network villi with pointed ends (Type 1 terminal villi), and narrow-meshed networks with finger-like ends (Type 2 terminal villi). In the "paired" young healthy mare at day 121 of gestation, most of the microplacentomes were globular in shape and appeared smaller in diameter than those in the 110-day "pair". The narrow-meshed capillary networks formed villi with stems that consisted of both intermediate and terminal parts, the latter of which represented more the Type 2 than the Type 1 terminal villus. In another aged endometrotic mare at 179 days of gestation, the microplacentomes were typically globular in shape and they showed a mean diameter of 534±36.07μm. The villi were short and thick and they were distinctly differentiated into stem, intermediate and terminal parts. The density of the fetal capillaries had now greatly increased so that, three dimensionally, they constituted bulb-like capillary networks at the base of the stem of each villus. At 199 days in the young healthy "pair", the microplacentomes were again smaller in diameter (402±16.24μm) than in the old mare at 179 days and the interhaemal distance had now reduced to 14.28±0.42μm. The vascular density was lower than in the day 179 aged mare and the fetal villi were much longer and thinner. In the single late stage, healthy young mare at 309 days of gestation (term=336days), the microplacentomes, each of around 2mm diameter, exhibited maximal length villi. The capillaries were arranged simply, mostly in straight lines along the axis of the villus, and with communications visible at irregular intervals. Simple and slightly more complicated side capillary loops could be seen along the whole length of the villi and at the top of the terminal villi. Most of the capillaries were characterized by zones containing dilated sinusoids, which increased the surface area for materno-fetal exchange. Thus, the morphological development of the microplacentomes on the surface of the horse placenta during gestation was studied, with special reference to the growth and organisation of the fetal and maternal capillary beds within each microplacenta. The study also reinforced previous work showing the disadvantageous influence of age-related endometrial degenerative changes on microplacentome development and on both the extent and intimacy of physical and haematological contact at the fetomaternal interface, and hence upon fetal growth.

Keywords:

Equine placenta, Morphology, Vascular corrosion casts, Endometrial degeneration

Published In:

Placenta, Vol. 27, No. 11, PP. 1103-1113