3 Early Human Placental Morphology

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Introduction

The first detailed descriptions of placental anatomy were published by Leonardo da Vinci and by Vesalius at the beginning of the sixteenth century [1]. Since that time and until the beginning of the twentieth century, the most significant contribution to knowledge of human implantation, placental development and vascularization was provided by William and John Hunter during the eighteenth century (Fig. 1). Their experiments also demonstrated clearly that maternal and fetal bloodstreams are separated by the placental barrier and are, therefore, not anastomosed end to end inside the placenta.

During the last one hundred years, the placental morphology from an early stage of gestation to term has been studied by many workers using light microscopy and, more recently, transmission and scanning electron microscopy (TEM and SEM, respectively). The explosion of new knowledge in the field of antenatal diagnosis in the last decade has been supported by application of these basic science discoveries to clinical research. An increased understanding of placental anatomy has provided the pathophysiologic principles of many diseases affecting pregnancy. Conversely, the advent of new techniques in perinatal medicine, such as ultrasonography, magnetic resonance imaging, or Doppler velocimetry, has allowed in vivo investigations of placental structures from an early gestational stage.

This chapter illustrates and summarizes the various aspects of early placental development and morphology. Peri-implantation trophoblastic development will not be considered in this chapter. Its properties and differentiation, however are described in Chap. 1.

Development of the Early Villous Tree

General Architecture

The formation of chorionic villi begins between 13 and 15 days after ovulation, corresponding to stage 6 of embryonic development and to the end of the 4th week after the last menstrual period [1–3]. Histologically,
Fig. 1. Plate of William Hunter’s *The Gravid Uterus* (Birmingham, 1774) illustrating early implantation in humans. (By courtesy of the King’s College Library, London)