Vaginosonographic Examination of the Fetus

1 General

Transabdominal ultrasound, with its large field of view, can demonstrate the presenting fetal part very easily and usually can depict numerous anatomic details. However, this can be difficult if the presenting part is already low in the pelvis when the study is performed. Even in the second trimester it can be difficult to visualize certain fetal structures if the presenting part is shadowed by the fetal limbs. Cases of this kind require either a different examination technique or a different route of approach.

Vaginal sonography was initially believed to have its greatest value in early pregnancy. At that time vaginosonography can play a crucial role in identifying normal and abnormal pregnancies, providing earlier detection of fetal life, and detecting ectopic gestation. The value of vaginosonography in detecting a low-lying placenta is discussed in the chapter “Placenta Previa.” But the advantages of this modality (transducer close to the organ of interest, higher transducer frequencies, superior resolution) are leading to increasing application in later stages of pregnancy as well.

2 Indications

2.1 Examination of the Fetus in the First Half of Pregnancy

2.1.1 Biometry

The late first trimester and early second trimester are particularly well suited for vaginosonographic evaluations of the fetus. At that time it is possible to image the entire fetus, depending on the scanning frequency and the available field of vision. It is advantageous to use a scanner with variable frequencies, for otherwise the presentation may allow only portions of the fetus to be delineated. By the 12th week of gestation the presence of fetal organs can be confirmed, and the entire spine can be visualized. At any stage of pregnancy it may be possible to demonstrate portions of the umbilical cord by vaginosonography (Fig. 1).

The advantages of vaginosonography for fetal examination include the capacity for earlier biometric evaluation and a more accurate prediction of term, especially when results from gestational sac biometry are not available (Fig. 2).
2.1.2 Visualization of Fetal Organs

The earliest point at which fetal organs can be depicted with ultrasound depends on many factors such as the experience of the examiner, the quality of the equipment, the thickness of the maternal abdominal wall, the amniotic fluid volume, and fetal position. However, an even more important consideration is the week of pregnancy in which the fetal organs in general can be demonstrated clearly enough to permit the detection or exclusion of anomalies. Generally it may be said that vaginosonography can demonstrate all fetal organs 1-4 weeks earlier than is possible with transabdominal scanning (Warren et al. 1989). When organ development is evaluated at such an early stage of pregnancy, it must be understood that some structures have not yet reached the stage of development that is traditionally demonstrated by abdominal ultrasound. Thus, while the falx cerebri is not seen when the fetal skull is examined in the 9th week of pregnancy, a scan taken in the 12th week will disclose the midline echo of the falx (Fig. 3).

From a sonographic standpoint, the dominant process in early embryonic development is the formation and differentiation of the central nervous system. Various stages can be recognized in the development of the embryonic brain. Ideally, a caudal and a rostral pole can be distinguished as early as the 6th week of pregnancy (Fig. 4). At the caudal pole are the three cerebral vesicles consisting of the prosencephalon, mesencephalon, and rhombencephalon (Fig. 5) (Wisser et al. 1988). With failure of neural tube closure in the brain region, a diagnosis of anencephaly can be made even at this very early stage. One week later the brain is seen to consist of five parts: the cerebrum, the diencephalon, the mesencephalon, the metencephalon, and the myelencephalon, from which the medulla oblongata is derived. This is the stage at which holoprosencephaly may develop, characterized by facial dysmorphias, arhinencephaly, and cerebellar aplasia. Additional details appear in the cranium by the 8th week of gestation, and the orbits, thalamus, choroid plexus, and cerebellum can be discerned by the 9th or 10th week. The developing ventricular system and choroid plexus appear to occupy most of the cranial volume at this stage (Fig. 6). Cysts of the choroid plexus usually have no pathologic significance (Green and Hobbins 1988). The maxilla and mandi-