

## Stage 24 Reposition of Umbilical Hernia

16 Days, 14–17 mm

### External Features

In the forefoot, *fingers* 2–5 are nearly parallel to each other, while the toes of the hindfoot still diverge. The *eyelids* have fused in most specimens. An epithelial mantle, a thin transparent membrane covering the cornea, is difficult to see by external inspection (Fig. 245). The external auditory meatus is almost completely covered by the *pinna*.

The *umbilical hernia* is disappearing, and the skin is becoming wrinkled.

The anterior part of the back is completely straight; this is more apparent than in 13–15 days embryos because of the increased length. In microscopic sections, however, the anterior vertebral column has a distinct lordotic curvature (Figs. 223 and 252).

*Length*. The length ranges, in extreme cases, between 14 and 18 mm.

*Sagittal section* (Fig. 252). The primary cortex of the *brain* is thickened and the choroid plexus is larger and divided into folds and villi.

The *abdominal cavity* has enlarged, so that the intestinal loops can be repositioned as the umbilical hernia is reduced.

### Circulatory System

The heart and great vessels have the final prenatal configuration (Fig. 252).

The superficial veins are easily recognizable through the thin transparent skin (Figs. 245 and 246).

### Intestinal Tract

A long slender *ductus nasopharyngeus* develops by further downward growth of the fused palatal processes. In this way, the epipharynx extends as far back as the prominent *epiglottis* (Fig. 252). The same sagittal section shows the anlage of the *incisors*.

The lip furrow (vestibulum oris) is still a solid plug of epithelial cells which will later split. The *thymus* increases strikingly in volume, surpassing considerably the neighboring thyroid (Fig. 252). The *thyroid* does not yet have follicles. Nevertheless, histologically it can be clearly distinguished from the parathyroids (Fig. 249).

The structure of the *lung* has not changed much since the previous stage.

The *stomach* is rapidly enlarging. The nonglandular portion, illustrated in Fig. 247, is lined by a multilayered cuboidal, sometimes flattened (squamous) epithelium.

The *spleen* (Fig. 247) contains distinct arteries and veins, separated by a rather compact tissue composed of various types of cells. Sometimes phagocytes can be recognized (Fig. 248), which seem to take up nuclei of red blood cells.

The *small intestine* now has longer, but still rather thick villi covered by columnar epithelium.

The large intestine is forming crypts.

In the *liver*, blood cell production is increasing. Externally, the final lobation is apparent [81]. The *pancreas* has finely branched, glandular trees, with distinct lumina, and pancreatic islets are budding. The typical  $\beta$ -cells cannot be seen with the light microscope until the 17th or 18th day [139].

The *suprarenals* appear as a regular network of strands composed of eosinophilic cells separated by wide capillaries. Scattered clusters of small medullary cells may also be seen.

## Urogenital Tract

The *kidneys* still have a large peripheral metanephric blastema (Fig. 247). Near the center, many glomeruli are well developed.

In the *testes* distinct interstitial cells can now be recognized.

## Central Nervous System

The primary cerebral cortex has enlarged considerably. In the diencephalon, the differentiation of the hypophysis and of the pineal gland is progressing. The epiphysis still has a central lumen, but the wall is markedly thickened (in Fig. 252 the wall is sectioned tangentially).

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FIG. 244. Eye, horizontal section, 16 days, 15 mm.

*Lid* = lower eyelid, *C* = cornea, *L* = lens, *G* = ganglion layer of retina.

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FIG. 245. Fetus of 16 days, life photograph, 15 mm.

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FIG. 246. Diagram of Fig. 245.

*V.u.* = vena umbilicalis, *V.v.* = vena vitellina, *Nb* = umbilical hernia (partially repositioned), *P* = placenta, *O* = pinna, *V.t.* = vena temporalis superficialis, *V.c.* = vena cephalica, *V.tb.* = vena thoracica lateralis, *V.m.* = venae metatarsae dorsales.

FIG. 247. Cross section, at the level of the spleen, 16 days.

*Ma* = stomach, *Md* = mesogastrium dorsale, *Ni* = left kidney, *RM* = spinal cord, *Ar* = rudiment of vertebral articulation.

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FIG. 248. Enlarged view of spleen in Fig. 247, with phagocyte (*arrow*) containing presumably nuclei of erythroblasts.

*A* = artery. 550:1

FIG. 249. Cross section, level of larynx, 16 days.

*Ly* = lymph vessel, *X* = nervus vagus, *Vj* = vena jugularis interna, *Ac* = arteria carotis communis, *Th* = thyreoidea (thyroid gland), *Pt* = parathyroid, *S* = cartilago thyreoidea, *La* = cavum laryngis.

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FIG. 250. Sagittal section through 5th thoracic vertebra.

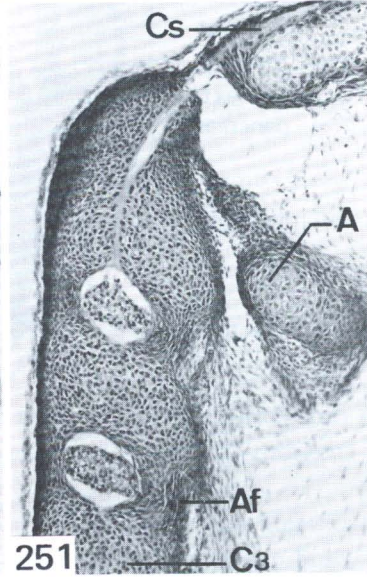
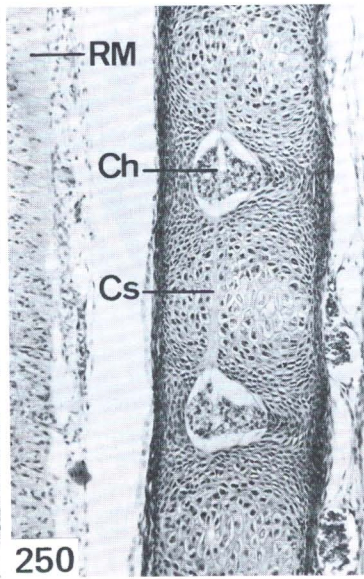
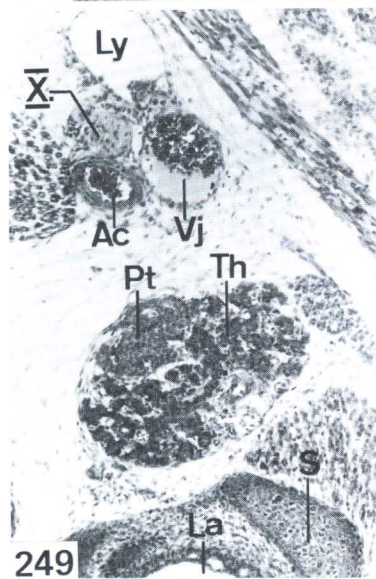
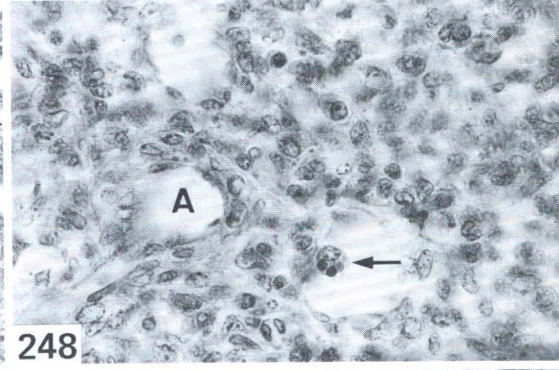
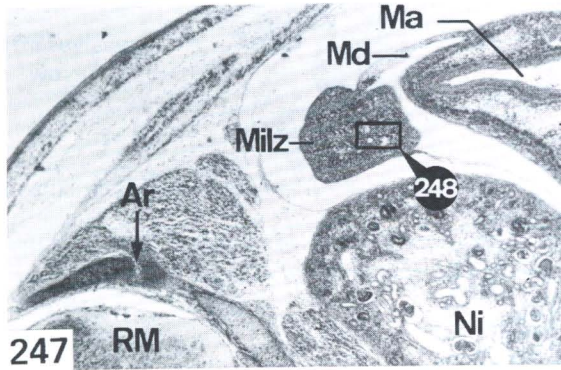
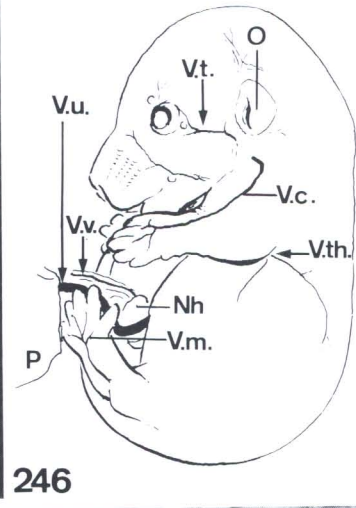
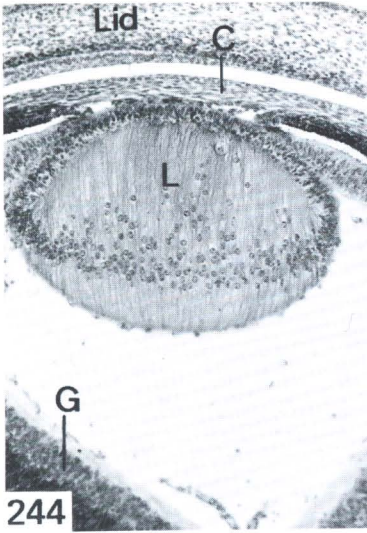
*RM* = spinal cord, *Cb* = notochordal segment, *Cs* = notochordal sheath, situated dorsally in calcified center of cartilage.

KT 646. 15 days. 105:1

FIG. 251. Sagittal section through axis, 16 days.

*Cs* = notochordal sheath, on clivus; *A* = anterior arch of atlas; *Af* = anulus fibrosus; *C<sub>3</sub>* = body of 3rd cervical vertebra.

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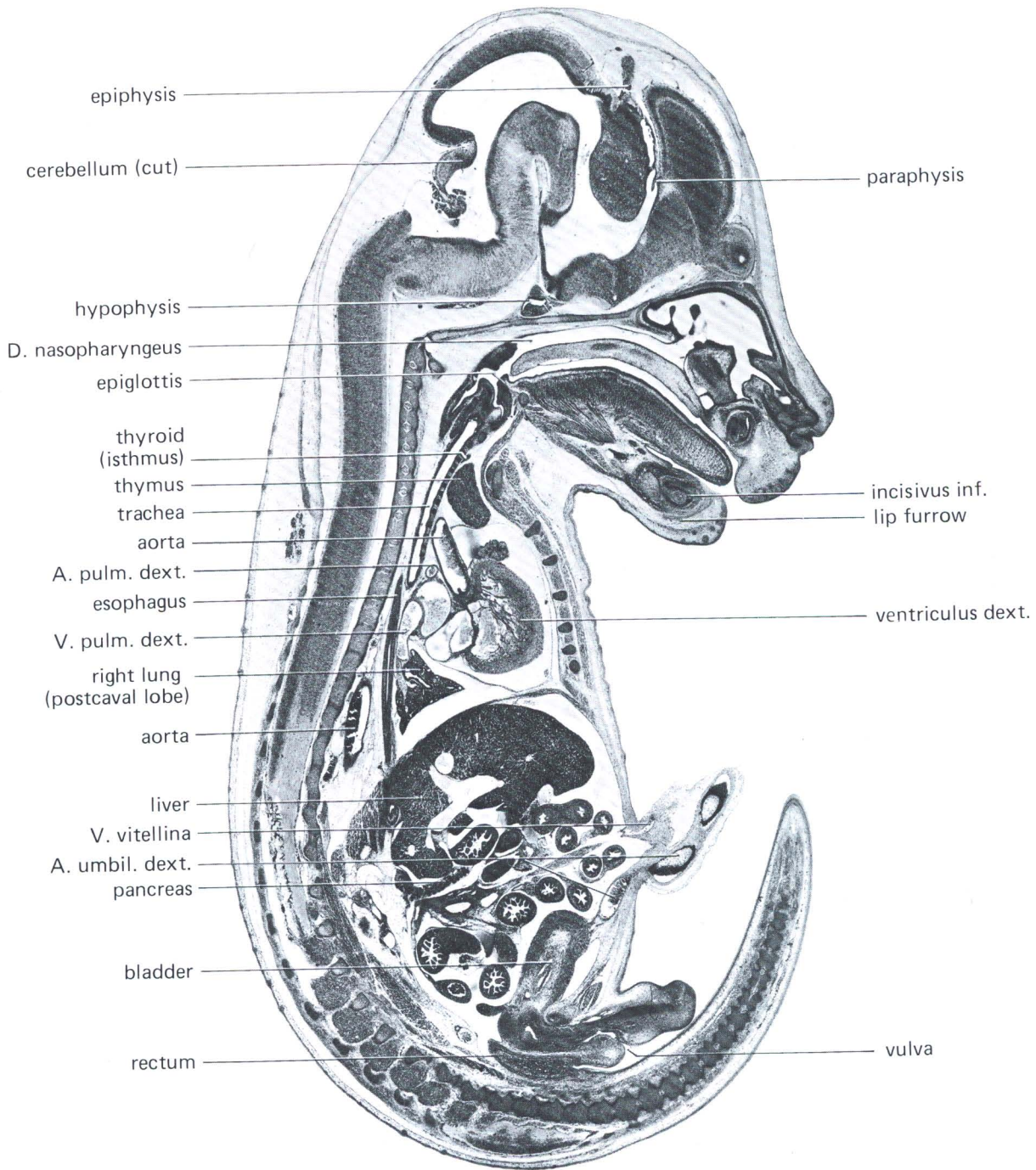
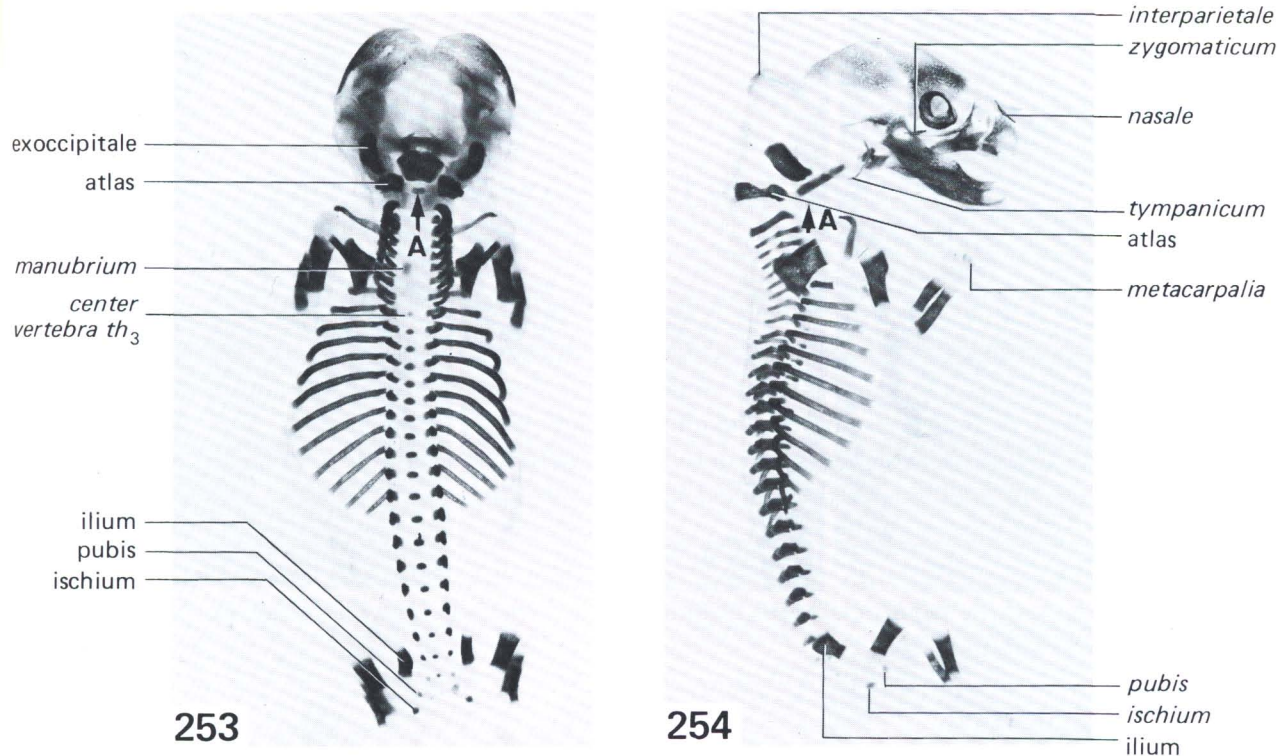


FIG. 252. Sagittal section. Female fetus, 16 days, 14.6 mm.  
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FIGS. 253–254. Alizarin-cleared preparations. Fetuses of 16 days. *New skeletal elements in italics* (in the previous stage, Figs. 242–243, these were not yet visible). *Arrows* indicate ossification center of anterior arch of atlas.

Anterior to the velum transversum, a small area represents the parphysis (Graumann [158]).

A thin transparent epithelial membrane is growing over the cornea of the *eye*. The iris and the corpus ciliare cannot yet be distinguished. The anterior chamber of the eye extends beyond the pupillary margin (Fig. 244).

The *retina* is not much more differentiated than in the 15-day stage. The labyrinth has a well developed cartilaginous capsule, which encloses the semicircular ducts and the ductus cochlearis. The sensory epithelia are thickened, but not well differentiated.

## Skeletal System

Most of the vertebral bodies contain initial ossification centers, i.e., calcium deposits within the cartilage, as shown in Fig. 250. Photographs of sagittal sections through the fifth thoracic vertebra will illustrate, in later stages, progressing ossification.

A salient feature of this developmental stage is the appearance of ossification centers in the anterior arch of the atlas and in other skeletal elements whose labels are in italics in Figs. 253–254.

Material	Age	
KT 646–47	16 days 2 h	7 fetuses, 14.0–15.2 mm
KT 1046–48	16 days 4 h	5 fetuses, 16–18 mm + 1 resorption