
HUMAN DEVELOPMENT AFTER THE FORTY-SECOND DAY

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I. Introduction.

This paper is concerned with the period of prenatal development after the 42nd day. The 7th week of development marks a time of several eventful changes in the external and internal features of the fetus.

II. Developments during and after the 7th week.

With the beginning of the 7th week of growth, or approximately at the time of the 42nd day, an osteocartilaginous skeleton is formed in the embryo. This gives it a characteristic human form. The trunk of the embryo becomes straight and the embryo now has a relatively large and rounded head (Figure 8-1). The eyes move to the front of the face in their specific position and the face acquires a human shape, i.e. it has been formed (Figure 8-2). The internal and external parts of the ear are formed after the 42nd day in a shape similar to that of the human, and the nose is also recognizably human. Limb buds which made their appearance towards the end of the 4th week are now (after the 42nd day) longer and show clearly defined fingers and toes which were not present before. The prominent tail bud has regressed, leaving a rudiment that is barely conspicuous. For comparison between the human embryo before and after the 42nd day, see Figures 7-2 and 8-2.

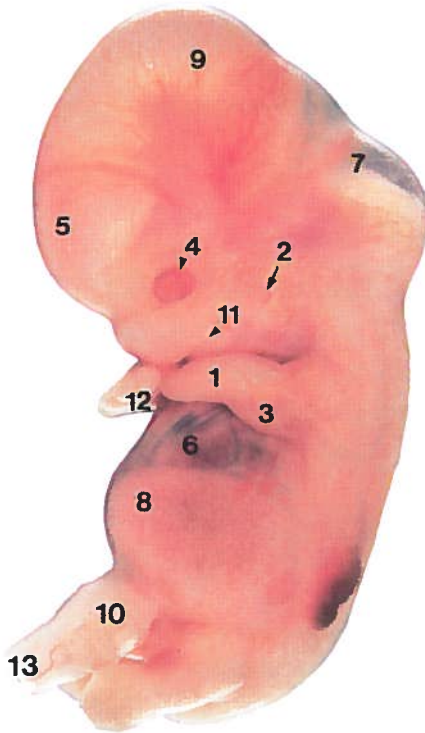


Figure 8-1. Embryo at the beginning of the 7th week (Day 40-42). The arms curve over the heart bulge and the toe rays are present on the foot. The size is 20 mm from crown to rump. 1, arm. 2, ear. 3, elbow. 4, eye. 5, forebrain. 6, heart bulge. 7, hindbrain. 8, liver bulge. 9, midbrain. 10, midgut herniation. 11, mouth. 12, notched hand plate. 13, umbilical cord. (Reproduced with permission from England, *Color Atlas of Life Before Birth*, Chicago, Year Book Medical Publishers Inc., 1983)

In the case of the external genital organs, the anlage, or primordium, are the same in both male and female, and they begin their development before the 42nd day, during the 4th week. The genital tubercle, labioscrotal swellings and urogenital folds do not evolve into distinguishing sexual characteristics until the 9th week. The differentiation between the male and the female fetuses can be made after the 12th week only (See Chapter 6, “Nash’ah Stage”).

The eyes and ears continue to develop advanced features after the 42nd day. At 11 weeks of development, even though the size of the eye is the size of a small bean, it shows more advanced features such as the cornea. By the 7th month, the retina is light sensitive, but perception of form and color develops only shortly after birth.

By the end of the 7th week, or 49th day, the cochlea coils of the ear are already established and to a large extent resemble the adult form. Chondrification of the precartilagae ear ossicles begins about

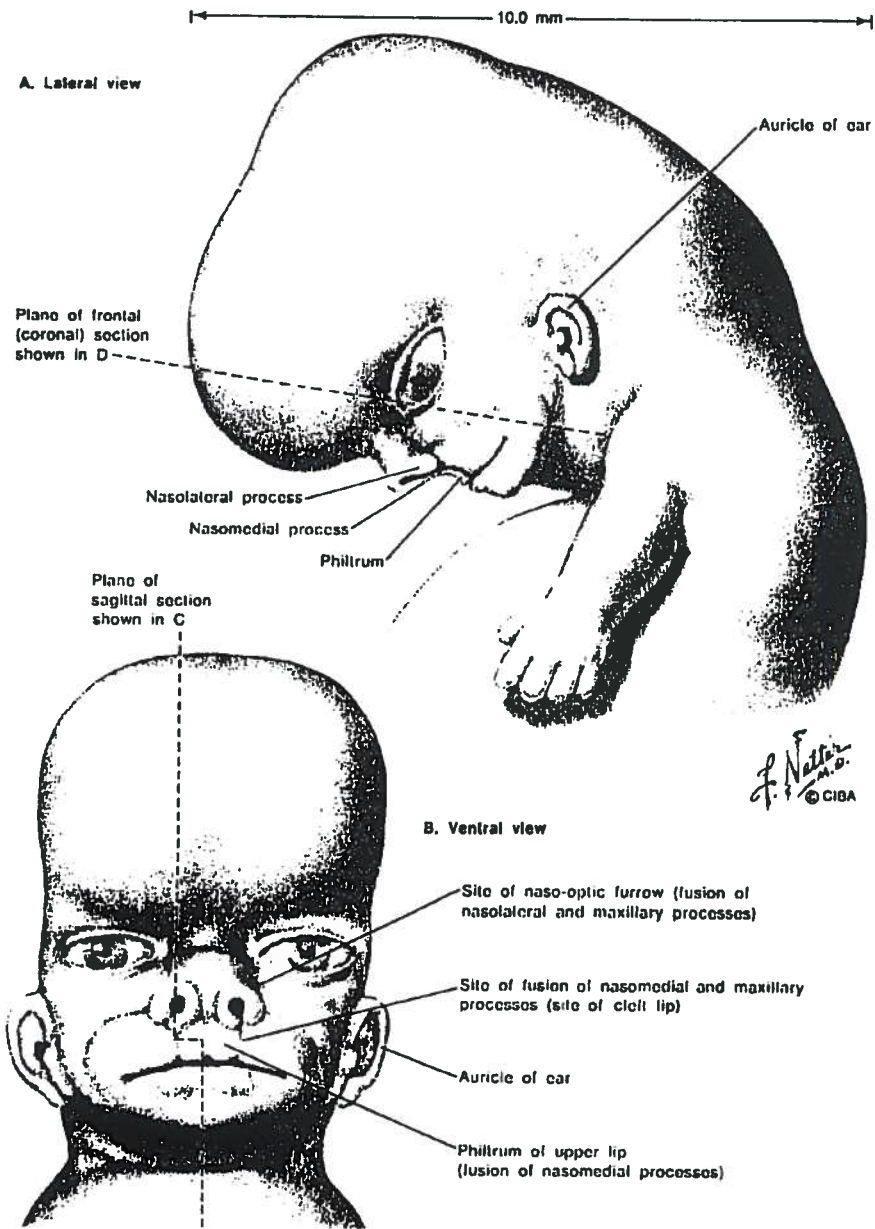


Figure 8-2. Drawing of embryo at 7 to 8 weeks. The appearance is now clearly that of a human embryo. (Reproduced from CIBA, *Clinical Symposia*, Vol. 28, No. 3)

this time and the auricle is formed from three pairs of tubercles (See Figure 8-2). It has been suggested that the fetus can hear sounds after the 24th week. (This relates to the functioning of body systems which occurs in the nash'ah stage, which is described in Chapter 6.) Thus the external, middle and internal parts of the ear are not formed until after the 42nd day and then acquire their function and recognizable shape. The skeletal system, muscles and skin also develop recognizable human characteristics after the 42nd day.

There is much to learn of the instinctive, intuitive and emotional development of the fetus. After the 42nd day, there is abundant evidence of brain activity as demonstrated by electroencephalography. A fetus between the age of 6 and 7 weeks will show an entire body response if the lip area is gently stroked. Spontaneous movements such as squinting and swallowing appear much later between the 9th and 10th week. Sir William Liley described the fetus after the 42nd day as follows:

“He is responsive to pain and touch and cold and sound and light. He drinks his amniotic fluid, more if it is artificially sweetened, less if it is given an unpleasant taste. He gets bored with repetitive signals but can be taught to be alerted by the first signal for a second.”

Studies of the human fetus after the 42nd day have revealed distinct behavioral traits not unlike those of the parents. Already the fetus has evolved its own unique personality, perhaps as a thinking, conscious and feeling being. (See Chapter 6, “Nash'ah Stage,” for a discussion regarding the acquisition of the soul.)

III. Human development after the 42nd day according to the Prophet's ḥadīth.

Prophet Muḥammad (peace and blessings be upon him) mentioned the developments described above and their timing in the following ḥadīth which was narrated by Ḥudhayfah:

”عَنْ حُذَيْفَةَ رَضِيَ اللَّهُ عَنْهُ أَنَّ رَسُولَ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ قَالَ: "إِذَا مَرَّ
 بالنطفةِ ثِنْتَانِ وَأَرْبَعُونَ لَيْلَةً بَعَثَ اللَّهُ إِلَيْهَا مَلَكًا فَصَوَّرَهَا، وَخَلَقَ سَمْعَهَا
 وَبَصَرَهَا، وَجِلْدَهَا، وَلَحْمَهَا، وَعِظَامَهَا، ثُمَّ قَالَ يَارَبُّ أَذْكَرُ أَمْ أُنْثَى؟ فَيَقْضِي
 رَبُّكَ مَا شَاءَ، وَيَكْتُبُ الْمَلِكُ" (صَحِيحُ مُسْلِمٍ: كِتَابُ الْقَدْرِ)

“When 42 nights have passed over the conceptus, God sends an angel to it, who shapes it (into human form) and makes its hearing, sight, skin, muscles and bones. Then he says, ‘O Lord, is it male or female?’ and your Lord decides what He wishes and the angel records it” (Ṣaḥīḥ Muslim: Kitāb Al-Qadar).

This ḥadīth describes the importance of the 42nd day in the intrauterine prenatal development. Embryological studies have shown that the human appearance is acquired during this time, just as mentioned in the ḥadīth. Prior to the 42nd day, it is difficult to distinguish the human embryo’s appearance from the appearance of embryos of many other species such as the chicken, fish, or rabbit (Figure 8-3). After the 42nd day, the human shape begins to be recognizable (Figure 8-4). The ḥadīth refers to these processes as *taṣwīr ādamī* or shaping into human form.

The reference to hearing and sight in the ḥadīth indicates the development of the organs of the eyes and ears, and the initial changes necessary for their functioning. It is understood that the 7th and 8th weeks are critical periods for the embryonic development of the ear, since it has been observed that rubella infection at this time can cause maldevelopment of the organ of Corti and a resulting defect in hearing (Figure 8-5, 8-6). The optic stalk between the eye and brain undergoes changes which result in the formation of the optic nerve between the 6th and 8th weeks (Figures 8-7, 8-8). The formation of skin involves its differentiation into its layers, sebaceous and sweat glands, and hair, which are recognized in complete skin, and the development of its functions through innervation. The process of differentiating into layers begins in the 7th week (Figure 8-9) and formation of the glands and hair occur a few weeks later. Sensitivity to touch, pain, and temperature, which would indicate that innervation has occurred, is present after the 42nd day, as stated by Liley above.

As discussed in Chapter 5, the cartilaginous skeleton is formed, and ossification begins, in the 7th week, and myogenesis, which results in muscle formation around the bones, begins in the 8th week. These processes serve to straighten and smooth the embryo’s body and contribute to the development of the human shape.

With regard to the sex of the embryo, the ḥadīth refers to the



Figure 8-3. Embryo at 30 days, about 6-7 mm (0.24-0.28 inch). The organs are partly differentiated and partly undifferentiated during the mudghah stage. The embryo now has a body with a head, a trunk, and a tail. The heart is positioned, almost literally, in the embryo's mouth. On the side of the trunk, an arm bud and a leg bud bulge out. The apparent shape of the embryo can not be distinguished as that of a human at this time. Early stages of embryos of some other species such as chicken, fish, or rabbit appear similarly to this stage in the human. (Reproduced with permission from Nilsson *et al*, *A Child is Born*, New York, Delacorte Press, 1982)

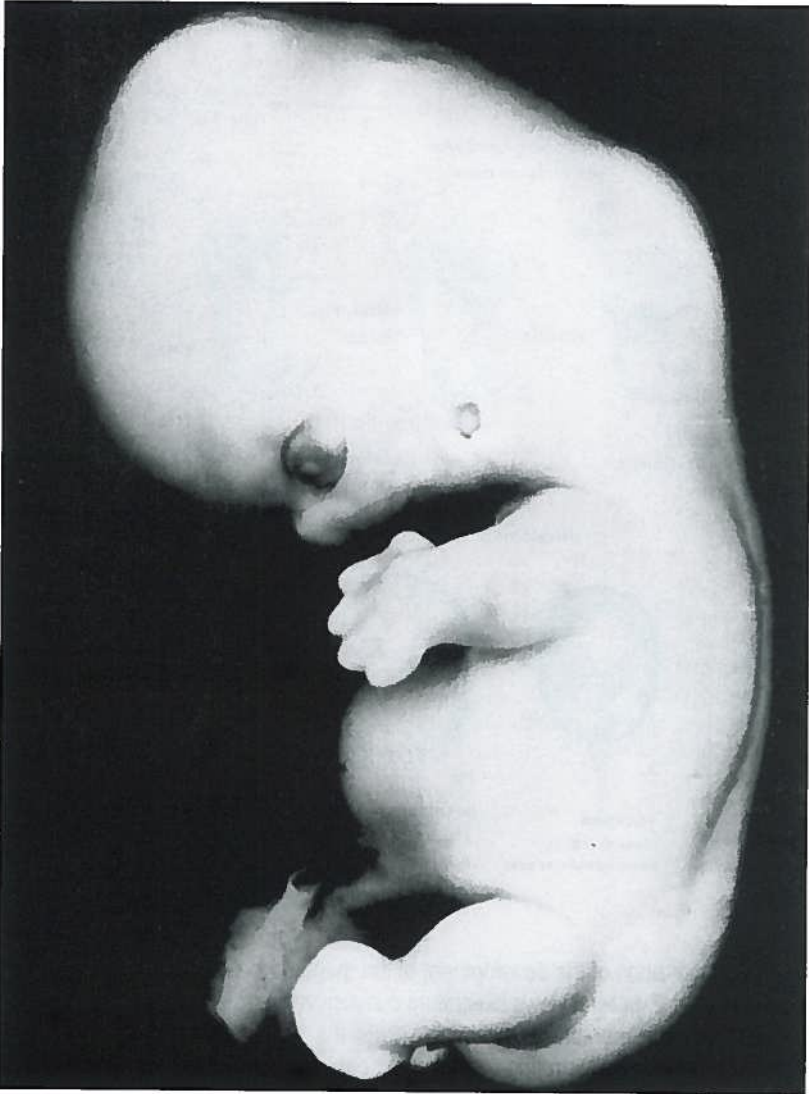


Figure 8-4. Embryo at about 48 days, during the 'izam stage. Actual size: 18.0 mm. The eye is noticeably well-developed, there are notches between the digital rays of the hand, and the developing external ear is set low upon the head. Taswir adami (forming the human shape) is clearly recognizable at this time, due to the formation of the cartilaginous skeleton and the beginnings of ossification. (From Dr. Kazumasa Hoshino, former Professor of Anatomy and Director of the Congenital Anomaly Center, Faculty of Medicine, Kyoto University, Kyoto, Japan, and reproduced with permission from Moore, K.L., *The Developing Human*, 4th ed., Philadelphia, Saunders, 1988)

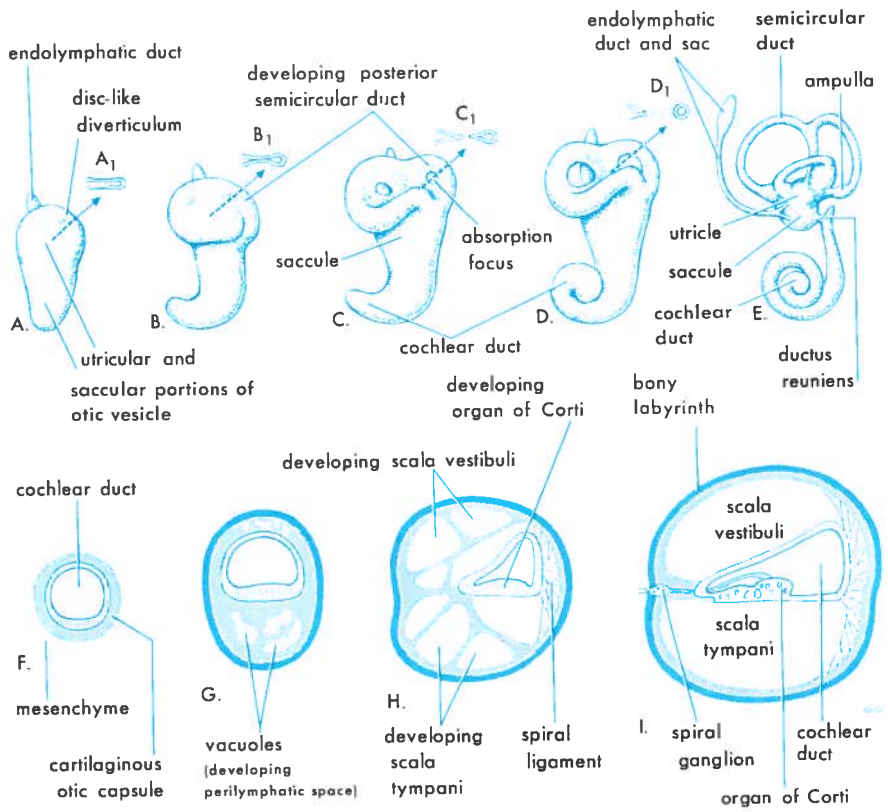


Figure 8-5. Illustration of the development of the membranous and bony labyrinths of the internal ear. *A to E*, Lateral views illustrating successive stages in the development of the otic vesicle into the membranous labyrinth from the 5th to the 8th weeks. *A₁ to D₁*, Diagrammatic sketches illustrating the development of a semicircular duct. *F to I*, Sections through the cochlear duct showing successive stages in the development of the spiral organ (of Corti) and the perilymphatic space from the 8th to the 20th week. The organ of Corti transfers the vibrations of sound to the nerve (See *I*) and defects in its development directly impact the ability to hear. (Reproduced with permission from Moore, K.L., *The Developing Human*, 4th ed., Philadelphia, Saunders, 1988)

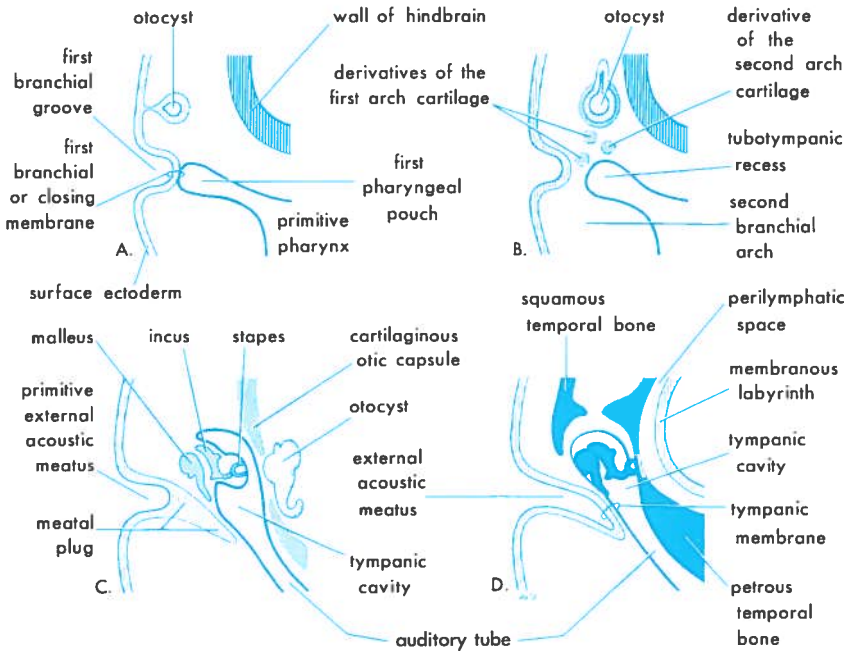


Figure 8-6. Drawings showing the development of the external and middle ear. *A*, Four weeks, illustrating the relation of the otic vesicle of the branchial apparatus. *B*, Five weeks, showing the tubotympanic recess and branchial (pharyngeal) arch cartilages. *C*, Later stage, showing the tubotympanic recess (future tympanic cavity and mastoid antrum) beginning to envelop the ossicles. *D*, Final stage of ear development, showing the relationship of the middle ear to the perilymphatic space and the external acoustic meatus. Note that the tympanic membrane develops from three germ layers: surface ectoderm, mesoderm, and endoderm of the tubotympanic recess. (Reproduced with permission from Moore, K.L., *The Developing Human*, 4th ed., Philadelphia, Saunders, 1988)

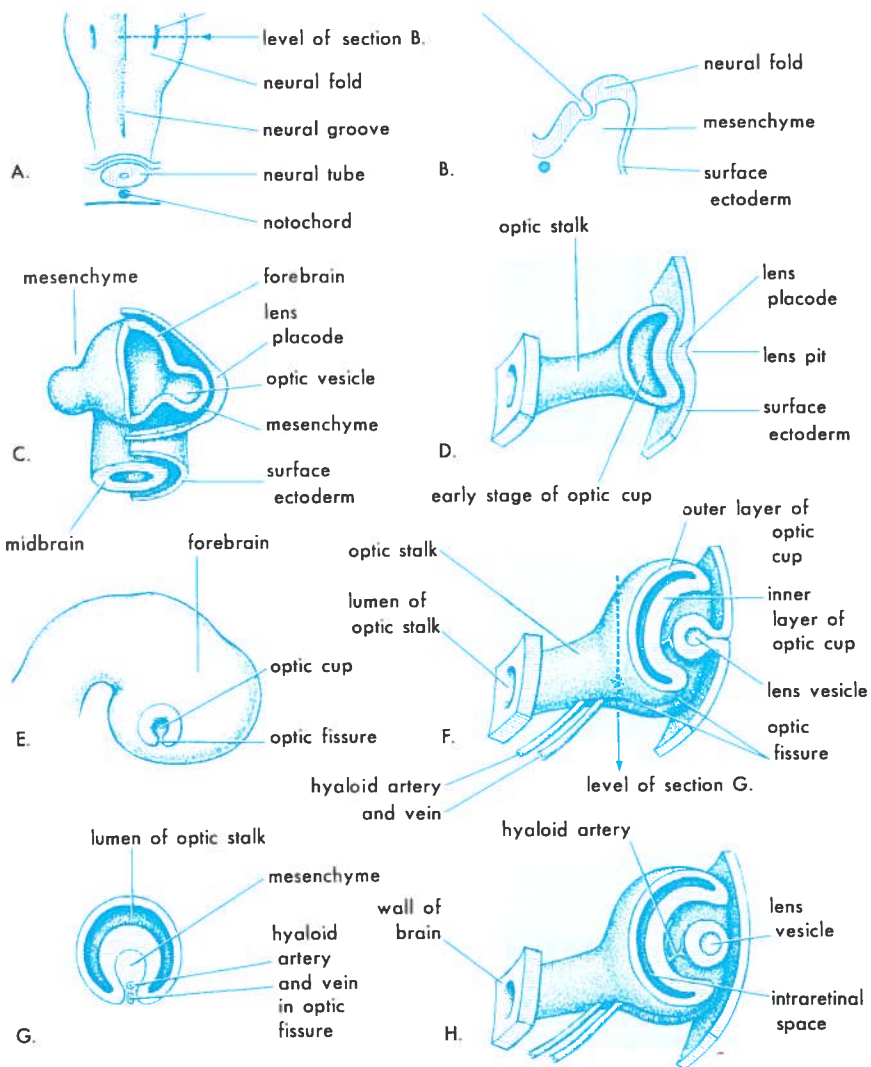


Figure 8-7. Illustrations of early eye development. **A**, Dorsal view of the cranial end of an embryo of about 22 days, showing the first indication of eye development. Note that the neural folds have not fused to form the primary brain vesicles at this stage. **B**, Transverse section of an optic sulcus. **C**, Schematic drawing of the forebrain, its covering layers of mesoderm and surface ectoderm, at about 28 days. **D**, **F**, and **H**, Schematic sections of the developing eye, showing successive stages in the development of the optic cup and lens vesicle. **E**, Lateral view of the brain of an embryo of about 32 days, showing the external appearance of the optic cup. **G**, Transverse section of the optic stalk, showing the optic fissure and its contents. Note that the edges of the optic fissure grow together and fuse, thereby completing the optic cup and enclosing the central artery and vein of the retina in the cup and the optic nerve. (Reproduced with permission from Moore, K.L., *The Developing Human*, 4th ed., Philadelphia, Saunders, 1988)

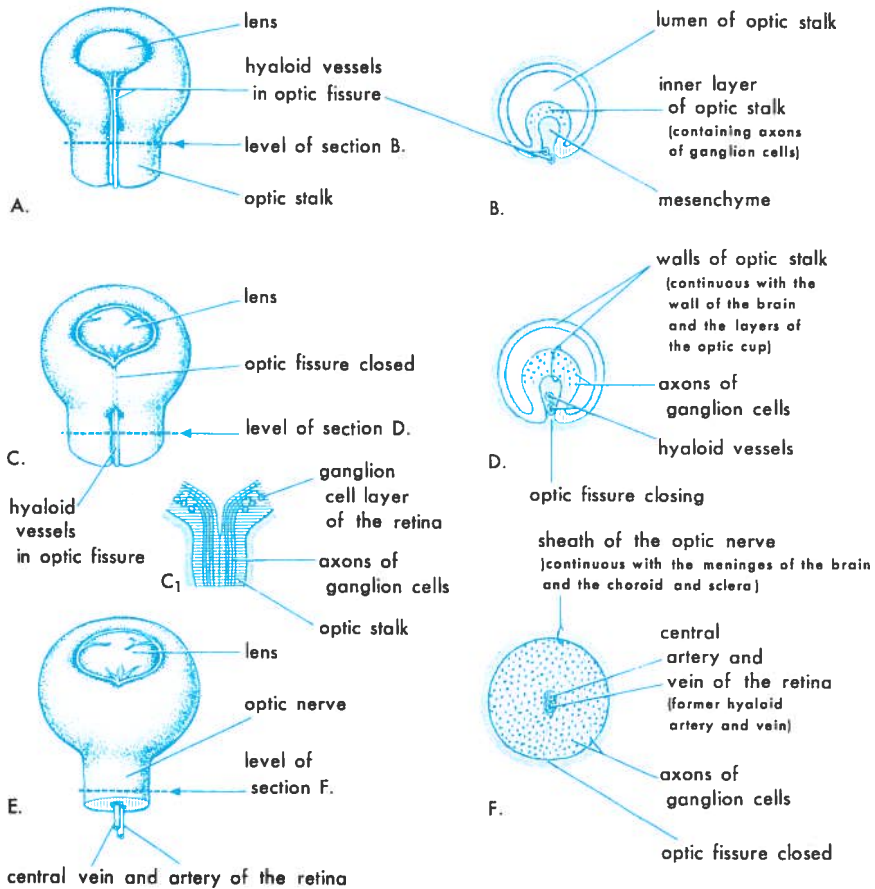


Figure 8-8. Drawing showing the closure of the optic fissure and formation of the optic nerve. A, C, and E, Views of the inferior surface of the optic cup and stalk, showing progressive stages in the closure of the optic fissure. C₁, Schematic drawing of a longitudinal section of a portion of the optic cup and optic stalk, showing axons of ganglion cells of the retina growing through the optic stalk to the brain. B, D, and F, Transverse sections of the optic stalk, showing successive stages in the closure of the optic fissure and in formation of the optic nerve. The optic fissure normally closes during the 6th week, just prior to the 7th week, and formation of the optic nerve is necessary for the function of sight. Note that the lumen of the optic stalk is gradually obliterated as axons of ganglion cells accumulate in the inner layer of the optic stalk as the optic nerve forms. (Reproduced with permission from Moore, K.L., *The Developing Human*, 4th ed., Philadelphia, Saunders, 1988)

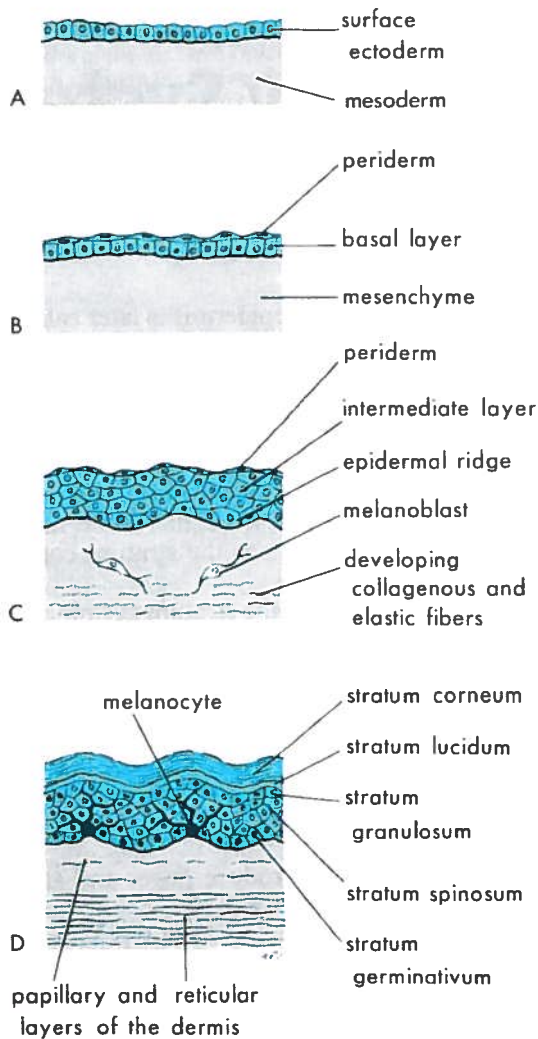


Figure 8-9. Illustrations of successive developments in the formation of thick skin. *A*, Four weeks. *B*, Seven weeks. The periderm is just beginning to form at this time. *C*, Eleven weeks. The cells of the periderm are continually undergoing keratinization and desquamation, and the exfoliated peridermal cells comprise part of the vernix caseosa which coats the fetal skin. *D*, Newborn. The dendritic branches of the melanocytes in the basal layer of the epidermis supply the epidermal cells with melanin. (Reproduced with permission from Moore, K.L. and Persaud, T.V.N., *The Developing Human*, 5th ed., Philadelphia, Saunders, 1993)

development of the external genitalia and not to the primary genetic sexual determination which is established with fertilization in the nutfah stage (See Chapter 2, "The Nutfah Stage"). The Qur'ān mentions this fact as follows:

"وَأَنَّهُ خَلَقَ الذَّكَرَ وَالْأُنثَىٰ مِنَ نُطْفَةٍ إِذَا تُمْنَىٰ" (النَّجْم: آيَاتُ ٤٥، ٤٦)
 "...And that He did create the two sexes, the male and female from nutfah, as it is emitted or planned" (Surah An-Najm, 53: Āyāt 45,46).

In the preceding ḥadīth, the question by the angel relates to the determination of the distinctive external genitalia which develop during the 12th week after the embryo has acquired its human form. The conjunction "thumma" is used in the ḥadīth to refer to the time of formation of the external genitalia and therefore means that this formation occurs after the development of the other processes mentioned in the ḥadīth.

The functioning of the organ systems mentioned in the ḥadīth begins in a later stage, for the creation of these systems precede their further development which is necessary for functioning.

The above-mentioned ḥadīth indicates the development and function of these organs, their timing, and the day after which these systems are created. Modern scientific information and embryological studies are in full agreement with the statements recorded in the Qur'ān and the Sunnah 14 centuries ago.



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