

PERSPECTIVE

Are the Bones of the Cranial Vault in Newborns Connected to Each Other by Sutures?

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Abstract

The skull of a newborn differs from the skull of an adult in many aspects, including the shape of the sutures and the presence of fontanelles. The sutures in an adult's skull that connect adjacent bones are fixed fibrous joints "synarthroses". The edges of the bones are serrated like sutures. On the other hand, in newborns these joints are flexible and slightly mobile with wide gaps where more than two bones meet. These gaps

are called fontanelles, and they close later as the baby grows. Fontanelles are of great clinical importance in monitoring normal growth and checking for diseases that may affect children. Although the joints of the cranial bones are quite different in newborns than in adults, some authors call them sutures in both cases. This may be inaccurate, and a distinction must be made between the terms in both cases, which may express quite different structures. Therefore, we suggest calling them fibrous joints with an interosseous membrane rather than sutures in newborns.

Key Words: *Skull; Cranial sutures; Cranial fontanelles; Joints*

The skull, including the mandible, consists of 22 bones [1]. The skull bones consist of two main parts: the neurocranium, which protects the brain, and inner parts of the ears, and the viscerocranium, which forms the bones of the face [2,3]. The cranial vault consists of a pair of parietal and temporal bones plus a single frontal bone and a posterior occipital bone [4].

The bones of the vault are connected to each other by fibrous joints. These joints are called sutures that can be defined as immovable synarthrosis [5]. However, the fibrous joints in

the newborn's skull are flexible, and the bones are separated by spaces of approximately 5 mm [1]. Gaps at the suture sites allow the skull bones to grow into the membrane [6]. Moreover, the adjacent bones can move closer together during vaginal delivery to reduce the diameters of the skull to allow it to pass easily through the birth canal. Furthermore, the bones adjacent to the cranial vault may override each other slightly at birth to facilitate the passage of the newborn's head during vaginal delivery. On the other hand, these fibrous connections of the cranial vault bones allow the brain, which is located

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inside the skull, to grow after birth. Therefore, it is recommended not to place tight bandages around the skull of a newborn baby for long periods of time so as not to hinder brain growth. This may be very important in the early stages of the baby's growth after birth, at least until the cranial fontanelles close [7]. Although there is a significant difference between the joints of the skull in adults and newborns, many authors do not differentiate in names and call them sutures, both in adults and newborns [8,9].

The skull of a newborn can be distinguished from that of an adult by several criteria, including that the frontal bone consists of two halves, separated by a frontal suture (also called the metopic suture). The two halves fuse together and the frontal suture gradually disappears until the seventh year of age. The mandible also consists of two halves at the symphysis menti. The two halves fuse together by the end of the first year of life. The bones of the skull are mobile, as they are separated by connective tissue. The gaps between the bones of the skull widen in some places where more than two bones meet, forming fontanelles (small fountains), which are closed by membranes. There are six fontanelles; two in the upper middle of the skull and two on each side (Figures 1 and 2). The most important fontanelles are the anterior and posterior fontanelles because they are more palpable and can be used to diagnose the position of the fetal head during vaginal delivery. The anterior fontanelle is the largest, diamond-shaped, and is bounded by four bones: the two halves of the frontal bone, anteriorly and two parietal bones, posteriorly. It closes at approximately 18 months of age. The posterior fontanelle is small and triangular in shape, and is bounded by only three bones: the two parietal bones, anteriorly and the occipital bone, posteriorly. It closes at approximately six months of age. Clinical palpation of the fontanelle not only

helps in diagnosing the position of the head during birth, but also helps in diagnosing the progress of growth of the surrounding bones after birth, checking the degree of dehydration by diagnosing a depressed fontanelle, and checking the degree of intracranial pressure by diagnosing a bulging fontanelle [1,7].

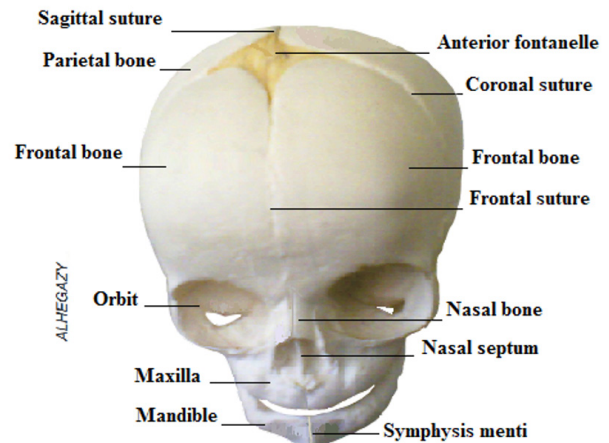


Figure 1) Photograph of newborn skull [3].

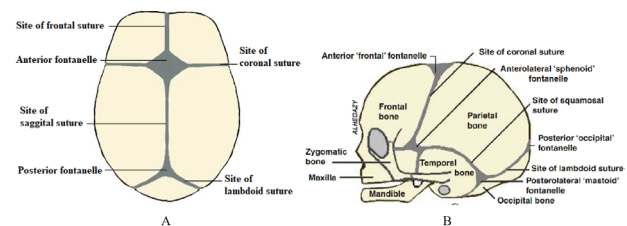


Figure 2) Diagrams showing newborn skull A) Superior view B) Lateral view [1,7].

Sutures are fixed fibrous joints where the cranial bones of the adult skull are joined by fibrous tissue without wide separation as in the newborn skull. In addition to the fibrous adhesion of adjacent bones in the adult skull, the edges of the bones are serrated and interlocked at the cranial sutures to give greater strength and stability to the bones of the adult skull (Figure 3). In adults, the appearance of cranial sutures may be similar to that of suturing a wound, which is perhaps why these skull joints are called sutures. On the other hand, the bones of the newborn's skull are not serrated, and are separated from other adjacent bones by gaps approximately 5 mm wide closed by an interosseous membrane [1]. Therefore, we suggest that the joints of the

newborn's skull should not be called sutures or synarthroses, but rather fibrous joints in which the bones are connected to each other by an interosseous membrane.

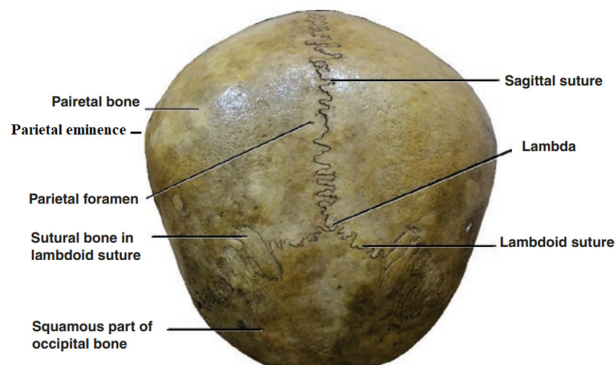


Figure 3) Photograph of posterior view adult skull showing some sutures [1].

Conclusion

In conclusion, the skull of a newborn differs from the skull of an adult in many respects including that the frontal bone and the mandible

each consist of two halves. One of most important differences between them is that the skull bones in newborns are not adherent at synarthrosis as is the case in adults but are connected by fibrous membranes. Furthermore, the vault of a newborn skull contains wide gaps where more than two bones meet called fontanelles, which are also closed by a fibrous membrane. The joints between the bones of the cranial vault in newborns cannot be considered sutures, but rather fibrous joints connected by an interosseous membrane.

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