

Orthodontics

Growth and development

GROWTH: PATTERN, VARIABILITY AND TIMING

1-Pattern:

In studies of growth and development, the concept of pattern is an important one. In a general sense, pattern reflects proportionality, usually of a complex set of proportions rather than just a single proportional relationship, because it refers not just to a set of proportional relationships at a point in time, but to the change in these proportional relationships over time. In other words, the physical arrangement of the body at any one time is a pattern of spatially proportioned parts.

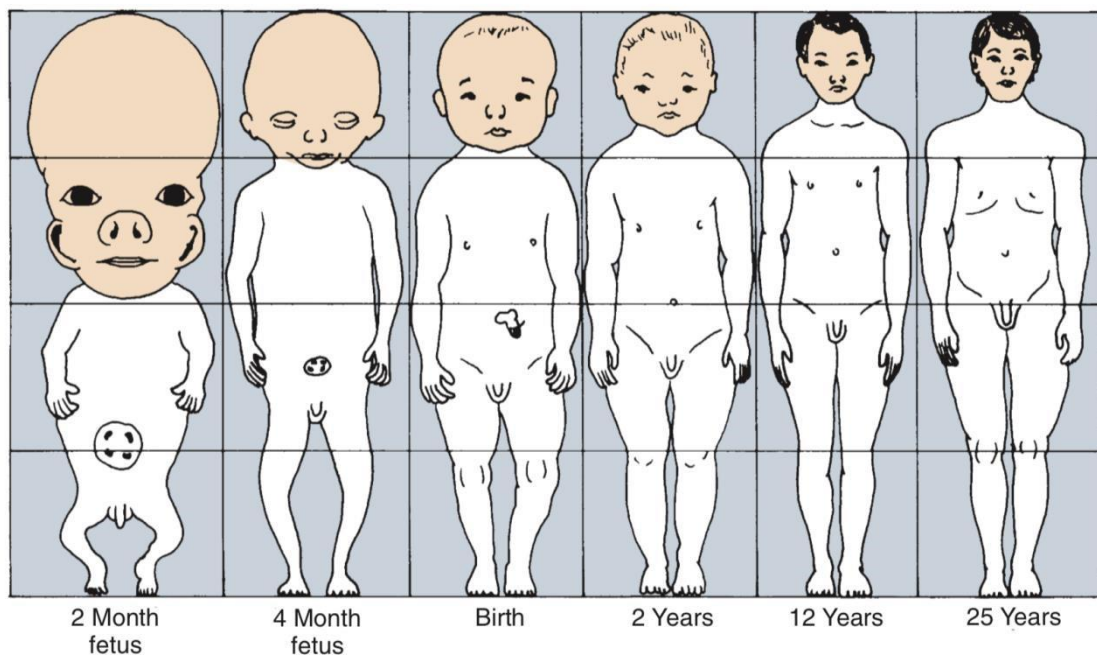


Figure 1 illustrates the change in overall body proportions that occurs during normal growth and development.

In fetal life, at about the third month of intrauterine development, the head takes up almost 50% of the total body length. At this stage, the cranium is large relative to the face and represents more than half the total head. In contrast, the limbs are still rudimentary and the trunk is underdeveloped.

By the time of birth, the trunk and limbs have grown faster than the head and face, so that the proportion of the entire body devoted to the head has decreased to about 30%. The overall pattern of growth thereafter follows this course, with a progressive reduction of the relative size of the head to about 12% of the adult. At birth, the legs represent about one third of the total body length, while in the adult, they represent about half.

As Figure (1) illustrates, there is more growth of the lower limbs than the upper limbs during postnatal life. All of these changes, which are a part of the normal growth pattern, reflect the "cephalocaudal gradient of growth." This simply means that there is an axis of increased growth extending from the head toward the feet.

As the face enlarges it grows downward and forwards away from the cranium, the growth of the face

involving many growth processes in the mandible, mid face, cranial base, all of these are going on at the same time, and the overall pattern of growth result from the interplay between them.

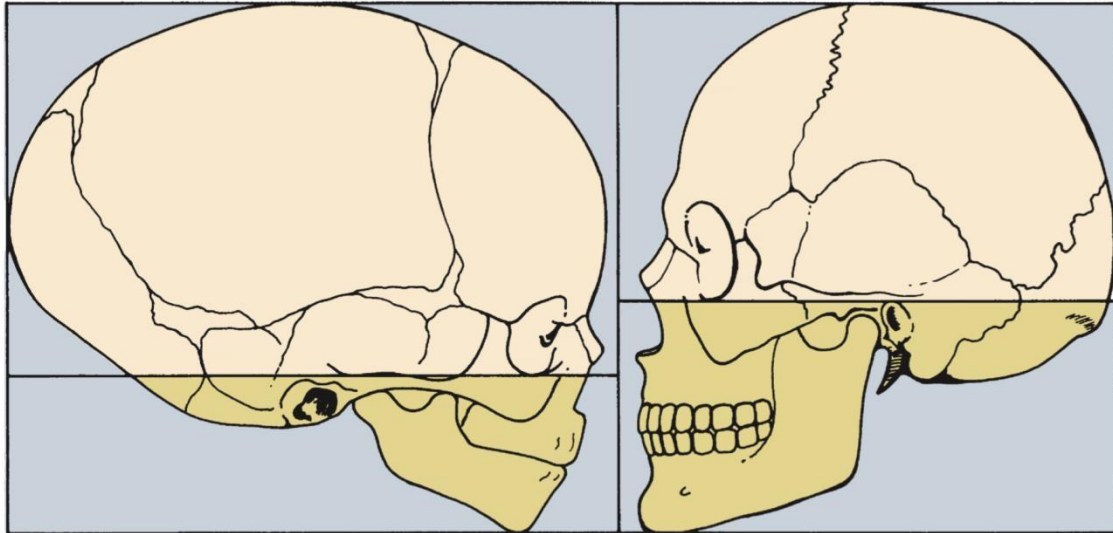


Fig (2): At birth, the face and jaws are relatively underdeveloped compared with their extent in the adult, there is much more growth of facial than cranial structures postnatally.

Even within the head and face, the cephalocaudal growth gradient strongly affects proportions and leads to changes in proportion with growth, so when the skull of a newborn infant is compared proportionally with that of an adult (fig. 2), it is easy to see that the infant has a relatively much larger cranium and a much smaller face.

When the facial growth pattern is viewed against the perspective of the cephalocaudal gradient, it is not surprising that the mandible, being farther away from the brain, tends to grow more and later than the

maxilla, which is closer, and this is considered as advantage in treatment of skeletal Class II and disadvantage in treatment of skeletal Class III.

Different systems of body have different growth patterns in terms of rate and timing and four main types are recognized:

- 1- **Lymphoid growth**
- 2- **Genital growth**
- 3- **Neural growth:** Determined by the growth of the brain, and the calvarium follows this pattern of growth, in other words the bones grows in response to the growth of another structure. There is rapid growth of cranium in the early years of the life, but this slows until about 8 years, growth is almost complete. The orbits follow the neural growth pattern.
- 4- **Somatic growth:** Is that followed by most of body structures. It is seen in the long bones leading to increase in the body height, This growth is fairly rapid in the early years but slows in the pre-pubertal period, while the pubertal growth spurt (11years in girls, 13 years in boys) is a time of very rapid growth, which followed by further slower growth.