

# The Smile or the Frown: How the face develops through the first trimester of Pregnancy

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As Samuel Taylor Coleridge said,

*"The history of man for the nine months preceding his birth would probably be far more interesting and contain events of greater moment than all the three score and ten years that follow it."*

In this article we are going to look at how the face of a child develops and how all of the very critical events which lead to normal facial growth occur during the first four to eight weeks after conception -- often before the mother even knows she is pregnant! After looking at normal growth and development, we'll look at those environmental factors that play a significant role in developmental malformations of the face.

## Normal Growth and Development

The first sign of growth in the area of the face is in the expansion of the head and brain in the first or second week. A little pit appears, deepens and forms the outline of the mouth. The tissues immediately surrounding this pit will form the face. In the fourth week, the heart, which occupies most of the chest cavity, beats for the first time and becomes responsible for the nourishment of the fetus. At about five weeks, the face appears "crowded" between the rapidly growing brain and the heart. The face shifts downward and forward as it grows out from between these two organs.

The face at the fifth week is about as thick as the sheet of paper, and the whole face is only about six tenths of an inch wide. However, the next two weeks, from five weeks to seven weeks of gestation, are probably the most important in one's life, because it is during this two-week time period that the critical components of the face form. At five weeks, two small raised areas appear just above the future mouth. In the next 48 hours, the centers of these raised areas become depressions and these depressions deepen into pits that will become the future nostrils and nose. In order to form the nose and lips as we know them, the tissues on either side of the pit fuse together to differentiate the nostrils and form the upper lip. By seven weeks, the roof of the mouth is forming and separates the nose from the mouth.

By six weeks the eyes appear at the sides of the head, and the lower jaw is broad and wide and makes up the lower lip. At this time also, the early buds of the ears appear at the side of the mouth. With continual development, the eyes migrate from the side to the front of the face and the ears are carried back to the side of the head. By the seventh week then, the face is recognizably human.

## Origin of Facial Malformations

Structural birth defects occur in 7 1/2 to 9 percent of live births in the United States. Twenty-five percent of these structural defects are craniofacial, equivalent to about 3.25 million live births in the U.S. The most common craniofacial birth defects are:

- Cleft lip and/or cleft palate appears in one of every 800 births, where there is a large opening on one or both sides of the upper lip stretching up to the nose, with or without a large opening in the middle of the roof of the mouth.
- Hemifacial microsomia, appears in one of every 4,000 births, where there is severe facial asymmetry because one half of the lower jaw and the ear on that side does not develop.
- Fetal alcohol syndrome, appears in one of every 500 births, where there are severe facial deformities of the eyes, nose, and jaws along with severe mental retardation.
- Treacher Collins syndrome, appears in 1 in 50,000 births, where there is underdevelopment of the middle one-third of the face, with malformed or absent ears and downward slanting eyes.

It is during the first three to seven weeks of the first trimester of pregnancy that the fetus is most susceptible to environmental damage. As we saw above, that is the time period in which the critical components of the face are formed, and this is why such a high percentage of birth defects occur in the head and face.

## Causes of Birth Defects

The most common causes of birth defects in the head and face are: alcohol, caffeine, nicotine, amphetamines, cocaine, heroin, valium, aspirin, excessive amounts of vitamins A, K, and E, radiation, and increased age of the mother.

Unfortunately, most women do not realize they are pregnant in the first three to seven weeks of pregnancy. Continuing to smoke, drink alcohol, or do drugs during this critical time period has disastrous results on the developing fetus. A very sad case in point was the thalidomide crisis of 1959. Thalidomide is a sedative hypnotic, used to counteract morning sickness and had been given to pregnant women in their first trimester. Taken at physiological doses, it had no harmful effects on the mother, but caused severe birth defects in the developing fetus. The irony of the thalidomide disaster is that it was tested exhaustively in rats, prior to its general release onto the market. It was later discovered that rats are resistant to thalidomide -- if dogs or mice had been used for research on the drug, the problems would have been discovered immediately.

Isn't it remarkable that the face we have for the duration of our lifetimes is completely formed during only two very critical weeks of gestation? Those children born with facial defects and malformations struggle with problems and hardships of a particularly poignant kind. Modern-day orthodontics and dentofacial orthopaedics, however, can greatly minimize the severity of these defects: we start to treat these children in their very early years, moving the bones of their faces into more favorable positions throughout their growing years, so as to mask the extent of the deformity, and allow them to lead more normal, less isolated lives. Orthodontics and dentofacial orthopaedics provide the second chance that nature, and the effects of the environment in our bodies, might have taken away.

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