DiGeorge Syndrome Development: "The Timing Is Off," Part 7 (Parathyroid Glands)

By Terry O. Harville, MD, PhD

PREVIOUSLY, WE discussed the improper timing and sequence of the formation of anatomic structures that result in DiGeorge syndrome (DGS) and partial DGS (PDGS) features. In this issue, we continue the discussion of the improper timing of the parathyroid glands.

The parathyroid glands are critical for maintaining calcium and phosphorus levels in the body. They do this by secreting the parathyroid hormone (parathormone, or PTH) and calcitonin (a polypeptide hormone) that regulate absorption of calcium and phosphorus from the intestines, kidneys and metabolism into the bones (vitamin D also plays a critical role in these processes), which is required to maintain the levels in narrow ranges for appropriate cardiac muscle, skeletal muscle, peripheral nerve and brain function. Too much calcium (hypercalcemia) may result in muscle weakness, twitches/spasms, nerve irritability and abnormal cardiac rhythms, which can be fatal. Too little calcium (hypocalcemia) can result in numbness and tingling of the extremities, muscle spasms and extreme contraction of muscles (tetany). Seizures and cardiac rhythm abnormalities can also occur, which can be fatal. Thus, maintaining appropriate serum calcium levels is critical for well-being.

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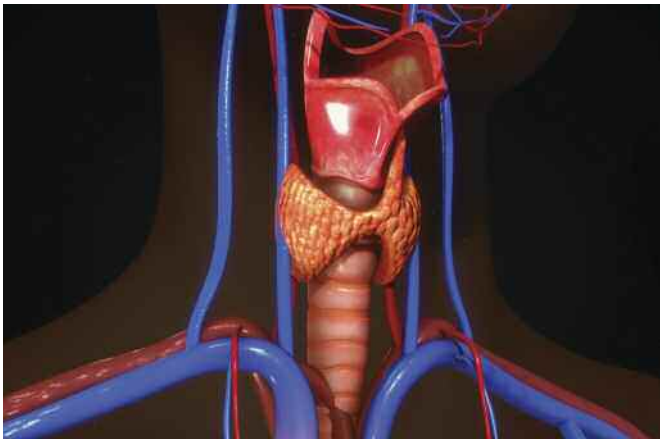
There are four parathyroid glands that begin development in the tissues of the third and fourth pharyngeal pouches (embryonic "gill" slits), as does the thymus. Eventually, the glands migrate to their normal final positions adjacent to the wings of the thyroid gland in the neck, hence their name. Because the parathyroid glands and thymus begin developing at the same time, disruption of the development of the thymus, as found in DGS/PDGS, may also disrupt the development of the parathyroid glands. This can be variable, though, depending on when the timing of the disruption occurs. For instance, there can be essentially absence of the thymus, resulting in complete DGS, but still with sufficient parathyroid tissue in the neck near their origins to maintain calcium metabolism. Alternatively, the thymus may be near normal in its formation, but have essential lack of parathyroid glandular tissues and severe hypocalcemia.



Hypocalcemia, due to decreased presence of parathyroid glands, is one of the original hallmarks described in DGS. Generally, an infant born with DGS/PDGS, who does not have an initially fatal cardiac lesion, will suffer seizures due to hypocalcemia about nine days after birth. In some cases, this may be the first indication that DGS/PDGS may be present. Regardless, the presence of neonatal hypocalcemia should be a signal to initiate a more comprehensive workup for DGS.

Once hypocalcemia is recognized, and can be attributed to decreased or absent parathyroid tissue, it can be treated with hormone replacement, vitamin D supplementation and calcium supplementation.

We will continue in the next issue with more discussion of the resulting issues when the timing is off during fetal development. ■

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