Dual Myelomeningocele in Twins: Insights Into An Environmental Versus Genetic Etiology

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Introduction:

Despite advancements in prenatal folate supplementation, neural tube defects (NTDs) occur in 0.5-1.0/1000 pregnancies with 30-50% non-folate preventable. Twinning has increased recently due to artificial fertilization methods and in itself predisposes to NTDs, at a rate of 1.6/1000. Concordance of NTDs in twins is 0.03/1000, and dual myelomeningocele has only been reported in 23 twins globally. We present the 24th pair of myelomeningocele twins and discuss the interplay of genetic versus environmental predisposing factors.
Methods

All cases of twin myelomeningoceles were reviewed and pertinent perinatal maternal and fetal attributes were investigated in the context of genetic versus environmental predispositions. A case of female diamniotic, monozygotic twins born to a well-nourished 24 year-old female with a negative genetic screen is reported.
Results

The twins were diagnosed with L3-S4 and L5-S4 myelomeningoceles, Chiari II malformations, and biventriculomegaly on prenatal ultrasound. An amniocentesis for microarray analysis was normal for both twins. Both underwent uncomplicated back-to-back repair of their NTDs on day of life 1, and ventriculoperitoneal shunt placement on days of life 10 and 16. One maintained and one developed movement in the legs upon 6-week follow-up.
Preoperatively

Baby A and B with Neural Tube Closure Intraoperatively

Baby A and B with Defect Closure Postoperatively
Postoperative cranial and spinal sagittal MR imaging demonstrating the successful repair of the myelomeningocele defects in both twins, yet the concurrent development of hydrocephalus in each twin as well.
Discussion

• Literature trends report dual myelomeningoceles increasingly in folate-resistant pregnancies.

• While once thought that the genetics of monozygotic twins predisposed to NTDs, the majority of cases are in dizygotic twins.

• Several folate regulators are implicated but no direct pathophysiological link is made, nor causative link to any key glycoproteins vital for neural tube closure.

• It is suspected that maternal and fetal exposures play a more pronounced role than once suspected.

• These etiological unknowns do not detract from the unprecedented outcomes with improved diagnosis and treatment in recent years, nor from the immense burden placed on parents-to-be upon diagnosis.
Summary points

- Myelomeningoceles currently being reported in the literature are trending towards those cases with proper folate supplementation as well as other etiological causes.

- The most common type of dual myelomeningoceles are in dizygotic twins, suggesting maternal or fetal exposures play a larger role than once suspected, whether the mother or clinical are aware of the exposure or not.

- Standard maternal genetic screening may not be analyzing all genes of interest in folate-independent or even in folate-dependent pathways, missing this diagnosis in certain cases, and as a result, a negative screen does not eliminate the risk of myelomeningocele.