Recent Advances in Prenatal Management of Spina Bifida

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Introduction

Neural tube defects include a range of genetic malformations known as cranial anomalies and open/closed spinal dysraphism. There are various obvious lesions known as spina bifida aperta and open spinal dysraphism, which include deformities like myelomeningocele.[1] Three factors can cause this multifactorial developmental defect: genetic, maternal, and environmental. During the first month of pregnancy, the spinal neural tube does not close properly, so a fluid-filled sac, meninges, and neural tissue protrude at the affected vertebral level, causing myelomeningocele.[1] Therefore, early surgical and medical management is key to avoiding further problems.

The number of neural tube abnormalities worldwide is over 140,000 each year.[2] In the United States and around the world, spina bifida affects more than three per 10,000 births, but in Asia, it is estimated to affect 243.14 per 100,000 babies.[3] The prevalence of myelomeningocele, by comparison, is about 0.8–1 per 1,000 live births around the world, and in the United States, it is about 0.2–0.4 per 1,000.[4,5]

Main Text

Traditionally, 1–2 days after birth, postnatal surgery to close an open spina bifida (OSB) was carried out. The objectives of this surgery are to stop the cerebrospinal fluid (CSF) fluid leak, repair the thecal sac, and secure the exposed neural components (neural placode). Postnatal healing has not been demonstrated to restore neurologic function, despite the fact that it is thought that the neural placode contains functional nerve tissue.[6,7] In 1980, myelomeningocele was the subject of a randomized clinical trial called the Management of Myelomeningocele Study (MOMS), which had the aim of comparing prenatal repair to exposed maternal–fetal surgery (maternal hysterotomy and laparotomy) versus postnatal repair (MMC).[8] Prenatal surgery was effective for the fetus, so the trial was halted early.

Recently, a least-invasive surgical approach has been introduced for the prenatal amendment of OSB, which not only repairs the malformation fetoscopically but also gives better health outcomes for the baby and reduces maternal risks. For example, there is a better chance you will deliver a normal baby vaginally at term with a minimal impact on future pregnancies. There are currently two surgical approaches for fetoscopic OSB repair: laparotomy-assisted and percutaneous. Although there is still a chance of premature birth, the percutaneous fetoscopic method is associated with the least amount of maternal discomfort. Although laparotomy-assisted fetoscopic repair is associated with a significantly increased risk of maternal morbidity due to maternal laparotomy and uterine exteriorization, it may also be connected to a lower risk of premature preterm tearing of membranes and preterm birth.[9]

Another option is the percutaneous/mini-laparotomy (PML) surgical technique, an evolved version of the percutaneous technique that balances the complexities of minimally invasive surgical tasks. Unlike the laparotomy-assisted fetoscopic approach, PML enables entry directly through uterine port closure, eliminating the requirement

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of uterine externalization.[9] Briefly, the PML surgical procedure offers a minimally invasive way to close all uterine ports, maintaining the benefits of both currently used fetoscopic techniques while reducing their dangers. Compared to a percutaneous repair, PML fetoscopic repair avoids possible complications, like losing uterine trocar access due to CO_2 buildup in the abdomen. Excess gas can be vented by creating a surgical window during the mini-laparotomy.

The PML fetoscopic technique's performance may be constrained by placental placement. Although this technique can be used on most patients with an anteriorly placed placenta, there may be some instances where a laparotomy-assisted method is required. Likewise, when lateral access to an anterior placenta is performed, there may be cases in which one or more instrument uterine port sites cannot be closed because of the vascular broad ligament of the maternal uterus and the port's proximity to it.[9] Moreover, when uterine ports are placed using this technique, ultrasound imaging quality is reduced because of the self-retaining and mini-laparotomy retractors, which can interfere with acoustic windows.

Conclusion

Recent data and previous studies demonstrate that this common condition, if promptly treated, can save several lives and lead to revolutionary breakthroughs in fetal surgical techniques. The scientific advancement from the MOMs trial to fetoscopic approaches shows that even little gains can help us overcome greater odds. Further research can assist us in eliminating the drawbacks of this recent procedure and may prove successful in treating all similar fetal issues.

Authors' Contributions

The conceptualization was done by AS and BSR. The literature and drafting of the manuscript were conducted by BSR, AS, TN, AWK and HSR. The editing and supervision were performed by BSR. All authors have read and agreed to the final version of the manuscript.

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References

1. Alruwaili AA and Das JM. Myelomeningocele. [Updated 2022 Jun 27]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. https://www.ncbi.nlm.nih.gov/books/NBK546696/
2. Copp AJ, Adzick NS, Chitty LS, et al. Spina bifida. *Nat Rev Dis Primers* 2015; 1: 15007.
3. Uy MNAR and Tantengco OAG. Investigating the landscape and trajectory of spina bifida research in Asia: A bibliometric analysis. *Childs Nerv Syst* 2022; 38(8): 1581–1591. https://doi.org/10.1007/s00381-022-05527-2
4. Shim JH, Hwang NH, Yoon ES, et al. Closure of myelomeningocele defects using a limberg flap or direct repair. *Arch Plast Surg* 2016; 43(1): 26–31.
5. Sahni M, Alsaleem M and Ohri A. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Sep 5, 2022. Meningomyelocele.
6. Sival DA, Begeer JH, StaalSchreinemachers AL, et al. Perinatal motor behaviour and neurological outcome in spina bifida aperta. *Early Hum Dev* 1997; 50: 27–37.
7. Sival DA, van Weerden TW, Vles JS, et al. Neonatal loss of motor function in human spina bifida aperta. *Pediatrics* 2004; 114: 427–434.
8. Adzick NS, Thom EA, Spong CY, et al. A randomized trial of prenatal versus postnatal repair of Myelomeningocele. *N Engl J Med* 2011; *364*: 993–1004.
9. Chmait RH, Monson MA, Pham HQ, et al. Percutaneous/mini-laparotomy fetoscopic repair of open spina bifida: A novel surgical technique. *Am J Obstet Gynecol* 2022; *227*(3): 375–383. DOI: 10.1016/j.ajog.2022.05.032