Neuropathic Bladder in the Neonate

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KEYWORDS

• Myelomeningocele • Urodynamics • Spina bifida
• Detrusor external sphincter dyssynergy

KEY POINTS

- Newborn urodynamic evaluation can provide valuable information allowing appropriate evaluation of infants with spina bifida.
- The Management of Myelomeningocele Study trial demonstrated a reduced incidence of ventriculoperitoneal shunting and improvement in lower motor function in prenatally repaired myelomeningocele infants.
- Detrusor external sphincter dyssynergy can lead to progressive deterioration in bladder function and upper urinary tract drainage.
- Most patients with spina bifida ultimately require intermittent catheterization and pharmacologic therapy to improve storage and facilitate drainage of their bladders.

INTRODUCTION

Bladder function can be defined by two simple processes, storage and emptying. Children who are born with myelomeningocele (also known as spina bifida or myelodysplasia) can have significant effects on both of these processes, leading in some situations to upper tract deterioration unless it is recognized and treated in a timely fashion. Pioneering work by Lapides and coworkers[1] demonstrated that clean intermittent catheterization (CIC) could be used to empty the bladder, thus improving the situation for children with poor bladder emptying. Pharmacologic measures have been used to improve bladder storage and the combination of pharmacotherapy and CIC has become the mainstay in the management of children with myelomeningocele.

Myelomeningocele lesions are distributed among thoracic, lumbar, and sacral vertebrae (**Fig. 1**).[2] Most of the bony abnormalities occur in the lumbosacral region. The actual level of the meningocele may not correspond to the distribution of the

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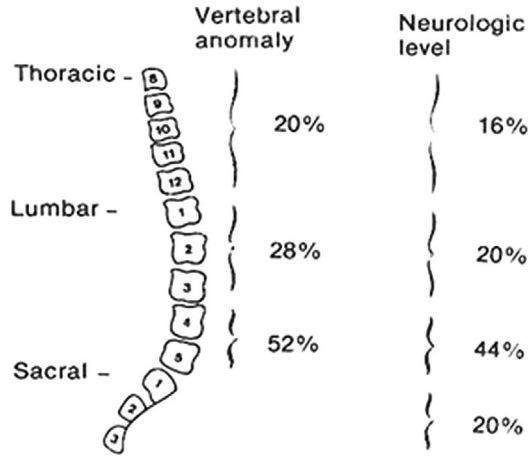

Fig. 1. Distribution of level of lesion in children with myelodysplasia. Most lesions involve the lumbosacral area.

injured nerve roots. In general, nerves opposite the level of the bony defect or more caudally positioned ones are affected. Occasionally the injury may affect more cranially positioned nerve roots and there may be differences on opposite sides of the spinal cord even at the same level.[3] Quite often, a lipoma of the filum terminala, or dura, is associated with the meningocele compressing or stretching the nerve roots. These patients, too, have an Arnold-Chiari malformation, which affects the brain and brainstem, so that most children require placement of a ventriculoperitoneal shunt. All of this leads to a considerable variation in the type and extent of neurologic injury. There remains ongoing debate concerning the appropriate evaluation, management, and treatment of patients with myelomeningocele.[4–6] Previously, urodynamic investigation, which is the best way of assessing the function of the bladder, was commonly not performed in children until after they reached school age. It was deemed important at that age to achieve social continence. Increasingly the evaluation of the bladder in the newborn period has been favored once the back has been closed and the child's neurosurgical condition stabilized.[7] The initial assessment provides a baseline so that subsequent studies can look for evidence of progressive deterioration that may occur.

The prenatal diagnosis of myelomeningocele is now more common, with a triple screen being performed to look for the presence of a neural tube defect.[8] Confirmation of the myelomeningocele occurs with ultrasonography so that appropriate prenatal counseling can occur and a thorough explanation of the various sequelae of spina bifida provided to expectant parents. Recently, the Eunice Kennedy Shriver National Institute of Child Health and Human Development sponsored a randomized prospective trial, The Management of Myelomeningocele Study (Clinicaltrials.gov NCT00060606), which provided a critical assessment of the outcome of infants who are born with myelomeningocele and are repaired in utero during midgestation versus those infants who had postnatal closure in the first 24 hours of life. This landmark study was published in the *New England Journal of Medicine* in March 2011.[9] This study demonstrated that the incidence of ventriculoperitoneal shunting was 80% in those who underwent postnatal closure versus 42% of those with prenatal repair. In addition, at 3 years, 42% of those who had prenatal repair walked independently versus 21% of those with postnatal closure. The urologic outcomes of those patients who underwent repair in utero is forthcoming, because the original studies had outcomes