Clinical Article

Evaluation of clinico-urodynamic outcome of bladder dysfunction after surgery in children with spinal dysraphism – a prospective study

R. Kumar¹, N. Singhal¹, M. Gupta², R. Kapoor², A. K. Mahapatra¹

¹ Department of Neurosurgery, Sanjay Gandhi Institute of Postgraduate Medical Sciences, Lucknow, India
² Department of Urology, Sanjay Gandhi Institute of Postgraduate Medical Sciences, Lucknow, India

Received 11 July 2007; Accepted 6 November 2007; Published online 30 January 2008
© Springer-Verlag 2008

Summary

Background. The aim was to assess the clinical profile and urodynamic findings and the outcome of surgery in children with spinal dysraphism.

Method. Twenty five children with spinal dysraphism who were treated at our institute between January 2005 and June 2006 were studied prospectively. There were 10 with an open spina bifida and 15 closed. The clinical profile of bladder dysfunction was assessed and urodynamic evaluation done pre-operatively in each child. An ultrasound study of the kidneys was also done to assess for hydro-uretero-nephrosis. All underwent surgery for their primary and associated malformations. Post-operatively, re-evaluation of bladder dysfunction and urodynamic parameters was performed at 6–8 months.

Results. Before operation there was a history indicating that the bladder was involved in 14 of the 25 children. Six of the 10 cases with an open spina bifida showed clinical involvement of the bladder as compared to 8 of 15 with a closed pattern. Urodynamic studies showed evidence of bladder dysfunction in 19 children. Of 10 with a meningomyelocele, there were abnormal urodynamics in 9 as compared to 10 of 15 with closed dysraphism. Follow up urodynamic studies showed improvement in 9 of 20 children 3 of 7 with a meningomyelocele and 6 of 13 with closed dysraphism.

Conclusion. Children with open spina bifida, as compared to closed dysraphism, tend to have more bladder dysfunction as exemplified on clinical history and urodynamic assessment. A pre-operative urodynamic study helps to identify severity of bladder dysfunction which is clinically overt cases and also identifies subtle bladder dysfunction in clinically silent cases. Evaluation after operation tends to show better outcome in children with closed dysraphism. The study also identifies deterioration in some patients with seemingly clinical improvement.

Keywords: Spinal dysraphism; neurogenic bladder dysfunction; incontinence; hydro-uretero-nephrosis; urodynamics.

Introduction

Spinal dysraphism is the most common cause of a neurogenic bladder in children. Meningomyelocele represents an extreme form of myelodysplasia, in which the dysplastic neural tissue leads to neurogenic bladder dysfunction. Occult spinal dysraphism causes bladder dysfunction by an abnormal caudal fixation of the conus medullaris which results in neuronal damage due to kinking and stretching of the blood supply to the spinal cord [25]. Children tend to present differently from the rare adult patient with spinal dysraphism. Urological presentation includes recurrent infections, enuresis, delayed toilet training and continuous dribbling in children, and irritable voiding symptoms, incontinence or retention in adults.

Correspondence: Dr. Raj Kumar, MS, Mch, Professor and Head, Department of Neurosurgery, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow 226014, UP, India. e-mail: rajkumar@sgpgi.ac.in
Conventional assessment techniques include kidney ultrasonography, voiding cystography and urodynamic studies. Urodynamic findings include uninhibited bladder contractions, bladder areflexia, decreased compliance and detrusor-sphincter dyssynergia [12]. These findings have future implications for children with myelodysplasia, such as continence, urinary tract infection and renal function. Post-operative follow up includes careful monitoring to detect early signs of deterioration with clinico-radiological and urodynamic studies. Many studies have evaluated urodynamic findings before and after surgical untethering, but they are confined mainly to older children and adults with tethered cord syndrome [2, 8, 13]. Review of the literature reveals that there are very few urodynamic studies in infants and smaller children, particularly those with meningomyelocele [3, 4]. In this study, we have evaluated 25 children with spinal dysraphism with detailed clinical assessment and urodynamic studies. Various risk factors for development of neurogenic bladder dysfunction were investigated.

Subjects and methods

We prospectively studied 25 children with spinal dysraphism who attended the clinic of pediatric neurosurgery at our institute between January 2005 and June 2006. The study consisted of 10 patients with meningomyelocele and 15 children with occult spinal dysraphism. Four children who had been operated upon at another institution were also included in the study because the surgery had consisted only of providing skin cover. The children’s ages ranged from 3 months to 18 years with a mean of 5.5 years. All underwent a detailed physical examination. The diagnosis of spinal dysraphism was established on the basis of clinical examination and radiological findings on cranio-spinal MRI. All subtypes of spinal dysraphism, with the exception of terminal myelocystocele, were included in the study. These patients were evaluated in detail regarding their urinary symptoms. Based on the details of urinary complaints in the clinical history, they were divided into 2 categories:

Category 1. Normal – No history of dysfunctional voiding.
Category 2. Symptomatic – This category was further divided into three grades based on the severity of bladder dysfunction.
Grade 1. Mild dysfunction – Children with frequency, urgency, straining at micturition and incomplete evacuation.
Grade 2. Moderate dysfunction – Children with occasional episodes of incontinence with dry periods (in hours) in between.
Grade 3. Severe dysfunction – Children with continuous dribbling of urine.

An ultrasound was done to evaluate the size of the kidneys and the presence of hydro-uretero-nephrosis. A pre-operative urodynamic study was done in all children to assess the severity and to classify the bladder dysfunction. Bladder abnormalities were assessed by Urodynamic studies on a Dantec Denmark Urodyn 5850. Saline was used to fill the bladder at the rate of 5–10 ml/min. Features assessed included bladder compliance, bladder capacity (cystometric capacity), bladder instability, bladder sensations and leak pressures. Standard definitions were used to define the findings. Based on clinical symptoms and Urodynamic abnormalities, patients were divided in 3 categories:

Category A. Normal group – No evidence of dysfunctional voiding on history or urodynamic evaluation.
Category B. Silent group – Asymptomatic child but evidence of bladder dysfunction on urodynamic evaluation.
Category C. Symptomatic group – Symptomatic child with evidence of bladder dysfunction on urodynamic evaluation.

Operation

All of the children underwent surgery as a single stage procedure with an aim to excise and repair the sac and to excise the bony spur or fibrous septum or any other tethering lesion in order to untether the cord. In neonates, surgery was deferred till the age of 3 months wherever possible, with careful clinical monitoring. This timing of surgery is appropriate for neonates in the developing world [20, 21]. It is our departmental policy to operate on all asymptomatic children irrespective of the nature of the dysraphic state. The children were reassessed after a follow up period of 6–8 months after surgery. Bladder function status was assessed clinically in all and a follow up urodynamic study was done in 20 children. Financial constraints meant that 5 did not undergo post-operative testing.

Statistical analysis

Both descriptive and data analysis were performed using the SPSS version 13.0 (SPSS INC, Chicago, IL) software package. The significance of the association between various probable causative factors and the occurrence of neurogenic bladder dysfunction was evaluated by univariate analysis using the Pearson chi-square test or Fisher’s exact test.