

Bladder Function in Children



Elderly care

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Bladder Function in Children

PJR Shah
Institute of Urology and Nephrology
and UCL Hospitals London

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Bladder function takes time to mature during childhood. Normal volitional voiding develops by the age of 2 years and the majority of children become continent at night by the age of 6 years.

It is assumed that the normal bladder empties to completion, i.e. there is no residual urine. Hiraoka et al (1999) were able to demonstrate that neonates may leave significant residual urine (when measured by flowmetry and an ultrasound assessment of residual urine). Residual urine was higher in males than in females.

A very useful formula for the assessment of bladder volume in children is

Bladder volume in mls = Age x 25 + 25

Ransley (personal communication)

Thus a child of 10 can expect a maximum bladder volume of 275ml. If this volume is regularly exceeded, bladder dysfunction should be suspected.

Urinary Tract Infection

Children that present with urinary tract infection should be investigated. Bladder ultrasonography is most useful in demonstrating bladder wall thickness and residual urine, which were frequent findings in such children. Maizels et al 1987 found that 50% of children with UTI had bladder dysfunction. Their assessment of out-patient based ultrasonography demonstrated 82% specificity and 98% sensitivity for bladder emptying and measurement of bladder wall thickness. Thirty-nine children with acute UTIs had significantly more residual urine than 55 control children (Lidefelt et al 1989).

Residual urine volume values of greater than 5ml were seen in 71% of girls with asymptomatic bacteriuria (Hansson et al 1990). Ultrasound scanning which demonstrated residual urine could be used to enable successful rehabilitation of bladder emptying with positive benefits for the reduction in bacteriuria.

Children with enuresis may have bladder dysfunction or dysfunctional voiding. Those with dysfunctional voiding tended to have significant residual urine and were more difficult to treat (Barrett et al 1989). Post-void residual urine was noted in 10% of enuretics along with a variety of other urodynamic diagnosis (Salinas-Casado et al 1994). Ultrasound scanning of the bladder in the child with enuresis may be beneficial in demonstrating residual urine and help in providing a rational indication for further investigation. For example, those children with enuresis without daytime symptoms who empty their bladders normally would not require further urodynamic investigation. Mayo et al (1990) confirmed that enuretics with abnormal bladders with significant residual urine were dysfunctional voiders with serious behavioural problems. If urine production during the night exceeds normal bladder capacity, enuresis is more likely. However bladder emptying is not always complete leaving large residual urine volumes (Rasmussen et al 1997). This may have major implications for the treatment of enuretic patients.

The Neurogenic Bladder & Non-Coordinated Voiding

The neurogenic bladder is associated with incomplete bladder emptying for a variety of reasons. Ultrasound scanning of the bladder has been found to be an accurate method of measuring bladder residual when validated by catheterisation (Massagli et al 1990).

The use of ultrasound in assessing residual urine in patients with neurogenic bladder dysfunction should be used (along with urodynamic investigation) to assess the need for intermittent catheterisation.

Non-coordinated voiding presents with urinary tract infection. Martin-Crespo et al (1999) showed that of 25 children with this condition 5 had reflux and 10 renal scarring. Sphincter dysfunction was seen on voiding cystometry with post-void residual urine.

A variety of voiding conditions, which include Hinman syndrome, valves and myelomeningocele, may be improved by the use of alpha blockers improving bladder emptying and reduction in residual urine (Austin et al 1999).

Pelvic floor retraining using a computer game assisted programme was able to improve bladder emptying with reduced post-void residual urine in 41 children with dysfunctional voiding (McKenna et al 1999).

Assessment of bladder emptying after the implantation of an artificial urinary sphincter for neuropathic incontinence showed that 66% of patients had significant residual urine (O'Flynn and Thomas 1991).

The Use of Ultrasound Scanning in the Paediatric Population

Massagli et al (1990) have confirmed that the use of ultrasound scanning in children was accurate in assessing retained residual urine after voiding and is very useful in out-patient practice (Zaontz and Maizels 1988, Padmore et al 1997). Erasmie and Lidelfelt (1989) showed that large volumes of residual urine may be underestimated by ultrasonography. However it is suggested that a single assessment of residual urine may not be accurate and should be repeated before a treatment regime is instituted (Stoller and Millard 1989). For the post-operative follow-up of patients who have undergone bladder reconstruction, ultrasonography is an essential tool which will provide information about bladder emptying and direct the need for clean intermittent catheterisation for those bladders that fail to empty to completion (Kajbafzadeh et al 1995).



Conditions which benefit from Ultrasonography to Assess Bladder Emptying

- 1) Recurrent urinary tract infection
- 2) Neurogenic bladders
- 3) Dysfunctional voiding
- 4) Enuresis
- 5) Congenital ano-rectal anomalies
- 6) Posterior urethral valves
- 7) After reconstructive bladder surgery
- 8) Vesico-ureteric reflux

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Verathon (UK) Ltd

The Granary, Manor Farm Courtyard,
Aston Sandford, Aylesbury,
Buckinghamshire HP17 8JB

Tel: 00 44 (0)1844 299207

Fax: 00 44 (0)1844 299218

E-mail: customerservice@verathon.co.uk

www.verathon.co.uk

Verathon USA

Corporate Headquarters,
21222 30th Drive SE, Suite 120,
Bothell, WA 98021

Tel: 800 331 2313 or 425 867 1348

Fax: 425 883 2896

E-mail: sales@dxu.com or service@verathon.com

www.verathon.com

Verathon Medical Europe BV

Boerhaaveweg 1
3401 MN IJsselstein
Netherlands

Tel: +31 (0)30-6870570

Fax: +31 (0)30-6870512

E-mail: salesEU@verathon.com

www.verathon.eu

