

Research article

**Clinical profile of voiding dysfunction with uroflow electromyography correlation in children**Ramdoss PothiNathan<sup>1</sup>, Ahila Singaravel Chidambaranathan<sup>2\*</sup><sup>1</sup> Consultant, Velan Child Care Clinic, West K.K. Nagar, Chennai, India<sup>2</sup> SRM Dental College, Ramapuram, Chennai, India**ABSTRACT**

Decrease in voiding frequency in children lead to improve the capacity of bladder which tends to reduce the intake of fluid as the child relies on table food for nutrition. The objective of the study was done to enumerate the clinical features of voiding dysfunction in children and correlate the clinical findings with uroflow electromyography (EMG) findings. A prospective clinical research conducted on children of 5-18 years old with the inclusion criteria of children attained bladder control, no complaints of infection of urinary tract and normal neurological status. A sum of 20 children were taken for this study. While the child was passing urine; rate of flow, amount of urine voided, peak flow rate and time to void were recorded. Shape of the curve obtained as uroflow was also studied. Sphincter activity was noted by uroflow electromyography machine. The uroflow electromyography testing in 17 children (85 %) of 20 was abnormal. The various abnormalities included staccato voiding, fractionated voiding and sphincteric contraction during the voiding phase. In 11 children with history of prior urinary tract infection (UTI), 8 exhibited abnormal voiding on uroflow electromyography. Increased frequency as symptom was noted in 16 children with abnormal uroflow electromyography findings. Fourteen children who were unable to control the urge to void exhibited abnormalities on their uroflow electromyography. Uroflow electromyography to be a useful tool in the management of children with voiding dysfunction as it helped in identification of the exact nature of the problem on an objective basis.

**Keywords:** Bladder control, Voiding phase, Voiding dysfunction, Uroflow EMG.

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**Correspondence:** Ahila S Chidambaranathan\* ✉ [ahilasc@yahoo.co.in](mailto:ahilasc@yahoo.co.in),

SRM Dental College, Ramapuram, Chennai, India

**INTRODUCTION**

Voiding dysfunction is a worldwide disorder affecting the children. Voiding dysfunction refers to any unusual holding of urine and interrupted voiding pattern found in children without any neurological problems [1]. It is calculated that 15% of up to 6-year-old children affected by voiding dysfunction [2]. The incidence of voiding dysfunction is found to be increasing in recent times due to attitude change in lifestyle like infrequent voiding, poor toileting habits, having too much fun or being too busy to go to the bathroom. Being fearful of urinating due to a previous infection of urinary tract and constipation are other notable causes of dysfunctional voiding. Postponing micturition leads to continue watching TV, playing video games and other distractions has become a habit in most children [3].

The identification and treatment of voiding dysfunction is important to prevent kidney failure. The clinical features of voiding dysfunction are recognizable with history like increased frequency of urination and child demonstrating a holding or abnormal posture to prevent urinating, day and night time wetting, repeated infection of urinary tract, features suggestive of constipation including infrequent

stooling habit, hard stools, standing to pass stools and encopresis [3].

Pain in the perineum or penis and pressure application to prevent wetting indicates abnormal postures. Clinical findings include presence of wet under clothes, dribbling of urine, palpable sigmoid with faecal loading, faecal soiling, urge to void and holding postures like crossing the legs and holding the glans penis etc [4].

Ultrasound of urinary tract shows thick-walled bladder and upper tract dilatation in severe cases with presence of post void residual urine. Cystography shows trabeculated bladder, large bladder, and spinning top deformity; in severe cases neurogenic bladder like appearance [5]. However objective assessment of voiding dysfunction by a reliable method was not possible until the advent of urodynamics. Uroflowmetry with sphincter electromyography (uroflow EMG) is one such tool which is completely non-invasive.

In uroflowmetry study the patient voids urine on command in a toilet with EMG electrodes measuring pelvic floor activity and the sensor measuring rate of flow, peak flow, and time to complete voiding and voided volume [6]. The findings are recorded as a graph

which can be interpreted easily and used as a tool to educate both parents and the child.

Depending on the uroflow EMG findings these children are treated with double voiding method (to void to complete), frequent or timely voiding (to avoid holding), change in voiding position (in obese female children who pool urine in the vagina) and elimination of constipation. Uroflow EMG also serve as a tool for bio-feedback to correct such voiding abnormalities. It is therefore a simple reliable and effective tool in the management of voiding dysfunction. Hence, this study was done with the objective of to enumerate the clinical features of voiding dysfunction in children and correlate the clinical features with uroflow EMG findings.

## MATERIALS AND METHODS

The prospective observational research was done on children of 5-18 years old at Department of Pediatric and Pediatric surgery at Sundaram Medical Foundation, Dr. Rangarajan memorial hospital, Chennai. A total of 20 children who satisfied the inclusion criteria were recruited like children attained bladder control (dry by night for approximately 6 months), no features of urinary tract infection (sterile urine culture), normal neurological status and willing to participate. The exclusion criteria were age between 5 and

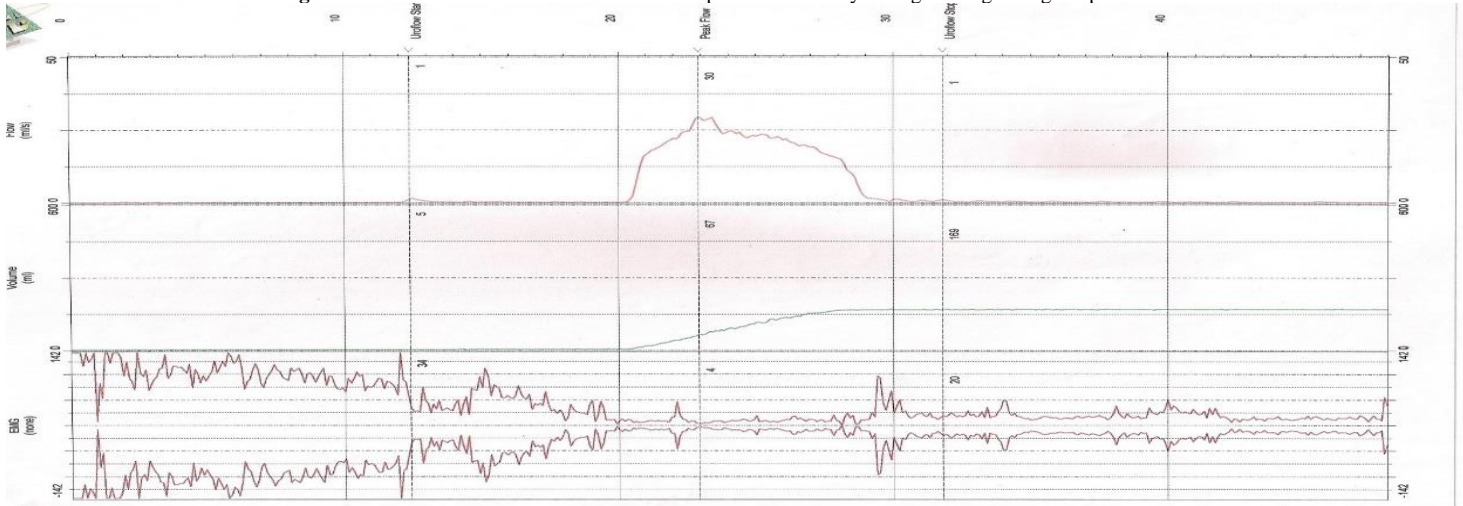
18, structural or anatomical abnormalities in bladder like PUV, neurogenic bladder, spinal cord abnormality or spinal surgery, development delay or mentally retarded child and features of urinary tract infection during study. A written informed consent was obtained from the parents/ child before including the child in this study.

## Procedure of uroflow EMG

Prior to the test the child was asked to drink plenty of water and be in a full bladder. When they expressed their desire to void; electrodes were fixed in each side of perineal region (positive and negative) and one on the thigh region (neutral). If the child displayed any abnormal posture to control the urine and if leakage of urine was seen which was noted. They were made to sit on the commode chair and asked to void urine on command. Boys who wanted to stand and void could do so. Parents or care taker was advised to stand near the child to prevent anxiety and behind a screen to ensure privacy. While the child was passing urine the flow rate, amount of urine voided, peak flow rate and time to void were recorded [7] and sphincter activity was noted by the EMG leads using uroflow EMG machine. (Urostym, Laborie, Mississauga, Ontario, Canada).

Shape of the curve obtained as uroflow was also studied. (Figure.1 - 7)

**Figure 1:** Normal uroflow EMG with almost nil sphincteric activity during voiding with good peak flow



**Figure 2:** Normal uroflow EMG with almost nil sphincteric activity during voiding with good peak flow

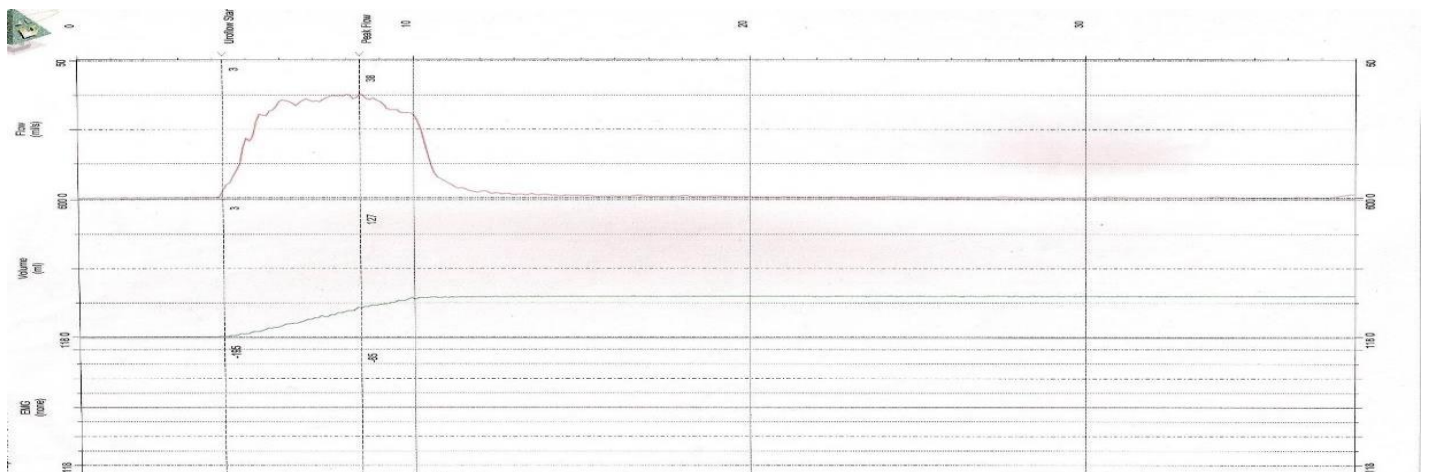


Figure 3: Good peak flow rate- no recording on EMG leads

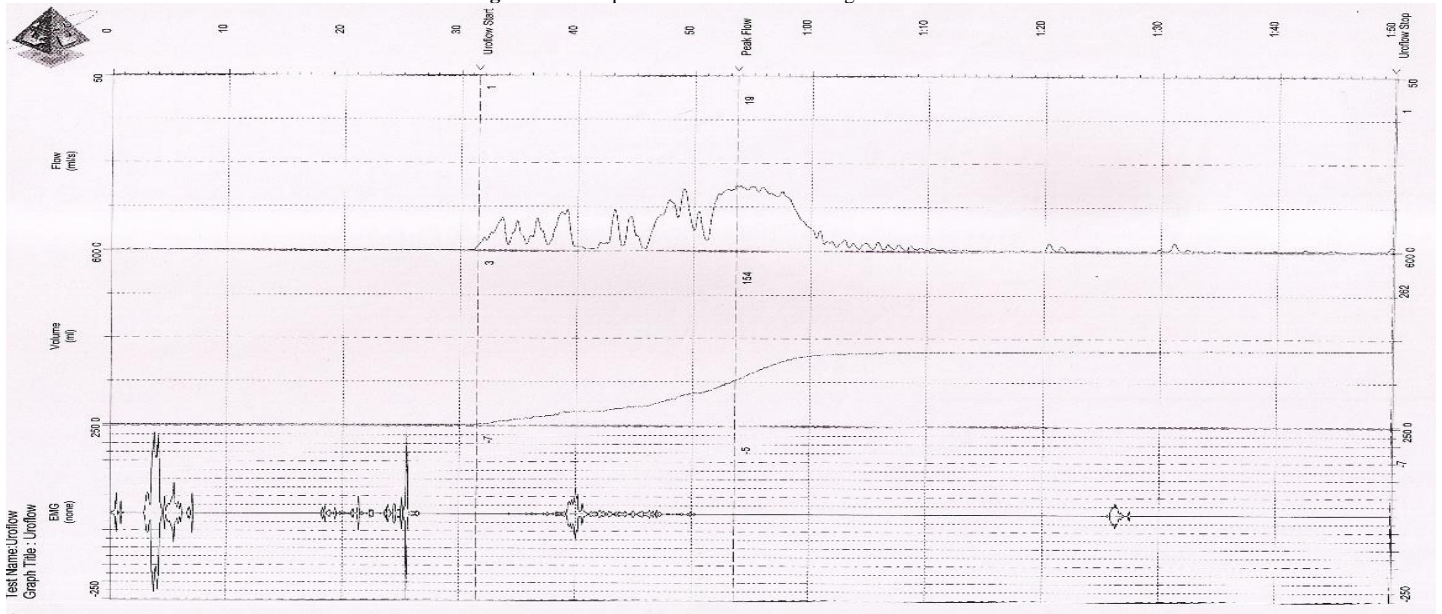


Figure 4: Staccato voiding with intermittent sphincteric activity while voiding

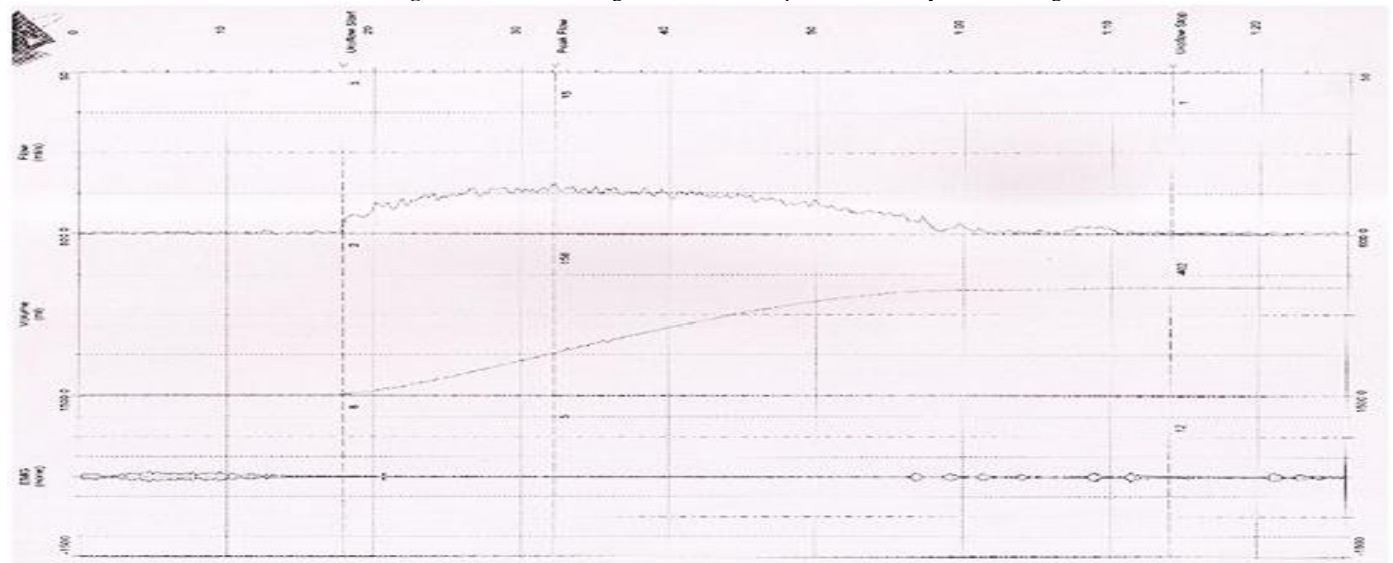
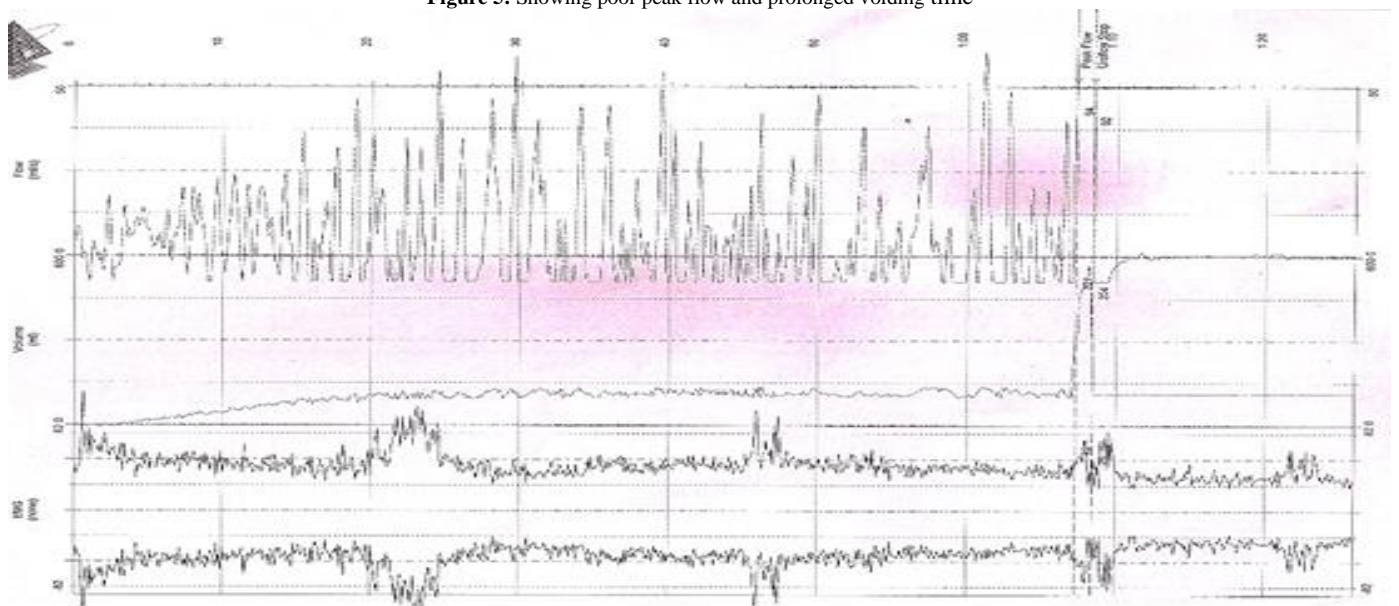
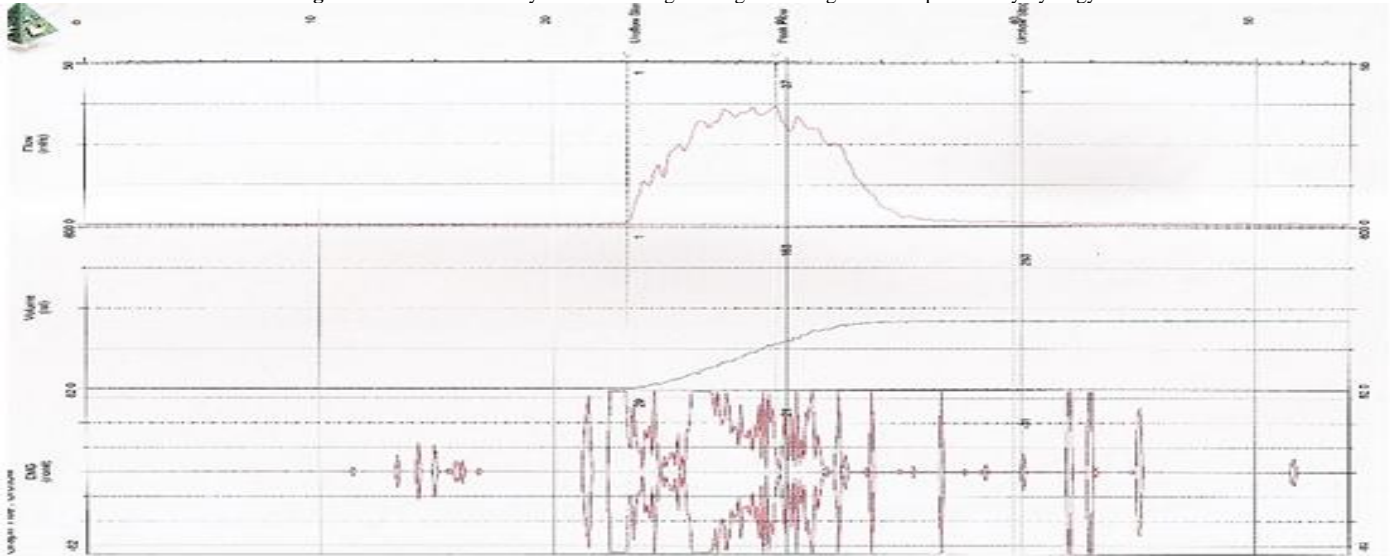
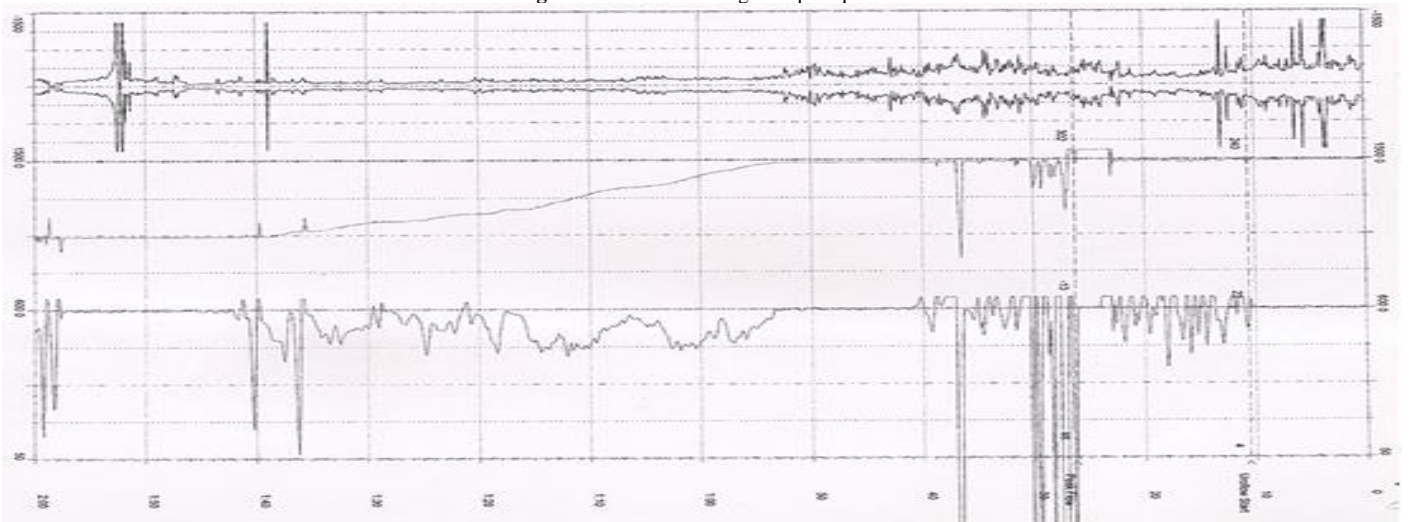


Figure 5: Showing poor peak flow and prolonged voiding time



**Figure 6:** Prominent activity in EMG during voiding indicating detrusor sphincter dyssynergy**Figure 7:** Staccato voiding with poor peak flow

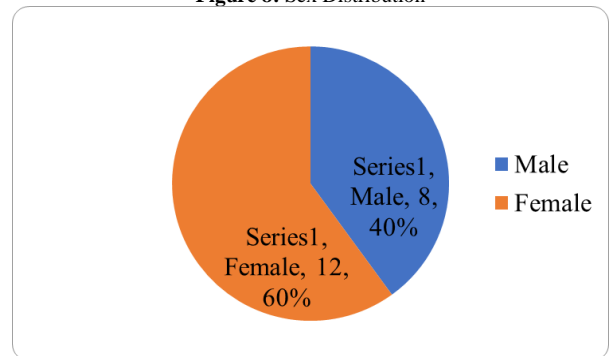
## RESULTS

In this study 20 children with features of voiding dysfunction were evaluated. (Table.1)

**Table.1:** Clinical features

Clinical features	Percentage	Numbers
Increased frequency of micturition	95	19
Not able to control the urge	80	16
Day time wetting	45	9
Night time wetting	35	7
Wearing diaper to school	15	3
Constipation	85	17
UTI in the past	55	11

The age range was 5 years to 18 years and mean age was 10.45 years. Out of 20 children 12 were girls and 8 were boys. Male and female ratio was 4:6. (Figure.8) Nineteen children had increased frequency of micturition, 16 children were unable to control the urge, 9 children had day time wetting, 7 children had night time wetting, 3 children wore diapers to school to prevent soiling of undergarments and 17 children had features of constipation. 11 children had UTI in the past.

**Figure 8:** Sex Distribution

Among the history 13 children, 6 children had attained bladder control over 5 years and 7 children by 4 years of age. All the female children who underwent the study had the practice of cleaning their genitalia from front to back. Sixteen children were in the habit of watching television for 3-4 hours per day. Ten children (50 %) have the habit of holding abnormal posture to prevent voiding (Holding the glans penis in case of boys, crossing the legs in case of girls). Two children voided only once in the school time (7.5-hr average) and 13 children voided two times in the school time. 1 child

voided 3 times a day during school hours and 4 children voided 4 times or more in a day.

Among the 20 children 12 children perceived the school toilet not to be good and 8 children perceived it to be good. The uroflow EMG testing in 17 children (85 %) out of 20 was abnormal. The various abnormalities included staccato voiding, fractionated voiding and sphincteric contraction during the voiding phase. In 11 children with 8 exhibited history of prior UTI abnormal voiding on uroflow EMG.

Increased frequency as a symptom was identified in 16 children with abnormal uroflow EMG findings. Fourteen children were finding difficulty to control the urge to void exhibited abnormalities on their uroflow EMG. Daytime wetting was seen in 9 children and nocturnal enuresis was present in 7, 3 children wore diapers to school. All of these children had abnormal uroflow EMG findings. 14 children with constipation exhibited abnormality in their uroflow EMG.

## DISCUSSION

Biofeedback is a group of therapeutic procedures that utilize electronic or electromechanical instruments to accurately measure, process and "feedback" to persons information with reinforcing properties about their neuromuscular and autonomic activity, both normal and abnormal, in the form of analogue or binary, auditory and/or visual feedback signals. Best achieved with a competent biofeedback professional, the objectives are to help the persons to develop greater awareness and voluntary control over their physiological processes that are otherwise outside of awareness and/or under less voluntary control, (e.g., strengthening pelvic muscles) by first controlling the external signal, and then with internal psychophysiological cues [8].

Biofeedback-assisted pelvic musculature relaxation is generally a component of a comprehensive behavioral program which has become a standard of practice [9] that provides key to muscle activity of which patients are often unaware, translates muscle responses into more understandable events, provides powerful and instant information on muscle performance and demonstrates the effectiveness of efforts to control pelvic muscles. However, it is difficult to achieve in children. Specific tools designed for biofeedback in children have been described [10][11].

Role of urodynamic studies in children with idiopathic bladder dysfunction is debatable; urodynamics does not have a significant additional value compared to baseline diagnostics. Therefore, noninvasive methods should be the first-line diagnostic tools. Only in patients with unsuccessful initial treatment, a urodynamic examination should be performed to rule out severe bladder dysfunction [9]. A minimal urodynamic evaluation seems to

be useful in the diagnosis of voiding dysfunction which caused urinary tract infection and/or bladder over activity [12].

The clinical diagnosis of voiding dysfunction has been clearly defined with various symptoms and findings described earlier. However, these need to be stratified into the type of problem in the individual patient to tailor the treatment accordingly. Clinical findings correlated with uroflow-EMG helped in the appropriate management of these children [13].

From this current study, the common clinical symptoms of voiding dysfunction were increased frequency of micturition 95%, not able to control the urge 80%, day time wetting 45%, night time wetting 35%, wearing diaper to school 15%, constipation 85%, UTI in the past 55% and compared to a previous study done by Joao-Amaro et al [14]. Increased frequency of micturition 95%, Not able to control the urge 84%, Day time wetting 51%, night time wetting 88%, constipation 85%, UTI in the past 49% were reported in this study.

In addition, in this study attempted to note the age of attaining bladder control. 35% of the children enrolled in the study attained bladder control (dry by night) by 4 years of age and 65% of the children attained bladder control by 5 years of age. Television watching has become the norm of the day with 80% of the children watching T.V. for an average of 3-4 hours per day. They avoid going to the toilet and hold back even if there is an urge, or even if they do go; they do not void to completion because of the hurry to get back to seeing T.V. The parents were taught to retrain the voiding habits in such children by practice of timed voiding, which thereby eliminates the holding habit.

Double voiding practice is a means of ensuring complete emptying, here the child is asked to go back to the toilet after voiding to try and void again; this was stressed in children who had post void residuals and those who did not void to completion. Their compliance with complete emptying thereby improves. Eighty five percent of the children in the study had features of constipation. The term constipation describes a symptom rather than a diagnosis, it is defined simply as difficulty in the passage of stools, the interval between such passage being prolonged and infrequent and painful defecation [15]. All of them were treated with toilet training and use of lactulose and contact laxatives (Bisacodyl) to induce the habit of regular evacuation. Recognition and treatment of constipation is mandatory as untreated constipation predisposes to UTI and bladder dysfunction.

Fifty percent of the children hold abnormal posture (holding glans penis in case of boys, sitting crossing leg in case of girls). Holding postures are exhibited by the child in order to prevent the act of voiding by increasing the outlet resistance during contraction of the detrusor. Ten percent of children use toilet in the

school once, 65% of the children use 2 times, 5% of the children use 3 times, 20% of children use 4 times. Infrequent voiding is thus an acquired habit in children which needs to be broken in order to treat bladder dysfunction.

Sixty five percent of the children perceive the school toilet as dirty. Because of the poor toilet facilities and strict school environment they avoid using the school toilet. Often the parental perception of a dirty toilet and their instruction to the child not to void in school for fear of contracting a UTI compounds the problem. Stress on the fact that it is abnormal holding and not a dirty toilet that is the cause often clears this misconception. Proper toilet maintenance by the school and provision of adequate number of toilets is often lacking. This issue needs to be addressed at a social level with parent teacher interactions.

Children with pronounced urgency and frequency were given anticholinergic agents Oxybutynin hydrochloride 0.2 Mg/kg/dose to relax the detrusor. They were encouraged to maintain a timed voiding schedule and void to complete by double voiding. Fluid intake in children with nocturnal enuresis was modified and they were asked to empty the bladder before going to bed. Constipation, holding, infrequent voiding during daytime were determined by a voiding diary and corrective voiding habits taught. Those with persistent wetting despite a strict fluid intake regimen were given pharmacotherapy if the clinical situation warranted.

Children with abnormal postures were taught to relax on the commode seat while voiding and follow double and timed voiding. Obese girls were advised to reverse position on commode seat during voiding to prevent vaginal pooling of urine. Urinary tract infections were managed as per prescribed norms and investigated as per the recommended guidelines. These children if suspected to have voiding dysfunction were included for the study only after complete recovery from their illness.

The clinical features in voiding dysfunction are thus increased frequency of micturition, unable to control the urge to void, day and night time wetting with need for wearing diapers. Constipation and recurrent UTI's are associated features. The correlation of these symptoms with the findings of Uroflow EMG allows appropriate therapy to be instituted.

## CONCLUSIONS

The clinical diagnosis of voiding dysfunction is on the basis of exclusion of organic causes of urinary symptoms like frequency, urgency, wetting day and night time, dysuria and associated UTI's and constipation. Though it is often suspected in children with no underlying structural abnormalities until the advent of uroflow EMG the means of establishing a diagnosis was purely subjective in nature. uroflow EMG offers a tool which is simple and relatively easy to

perform on an outpatient basis with stratification into types described earlier. The authors concluded that uroflow EMG to be a useful tool in the management of children with voiding dysfunction as it helped in identification of the exact nature of the problem on an objective basis.

## CONFLICT OF INTEREST

The authors declared that there is no conflict of interest.

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