HAYDARPAŞA NUMUNE MEDICAL JOURNAL

DOI: 10.14744/hnhj.2025.47048
Haydarpasa Numune Med J 2025;65(4):333–339

hnhtipdergisi.com

ORIGINAL ARTICLE

The Effectiveness of Biofeedback Therapy in Treating Dysfunctional Voiding and Enuresis in Children: A Retrospective Study

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Abstract

Introduction: Biofeedback therapy is a non-invasive approach used to treat children with dysfunctional voiding (DV) and daytime enuresis (DE). It improves voluntary relaxation of the pelvic floor muscles and normalizes voiding patterns. This study aimed to evaluate clinical indications, treatment responses, and changes in uroflowmetry parameters and voiding curve patterns in children receiving biofeedback therapy.

Methods: This retrospective study included children aged 5–18 years with DV or DE who underwent at least two pre-treatment uroflowmetry (UFM) and electromyography (EMG) evaluations between April 2023 and March 2024. A standardized biofeedback protocol was administered weekly by a trained nurse under the supervision of a pediatric urologist. Voiding symptoms, EMG activity, and uroflowmetry parameters were assessed. McNemar and Wilcoxon signed-rank tests were used for statistical analysis.

Results: A total of 42 female patients (mean age: 12±3.2 years) were evaluated. Non-monosymptomatic enuresis (31%) and DV-related urinary tract infections (24%) were the most common indications. Daytime incontinence was present in 33% of patients, and 62% had a history of urinary tract infections. Although complete response rates were low, improvements were observed in EMG relaxation (83%) and bell-shaped voiding curves, which increased markedly from 26.3% to 84% by the 8th session. Voided volume and Qmax increased significantly ($p<0.05$). Children with ≥5 voids per day showed a significantly higher treatment response ($p=0.031$).

Discussion and Conclusion: Biofeedback therapy effectively improves voiding parameters and pelvic floor muscle relaxation; however, complete dryness remains limited, particularly in patients with nocturnal enuresis.

Keywords: Biofeedback; dysfunctional voiding; EMG activity; enuresis; urinary patterns.

Enuresis is a frequent presenting complaint in pediatric urology clinic visits. The International Children's Continence Society (ICCS) defines monosymptomatic enuresis (MSE) as nocturnal urinary incontinence in children aged over five years without accompanying lower urinary tract symptoms [1]. Approximately 10% of 7-year-old children and 5% of 10-year-old children experience this condition, with a persistence rate of 0.5–1% into adulthood [2,3].

Non-monosymptomatic enuresis (NMSE) is defined as nocturnal enuresis accompanied by lower urinary tract

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Submitted Date: 26.05.2025 **Revised Date:** 16.07.2025 **Accepted Date:** 18.08.2025
Haydarpaşa Numune Medical Journal

symptoms such as daytime urinary incontinence, urgency, or increased voiding frequency. NMSE accounts for approximately 30% of all enuresis cases [4,5]. Dysfunctional voiding is a prevalent lower urinary tract symptom affecting 3.8% of boys and 6% of girls aged 7 years [6]. These conditions highlight the importance of targeted therapeutic strategies.

Urotherapy serves as the cornerstone of non-invasive treatment for pediatric urinary incontinence and voiding dysfunction. Standard urotherapy integrates lifestyle modifications, regular voiding habits, adequate fluid intake, prevention of constipation, and pelvic floor muscle training. Biofeedback therapy can be an effective intervention for children with dysfunctional voiding and non-monosymptomatic enuresis (NMSE) with urgency and incontinence symptoms. It facilitates awareness and control of pelvic floor muscle activity through auditory or visual feedback, aiming to normalize voiding patterns. It is particularly beneficial for children with dysfunctional voiding characterized by overactive pelvic floor muscles [7]. The International Children's Continence Society (ICCS) has outlined the definitions, indications, and practice of urotherapy in children and adolescents with dysfunctional voiding or NMSE [1,8,9].

Our study focuses on evaluating the indications, treatment response rates, and changes in uroflowmetry parameters and voiding curve patterns in children undergoing biofeedback therapy. Additionally, it aims to identify the critical number of sessions necessary to predict clinical response, providing insights into optimizing treatment protocols for pediatric patients with voiding dysfunction.

Materials and Methods

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the institutional ethics committee (Approval No:17.04.2025-495), and informed consent was obtained from all patients or their legal guardians before participation. Medical records of patients receiving biofeedback therapy between April 2023 and March 2024 were reviewed. Children aged 5–18 years with dysfunctional voiding or enuresis who had undergone at least two pre-treatment uroflowmetry and electromyography (EMG) evaluations constituted the study group. A retrospective analysis was conducted of the outcomes of our biofeedback training program administered to patients who were unresponsive to initial management between April 2023 and March 2024. Children under 5 years of age and those with anatomical or neurogenic bladder conditions were excluded.

At our center, all patients with lower urinary tract symptoms and enuresis initially undergo a 1-month behavioral therapy program. Behavioral therapy includes encouraging adequate fluid intake during the day, scheduled voiding, management of constipation, and avoidance of tea, coffee, and carbonated drinks. For children with MSE, fluid intake is restricted for two hours before bedtime. Following behavioral therapy, patients with persistent symptoms receive either medical treatment or biofeedback therapy, depending on the treating physician's preference.

A urinary tract infection (UTI) was defined as ≥100,000 CFU/mL of bacteria in a midstream urine sample. Bladder capacity was determined as the maximum voided volume recorded in voiding diaries. UFM-EMG was performed at least twice, and patients with abnormal voiding curves and increased EMG activity were diagnosed with dysfunctional voiding. UFM-EMG curves were classified as normal, staccato, tower, intermittent, or plateau based on ICCS recommendations [4]. Patients were assessed at the 4th and 8th weeks. For patients who were noncompliant with therapy by the 4th week, treatment was discontinued. The remaining patients received biofeedback therapy for up to 8 weeks, with reevaluation at the end of this period. Therapy was extended to 12 weeks for patients showing improvement without achieving full recovery. For patients without progress by the 8th week, therapy was terminated.

Surface EMG electrodes were placed at the 2 o'clock and 10 o'clock positions of the anal sphincter to detect pelvic floor muscle activity. Biofeedback training involved the use of a computer animation that allowed children to manipulate on-screen objects by contracting or relaxing the pelvic floor muscles. Each session lasted 20 minutes and consisted of 10-second contraction and relaxation cycles. All UFM measurements and biofeedback sessions were conducted by the same nurse. Children attended weekly biofeedback sessions and were instructed to perform pelvic floor exercises at home three times per week for 20 minutes. Symptoms and incontinence were reassessed using bladder diaries before each session.

Parents and children were instructed to record voiding frequency, fluid intake, episodes of incontinence, and the number of wet nights before the subsequent session. Regular voiding every 3 hours with adequate fluid intake was encouraged. Proper toilet positioning and adherence to home exercises were repeatedly emphasized.

The evaluated outcomes in this study included treatment results according to indication, reduction in urinary tract infection (UTI) frequency, normalization of voiding

curves, normalization of EMG activity, maximum voiding flow rate (Qmax), and voiding time.

Treatment success was defined according to ICCS criteria as clinical response assessed by the percentage reduction in wet nights: no response (<50% reduction), partial response (50–99% reduction), or full response (100% reduction with no wet nights) [4].

Statistical Analysis

Statistical analyses were conducted using SPSS 26.0, with a confidence level of 95%. Pre- and post-treatment changes in categorical variables were analyzed using the McNemar test. Changes in numerical variables were assessed using the Wilcoxon test. Age-related treatment response was analyzed using the t-test, and associations between treatment response and categorical variables were examined using the chi-square test. A p-value of <0.05 was considered statistically significant.

Results

The mean age of the participants was 12±3.26 years (min–max: 5–18). All patients were female. The most common indication was NMSE (n=13, 31%), followed by dysfunctional voiding–associated UTI (n=10, 23.8%). Demographic characteristics are presented in Table 1.

Table 1. Demographic characteristics of patients

	n	%
Age (year)	12±3.26	
Indication		
Non-monosymptomatic enuresis	13	31
UTI	10	23.8
Monosymptomatic enuresis	7	16.7
Daytime incontinence	6	14.3
Dysfunctional voiding	2	4.8
Pollakiuria	2	4.8
Dysfunctional voiding	2	4.8
Post-void residual urine	1	2.4
Form of onset		
Primary	14	43.8
Secondary	18	56.3
Referring clinic		
Pediatric nephrology	24	57.1
Pediatric urology	17	40.5
Pediatric surgery	1	2.4
Parental status		
Together	41	97.6
Mother deceased	1	2.4

UTI: Urinary tract infection.

The most common daytime symptom was incontinence (n=14, 33.3%) (Table 2). A history of UTIs was present in 26 patients (61.9%). Among the medications used, prophylactic antibiotics were the most prevalent, prescribed to 17 patients (70.8%), followed by anticholinergics in 8 patients (33.3%).

Biofeedback therapy did not demonstrate an effect on constipation, fecal incontinence, or voiding frequency. Data on constipation and voiding frequency before and after treatment are presented in Table 3.

Biofeedback therapy was effective in reducing daytime and nighttime incontinence and the frequency of UTIs. Complete response rates were 22.2% for UTIs, 16.7% for daytime incontinence, 0% for nocturnal enuresis, and 7.7% for NMSE (p>0.05). Patients with a voiding frequency of ≥5 times per day showed a significantly higher treatment response compared with those with a voiding frequency of <5 times per day (p=0.031) (Table 4, 5).

Table 2. The patients' symptoms and medications.

	n	%
Daytime symptom		
Incontinence	14	33.3
Retention	8	19
Urge	9	21.4
No	11	26.2
History of urinary tract infections		
No	16	38.1
Yes	26	61.9
Medications used		
Anticholinergics	8	33.3
Prophylaxis	17	70.8
Laxatives	6	25
Other medications	4	16.7

Table 3. Effect of biofeedback therapy on constipation and voiding frequency

	Before treatment		After treatment		p
	n	%	n	%	
Constipation					
No	34	81	37	88.1	0.453
Yes	8	19	5	11.9	
Fecal incontinence					
No	41	97.6	41	97.6	1.000
Yes	1	2.4	1	2.4	
Voiding frequency					
Less than 5/day	16	38.1	17	42.5	0.727
5 or more/day	26	61.9	23	57.5	

Table 4. Changes in incontinence and UTI frequency following treatment

	n	Mean rank	p
Frequency of daytime urinary incontinence after treatment (days)<Frequency of daytime urinary incontinence before treatment (days)	11	7.05	0.025
Frequency of daytime urinary incontinence after treatment (days)>Frequency of daytime urinary incontinence before treatment (days)	2	6.75	
Frequency of daytime urinary incontinence after treatment (days)=Frequency of daytime urinary incontinence before treatment (days)	28		
Frequency of nighttime urinary incontinence after treatment (hours)<Frequency of nighttime urinary incontinence before treatment (hours)	12	8.88	0.008
Frequency of nighttime urinary incontinence after treatment (week)>Frequency of nighttime urinary incontinence before treatment (week)	3	4.50	
Frequency of nighttime urinary incontinence after treatment (week)=Frequency of nighttime urinary incontinence before treatment (week)	26		
Frequency of UTI after treatment (years)<Frequency of I UTI before treatment (years)	14	9.21	0.012
Frequency of UTI after treatment (years)>Frequency of UTI before treatment (years)	3	8.00	
Frequency of UTI after treatment (years)=Frequency of UTI before treatment (years)	18		

Wilcoxon test. UTI: Urinary tract infection.

Table 5. Response rates to treatment

	Response to treatment				p
	Yes		No		
	n	%	n	%	
Age (mean±SD)[a]	12±294		12.12±3.34		0.932
Comorbidities[b]					
No	2	11.1	16	88.9	0.438
Yes	5	21.7	18	78.3	
Constipation[b]					
No	5	15.2	28	84.8	0.606
Yes	2	25	6	75	
Fekal incontinence[b]					
No	7	17.5	33	82.5	1.000
Yes	0	0	1	100	
History of UTI[b]					
No	3	18.8	13	81.3	1.000
Yes	4	16	21	84	
Voiding frequency[b]					
Less than 5	0	0	16	100	0.031
5 or more	7	28	18	72	
Medications used[b]					
Anticholinergics	1	14.3	6	85.7	1.000
Prophylaxis	4	25	12	75	0.273
Laxatives	2	33.3	4	66.7	0.270
Other medications	1	25	3	75	1.000
Indication[b]					
UTI	2	22.2	7	77.8	0.130
Daytime incontinence	1	16.7	5	83.3	
Monosymptomatic enuresis	0	0	7	100	
Non-monosymptomatic enuresis	1	7.7	12	92.3	
Other	3	50	3	50	

[a]: t-test; [b]: Chi-square test. UTI: Urinary tract infection.

Initially, increased EMG activity was common; however, by the 12th session, most patients demonstrated significant relaxation (83.3%), while only 16.7% continued to show increased activity (Table 6).

At the first session, 26.3% of patients exhibited a bell-shaped voiding pattern, which increased to 84% by the eighth session. This rate plateaued at the eighth session and persisted through the twelfth session (Table 6, Fig. 1).

Table 6 and Figure 1 present changes in three parameters—voided volume (mL), Qmax (mL/s), and voiding time (seconds)—over eight sessions. A statistically significant increase in voided urine volume and Qmax values was observed when these parameters were compared successively from the 1st to the 8th session ($p<0.05$). No significant change was observed in voiding duration (Figs. 1, 2).

Table 6. Changes in electromyographic activity, voiding patterns, and uroflow parameters during biofeedback therapy

Session	EMG relaxation		EMG increase		Bell-shaped voiding pattern		Voided volume (mL)	Qmax (mL/s)	Voiding time (sec)
	n	%	n	%	n	%			
1st	11	26.3	31	73.7	11	26.3	193.47±156.99	13.7±11.8	77±136
8th	24	56.0	7	16.7	35	84.0	247.48±168.43	17.6±14.9	40±55
12th	24	56.0	7	16.7	35	84.0	202±111	15.5±6.8	20±9.9

EMG: Electromyography.

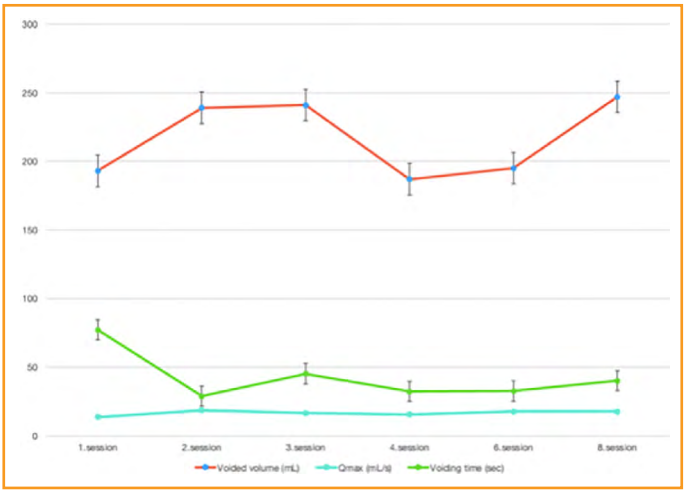

Figure 1. Changes in parameters.

Discussion

Biofeedback therapy has been reported as a non-invasive and potentially effective approach for the treatment of dysfunctional voiding and daytime enuresis in children [7–9]. It helps children become aware of normal voiding cycles and teaches them to consciously relax their pelvic floor muscles during urination [10,11]. The success of biofeedback largely depends on the motivation of children and their families, adherence to the program, and compliance with standard behavioral therapy. Additionally, the presence of a trained urotherapy nurse is crucial. In this study, treatment sessions were conducted by a single experienced nurse, and indications were mainly determined by a single pediatric urologist or nephrologist, which likely contributed to the consistency of our results.

Numerous studies have reported varying outcomes regarding the efficacy of biofeedback. Some have demonstrated significant improvements in dysfunctional voiding and NMSE, whereas others have reported limited or no benefit [4,12–15]. Reported success rates for the treatment of daytime symptoms and NMSE range from 28% to 64%. For example, in a prospective controlled study evaluating intra-anal biofeedback for resistant MSE, 60% of patients achieved a partial response by the third month, while none achieved complete dryness [16]. According to the International Children's Continence Society (ICCS), desmopressin and alarm therapy are recommended as first-line treatments for MSE, whereas biofeedback is considered appropriate

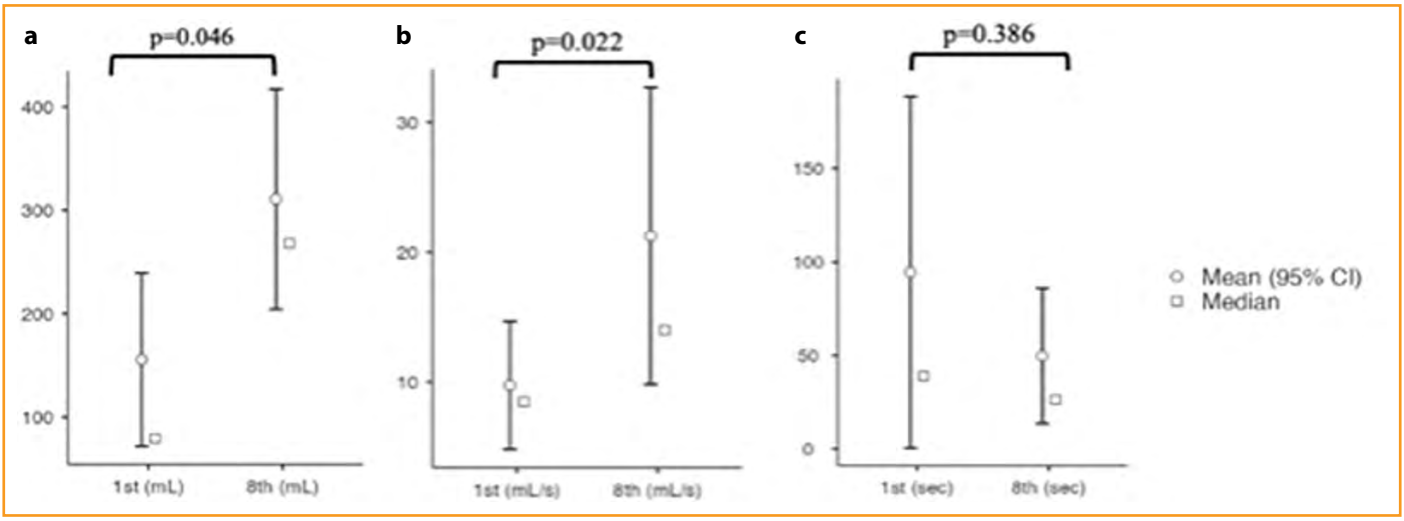

Figure 2. Comparison variables before and after sessions. (a) Voided volume, (b) Qmax, (c) Voiding duration.

for children with dysfunctional voiding. In NMSE, correction of voiding posture and prioritization of daytime symptom treatment are essential, as emphasized in the updated ICCS standardization document on the management and treatment of nocturnal enuresis [17]. Our findings are consistent with ICCS recommendations; although biofeedback reduced the frequency of wet episodes, it did not result in complete dryness.

Improvements in uroflow patterns and EMG relaxation are consistent with the expected effects of biofeedback therapy. In our study, bell-shaped voiding curves increased to 84% by the eighth session and remained stable thereafter [9,18–20]. However, despite these improvements, complete dryness was not consistently achieved. These results further support ICCS recommendations, which endorse biofeedback for dysfunctional voiding while emphasizing the prioritization of daytime symptom management in NMSE [17].

Patients who voided five or more times per day showed better responses to biofeedback therapy compared with those with lower voiding frequency. This finding is consistent with previous studies suggesting that voiding frequency and bladder capacity may guide treatment strategies [21]. Interestingly, the use of anticholinergic medications, which was common in our cohort, appeared to be a negative predictor of treatment success, although this association did not reach statistical significance in our study.

Constipation remains a challenging comorbidity. Although some studies suggest that biofeedback may improve functional constipation, meta-analyses report limited efficacy in this context [22–24]. Similarly, our findings showed no significant change in constipation symptoms, indicating a need for more targeted interventions.

Significant improvements in uroflowmetry (UFM) parameters following biofeedback therapy have been previously documented, including increased voided volume and maximum flow rate (Qmax), along with reduced voiding time [25,26]. These findings are consistent with our results, in which voided volumes increased significantly by the eighth session. However, variability in Qmax and voiding time may reflect external factors such as stress or urgency during testing.

Regarding treatment duration, one study reported improvements after a mean of 2.2 sessions, with peak improvement in voiding patterns observed by the eighth session and sustained through the twelfth session [27]. In our cohort, bell-shaped voiding patterns were observed in 43.5% of patients by the third session, increasing to 84% by the eighth session and remaining stable thereafter. These findings support an 8–12-week treatment period to optimize outcomes, maintain motivation, and avoid unnecessary prolongation of therapy.

This study has several limitations. As the cohort included only female patients, the generalizability of the findings is limited. The relatively short follow-up period precluded assessment of long-term treatment efficacy. Moreover, the absence of a control group limited the ability to evaluate the effectiveness of biofeedback therapy in a comparative context. Most participants were children with refractory symptoms who had not responded to prior medical and behavioral therapies; therefore, leaving them untreated was considered ethically inappropriate, making a randomized controlled design unfeasible. Another limitation was the inability to systematically monitor adherence to the recommended home exercise program. Despite these limitations, our study demonstrates the effectiveness of biofeedback therapy, particularly in refractory dysfunctional voiding, and highlights the importance of identifying patient profiles most likely to benefit, as well as the need to develop standardized clinical protocols.

Conclusion

In this study, biofeedback therapy was found to be effective in the treatment of dysfunctional voiding and in reducing the frequency of urinary tract infections (UTIs). Episodes of incontinence in children with daytime incontinence were reduced by this non-invasive treatment modality. However, biofeedback was not successful in achieving complete dryness or in the treatment of MSE. Overall, the results support the effectiveness of biofeedback therapy in normalizing voiding patterns and facilitating conscious relaxation of the pelvic floor muscles.

Ethics Committee Approval: The study was approved by İstanbul Medipol University Ethics Committee (No: 495, Date: 17.04.2025).

Use of AI for Writing Assistance: No artificial intelligence tools were used in this study.

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept – A.C.; Design – A.C.; Supervision – Ç.U.D.; Fundings – A.C.; Materials – B.Ö.A., A.C.; Data collection and/or processing – A.C., B.Ö.A.; Analysis and/or interpretation – A.C., Ç.U.D.; Literature search – A.C.; Writing – A.C.; Critical review – Ç.U.D.

Conflict of Interest: The authors declare that there is no conflict of interest.

Financial Disclosure: This study was conducted without any institutional or financial support.

References

1. Neveus T, Eggert P, Evans J, Macedo A, Rittig S, Tekgül S, et al. Evaluation of and treatment for monosymptomatic enuresis: a standardization document from the International Children's Continence Society. J Urol 2010;183:441–7. [CrossRef]
2. Sarici H, Telli O, Ozgur BC, Demirbas A, Ozgur S, Karagoz MA. Prevalence of nocturnal enuresis and its influence on quality of life in school-aged children. J Pediatr Urol 2016;12:159.e1–6. [CrossRef]
3. Franco I, von Gontard A, De Gennaro M; International Childrens's Continence Society. Evaluation and treatment of nonmonosymptomatic nocturnal enuresis: a standardization document from the International Children's Continence Society. J Pediatr Urol 2013;9:234–43. [CrossRef]
4. Austin PF, Bauer SB, Bower W, Chase J, Franco I, Hoebeke P, et al. The standardization of terminology of lower urinary tract function in children and adolescents: Update report from the standardization committee of the International Children's Continence Society. Neurourol Urodyn 2016;35:471–81. [CrossRef]
5. Butler R, Heron J; Alspac Study Team. Exploring the differences between mono- and polysymptomatic nocturnal enuresis. Scand J Urol Nephrol 2006;40:313–9. [CrossRef]
6. Soygür T. Alt üriner sistem disfonksiyonlu hastanın evalüasyonu. Turkiye Klinikleri J Urology-Special Topics 2010;3:55–8. [Article in Turkish]
7. Feldman AS, Bauer SB. Diagnosis and management of dysfunctional voiding. Curr Opin Pediatr 2006;18:139–47. [CrossRef]
8. Nieuwhof-Leppink AJ, Hussong J, Chase J, Larsson J, Renson C, Hoebeke P, et al. Definitions, indications and practice of urotherapy in children and adolescents: - A standardization document of the International Children's Continence Society (ICCS). J Pediatr Urol 2021;17:172–81. [CrossRef]
9. Ebiloglu T, Ergin G, Irkilata HC, Kibar Y. The biofeedback treatment for non-monosymptomatic enuresis nocturna. Neurourol Urodyn 2016;35:58–61. [CrossRef]
10. Koenig JF, McKenna PH. Biofeedback therapy for dysfunctional voiding in children. Curr Urol Rep 2011;12:144–52. [CrossRef]
11. Combs AJ, Glassberg AD, Gerdes D, Horowitz M. Biofeedback therapy for children with dysfunctional voiding. Urology 1998;52:312–5. [CrossRef]
12. Alyami F, Ewida T, Alhazmi H, Trbay M, Arafa M, Tahir M, et al. Biofeedback as single first-line treatment for non-neuropathic dysfunctional voiding children with diurnal enuresis. Can Urol Assoc J 2019;13:E7–E9. [CrossRef]
13. Dos Reis JN, Mello MF, Cabral BH, Mello LF, Saiovici S, Rocha FET. EMG biofeedback or parasacral transcutaneous electrical nerve stimulation in children with lower urinary tract dysfunction: A prospective and randomized trial. Neurourol Urodyn 2019;38:1588–94. [CrossRef]
14. Vasconcelos M, Lima E, Caiafa L, Noronha A, Cangussu R, Gomes S, et al. Voiding dysfunction in children. Pelvic-floor exercises or biofeedback therapy: a randomized study. Pediatr Nephrol 2006;21:1858–64. [CrossRef]
15. Jacobsen LV, Jørgensen CS, Kaas Sørensen KM, Enemark L, Rittig S, Kamperis K. The efficacy of physiotherapeutic intervention with biofeedback assisted pelvic floor muscle training in children with dysfunctional voiding. J Pediatr Urol 2021;17:793.e1–e6. [CrossRef]
16. Abd El-Moghny SM, El-Din MS, El Shemy SA. Effectiveness of intra-anal biofeedback and electrical stimulation in the treatment of children with refractory monosymptomatic nocturnal enuresis: a comparative randomized controlled trial. Int Neurourol J 2018;22:295–304. [CrossRef]
17. Nevéus T, Fonseca E, Franco I, Kawauchi A, Kovacevic L, Nieuwhof-Leppink A, et al. Management and treatment of nocturnal enuresis-an updated standardization document from the International Children's Continence Society. J Pediatr Urol 2020;16:10–9. [CrossRef]
18. Hoekx L, Vermandel A, Wyndaele JJ. Functional bladder capacity after bladder biofeedback predicts long-term outcome in children with nocturnal enuresis. Scand J Urol Nephrol 2003;37:120–3. [CrossRef]
19. Sancak EB, Akbaş A, Kurt Ö, Alan C, Ersay AR. The effectiveness of biofeedback therapy in children with monosymptomatic enuresis resistant to desmopressin treatment. Turk J Urol 2016;42:278–84. [CrossRef]
20. Berry A, Rudick K, Richter M, Zderic S. Objective versus subjective outcome measures of biofeedback: what really matters? J Pediatr Urol 2014;10:620–6. [CrossRef]
21. Haid B, Tekgül S. Primary and secondary enuresis: pathophysiology, diagnosis, and treatment. Eur Urol Focus 2017;3:198–206. [CrossRef]
22. Jarzebicka D, Sieczkowska J, Dadalski M, Kierkus J, Ryzko J, Oracz G. Evaluation of the effectiveness of biofeedback therapy for functional constipation in children. Turk J Gastroenterol 2016;27:433–8. [CrossRef]
23. Qi W, Zhou Y, Zhong M, Lv G, Li R, Wang W, et al. The effect of biofeedback treatment for children with non-neurogenic voiding dysfunction: A systematic review and meta-analysis. Neurourol Urodyn 2022;41:868–83. [CrossRef]
24. Li F, Feng L, Yang Y, Ma X, Kang T, Huang W. The effect of biofeedback on nonneurological dysfunctional voiding in children: A meta-analysis and systematic review. J Pediatr Urol 2024;20:565–80. [CrossRef]
25. Nelson JD, Cooper CS, Boyt MA, Hawtrey CE, Austin JC. Improved uroflow parameters and post-void residual following biofeedback therapy in pediatric patients with dysfunctional voiding does not correspond to outcome. J Urol 2004;172:1653–6. [CrossRef]
26. Desantis DJ, Leonard MP, Preston MA, Barrowman NJ, Guerra LA. Effectiveness of biofeedback for dysfunctional elimination syndrome in pediatrics: a systematic review. J Pediatr Urol 2011;7:342–8. [CrossRef]
27. Shei Dei Yang S, Wang CC. Outpatient biofeedback relaxation of the pelvic floor in treating pediatric dysfunctional voiding: a short-course program is effective. Urol Int 2005;74:118–22. [CrossRef]