doi: 10.13241/j.cnki.pmb.2017.07.015

生物反馈联合电刺激在女性盆底功能障碍性疾病治疗中的临床应用

张 璐 郑 萍 孙如意 李 慧 魏 薇

（首都医科大学附属北京妇产医院妇科 北京 100026）

摘要 目的:分析生物反馈联合电刺激对女性盆底功能障碍性疾病(PFD)的治疗效果。**方法**:选择2011年1月至2016年3月我院收治的1000例PFD患者为研究对象,按随机数字表法分为实验组和对照组,每组各500例。实验组给予生物反馈联合电刺激,对照组给予功能性电刺激治疗。比较两组治疗前后盆底肌肉肌力分级的变化,测定盆底功能相关指标的改善及患者治疗前后排尿情况。**结果**:治疗后2组盆底肌力分级均呈明显上升趋势(Z=52.587,37.581;P<0.001),且观察组改善效果优于对照组(Z=27.588,P<0.001);治疗后实验组盆底肌肉肌力正常率高于对照组,差异有统计学意义(x^2=68.323,P<0.05);治疗后实验组最大收缩压、持续收缩压提升幅度较大,膀胱颈移动度明显减小,与对照组各项指标对比差异有统计学意义(P<0.05),且治疗后两组排尿情况均有所好转,实验组效果优于对照组(P<0.05)。**结论**:生物反馈联合电刺激对女性PFD具有较好的效果,能提高患者盆底最大收缩压、持续收缩压,减小膀胱颈移动度,改善患者排尿功能。

关键词:生物反馈;电刺激;盆底功能障碍

中图分类号:R711 **文献标识码**:A **文章编号**:1673-6273(2017)07-1263-03

Clinical Application of Biofeedback Combined with Electrical Stimulation in the Treatment of Female Pelvic Floor Dysfunction

ZHANG Lu, ZHENG Ping, SUN Ru-yi, LI Hui, WEI Wei

(Department of Gynecology, Beijing Obstetrics and Gynecology Hospital Affiliated to Capital Medical University, Beijing, 100026, China)

ABSTRACT Objective: To analyze the effect of biofeedback combined with electrical stimulation on the treatment of female pelvic floor dysfunction (PFD). **Methods:** 1000 cases of PFD in our hospital from January 2011 to March 2016 were selected and divided into experimental group and control group according to the random number table method,500 cases in each group. The experimental group was treated with biofeedback and electrical stimulation, and the control group was treated with functional electrical stimulation. Compared with the two groups before and after the treatment of pelvic floor muscle muscle strength classification, the improvement of pelvic floor function and the improvement of patients before and after treatment. **Results:** After treatment, two groups of pelvic floor muscle strength grading showed a significant upward trend (Z=52.587, 37.581; P<0.001), and the improvement effect of the observation group was better than the control group (Z=27.588, P<0.001); After treatment, the muscle strength of the pelvic floor in the experimental group was higher than that in the control group, the difference was statistically significant (x^2=68.323, P<0.05); After treatment,the maximum systolic blood pressure and the increase of the continuous systolic blood pressure in the experimental group were significantly higher than that of the bladder neck,compared with the control group,the differences were statistically significant (P<0.05), and after treatment, the two groups were improved by urination, the experimental group was better than the control group (P<0.05). **Conclusion:** Biofeedback combined with electrical stimulation on female PFD has good effect, can improve the patient's pelvic floor maximum systolic pressure, continuous systolic pressure, reduce bladder neck mobility, improve the patient's urination function.

Key words: Biofeedback; Electrical stimulation; Pelvic floor dysfunction

Chinese Library Classification(CLC): R711 Document code: A

Article ID: 1673-6273(2017)07-1263-03

前言

女性盆底功能障碍(Pelvic Floor Dysfunction, PFD)是由盆底支持结构功能降低,导致盆腔脏器位移,脏器功能异常所致,表现为压力性尿失禁 (Stress Urinary Incontinence, SUI) 和盆腔器官脱垂[1],多发于中年妇女群体,对患者生活质量及身体健康具有较大的负面影响。目前治疗分为手术治疗及非手术治疗,非手术治疗包括盆底肌训练、功能性电刺激、生物反馈等,盆底肌肉训练因其操作简便、安全有效等优点临床运用广泛,其作用机理主要以指导患者对肛门及阴道进行反复性的收缩动作,收紧动作≥ 3 s,然后放松,以增强患者盆底肌肉的力量,改善患者尿失禁情况,但部分患者毅力欠缺,无法维持训练的持续进行。为此,可以将功能性电刺激及生物反馈治疗作为一种联合治疗手段,以帮助患者达到预期训练效果[2-4]。基于此,本研究对

作者简介:张璐(1977-),女,本科,主治医师,从事盆底功能障碍性疾病及妇科方面的研究,E-mail:wangzai199@sina.com

(收稿日期:2016-07-28 接受日期:2016-08-20)

收治患者采取不同的治疗方案，对比其疗效，为临床提供治疗依据，现报道如下：

1 资料与方法

1.1 一般资料

选择 2011 年 1 月至 2016 年 3 月我院收治的 1000 例 PFD 患者为研究对象。纳入标准：均符合《女性盆底功能障碍性疾病诊断方法》中相关标准[5]；均伴尿失禁症状，患者腹部用力、上下坡、咳嗽时出现不自主尿液漏出情况；患者知情同意，经本院医学伦理委员会批准。排除标准：排除临床资料不完整者；盘底失去神经支配者；合并严重妇科疾病、恶性肿瘤者；患有精神类疾病者或意识不清、语言功能障碍者。按随机数表法分为实验组和对照组，每组各 500 例。实验组年龄 22-40 岁，平均（28.6± 4.7）岁；体重 46-60 kg，平均(52.6± 5.4)kg；病程（4.5± 2.3）个月；孕产次（1.3± 0.2）次。对照组年龄 21-39 岁，平均（28.9± 5.21）岁；体重 45-59 kg，平均(52.0± 4.5)kg；病程（4.6± 2.4）个月；孕产次（1.2± 0.2）次。两组男女比例、年龄、体重、病程、孕产次等资料比较差异无统计学意义（P＞0.05），具有可比性。

1.2 方法

对照组给予功能性电刺激治疗，采用法国 PHENIX USB 4 型神经肌肉电刺激仪，给予 35-50 Hz 的持续电刺激，电流 0 至 70 mA 递增，脉冲 200-500 us，1UROSTYM 生物刺激反馈治疗仪 h/ 次，1-2 次 /d。实验组在此基础上加用生物反馈方案，采用加拿大 UROSTYM 生物刺激反馈治疗仪，消毒电击片后插入阴道直至电极颈末端，输入生物反馈电流，以有刺激但无疼痛感为佳，电流低于 100 Hz，1 次 /20 min，＞2 次 / 周，两组治疗均维持三个月。

1.3 观察指标

①采用盆底肌肉肌力分级[6]测定两组治疗前后盆底肌肉功能的改善情况，分为 0-5 级共 6 个级别。0 级：检测者手指感觉不到肌肉收缩；1 级：感觉阴道肌肉轻微颤动；2 级：感觉阴道肌肉出现不完全收缩；3 级：感觉阴道肌肉完成收缩，持续 3S，重复 3 次，没有对抗；4 级：阴道肌肉完全收缩，维持 4S，重复 4 次，具有轻微对抗；5 级：阴道肌肉完全收缩，持续 5S，重复次数＞5 次，且具有持续对抗。≥ 3 级为正常。②检测两组治疗前后盆底功能相关指标的改善情况，包括盆底肌最大收缩压、持续收缩压、膀胱颈移动度等指标。③观察两组患者排尿间隔、每日排尿频次、夜尿频次、每日排尿量等情况。

1.4 统计学方法

应用 SPSS19.0 对数据进行处理，计量资料用（$\bar{x}$± s）表示，采用 t 检验，计数资料用%表示，采用卡方检验，等级资料比较采用秩和检验，P＜0.05 为差异有统计学意义。

2 结果

2.1 两组患者治疗前后盆底肌肉肌力分级对比

治疗前，两组盆底肌肉肌力分级情况与对照组差异对比无统计学意义（Z=-0.683，P＞0.495），治疗后 2 组盆底肌力分级均呈明显上升趋势（Z=52.587，37.581；P＜0.001），且观察组改善效果优于对照组（Z=27.588，P＜0.001）。治疗后实验组盆底肌肉肌力正常率为 88.0%（440/500），高于对照组的 66.0%（330/500），差异有统计学意义（x^2=68.323，P＜0.05），见表 1。

表 1 两组患者治疗前后盆底肌肉肌力分级对比[n(%)]

Table 1 Comparison of patients before and after treatment of pelvic floor muscle muscle strength of the two groups [n(%)]

Groups		Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
Experience group（n=500）	Before treatment	100(20.0)	120(24.0)	110(22.0)	80(16.0)	50(10.0)	40(8.0)
	After treatment	0(0.0)	20(4.0)	40(8.0)	160(32.0)	200(40.0)	80(16.0)
Control group（n=500）	Before treatment	90(18.0)	130(26.0)	140(28.0)	70(14.0)	40(8.0)	30(6.0)
	After treatment	30(6.0)	40(8.0)	100(20.0)	100(20.0)	180(36.0)	50(10.0)

2.2 两组盆底功能相关指标对比

两组治疗前盆底肌最大收缩压、持续收缩压、膀胱颈移动度等指标对比，差异无统计学意义（P＞0.05），治疗后两组最大收缩压、持续收缩压具有所提升，膀胱颈移动度有所减小，但观察组提升幅度较大，对比对照组差异具有统计学意义（P＜0.05），见表 2。

表 2 两组盆底功能相关指标对比

Table 2 Comparison of pelvic floor function related indicators of the two groups

Groups	Maximum systolic pressure(μV)		Continuous systolic blood pressure(μV)		Bladder neck mobility(mm)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Experience group（n=500）	35.1± 5.4	44.9± 6.4*	23.5± 5.3	33.4± 4.9*	34.1± 5.6	24.5± 3.5*
Control group（n=500）	35.2± 4.8	40.5± 3.9*	23.2± 4.4	31.9± 3.6*	33.9± 4.5	29.8± 4.6*
t	0.618	13.128	0.973	5.516	0.623	20.503
P	0.536	0.233	0.330	0.000	0.534	0.000

Note:compared with before treatment,*P<0.05.

2.3 两组治疗前后排尿情况对比

治疗前，两组排尿间隔、每日排尿频次、夜尿频次、每日排尿量对比差异无统计学意义（P＞0.05），治疗后两组排尿情况均有所好转，实验组各项指标改善情况优于对照组，对比差异

具有统计学意义(P< 0.05),见表 3。

表 3 两组治疗前后排尿情况对比

Table 3 Comparison of before and after treatment of the two groups

Groups	Micturition interval(h)		Daily micturition frequency (once/d)		Night urine frequency(once/d)		Daily micturition volume(mL)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Experience group(n=500)	1.0± 0.3	2.6± 0.5*	9.7± 1.8	5.6± 1.4*	3.5± 0.4	1.1± 0.2*	133.4± 42.1	370.5± 59.2*
Control group (n=500)	1.0± 0.4	1.9± 0.8*	9.6± 1.9	7.2± 1.5*	3.5± 0.5	1.5± 0.1*	134.5± 41.2	300.5± 64.6*
t	0.000	16.592	0.854	17.437	0.000	40.000	0.418	67.115
P	1.000	0.000	0.393	0.000	1.000	0.000	0.676	0.000

Note: compared with before treatment, *P<0.05.

3 讨论

PFD 为临床常见疾病,多发于中老年群体,且随患者年龄的增加,其发病率明显上升[8,9]。其发病与盆腔脏器移位有关,且其发病诱导因素较多,妊娠和分娩是其主要危险因素[10-12]。妊娠过程对盆底肌肉过度压迫,盆底组织松弛,引起尿失禁。有统计资料显示[13],妊娠期尿失禁发生率超过 45%,且发生率随孕周的增加逐渐增加。分娩过程中对盆底肌创伤较大,相比剖宫产,阴道分娩会破坏盘底肌肉筋膜和阴道壁,间接破坏盆底肌肉和神经,导致尿失禁。也有研究报道[14],随着年龄的增长,尿失禁患病率在持续增加,调查显示尿失禁发病的高峰期在 50 岁左右,该年龄阶段的群体各项机能处于衰退的过程中,但高龄并不是尿失禁发病的必要因素。此外肥胖、便秘、绝经、呼吸系统病史、盆腔手术也是其危险因素[15,16]。

外科手术是治疗 PFD 的有效方案,但其对女性机体创伤大,术后并发症发生率较高,患者可接受度差。相对而言,保守治疗安全性较高,并发症发生较低,且治疗费用低廉,患者可接受度高。生物反馈疗法、盆底肌肉训练均为常见保守治疗方案,其中盆底肌肉锻炼早期应用较为广泛,具有简单、易操作,主要是指导患者有规律收缩肛门及阴道,增加患者对神经的操控度,以达到预期效果,但其对患者主观要求高,其疗效与患者配合度呈正相关。在此基础上辅以生物反馈疗法则可提高干预效果,帮助患者增强盆底肌肉力量。生物反馈法是指采用模拟的声音及视觉信号对患者盆底肌肉异常状态进行反馈,矫正临床治疗的缺陷,以达到预期效果。电刺激治疗是指对盆底给予持续的电流刺激,诱导患者神经反射,改善下尿路功能异常。

生物反馈联合电刺激治疗 PFD,其工作原理为采用模拟的语音、视觉信号提示,指导患者积极参与训练,采用编程式人机交互方式,选择合适的治疗方法,并且对不同参数下的疗效作评价和对比,达到精准、针对性治疗的目的。早期该治疗方案多用于偏瘫患者局部肢体功能康复的训练,后来证实在男性前列腺术后尿失禁、慢性骨盆疼痛综合征、趾骨直肠肌失弛缓性便秘以及臂丛神经损伤治疗中也具有较高的疗效[17]。本研究中实验组患者采用生物反馈联合电刺激治疗,盆底肌肉肌力分级提升明显,较对照组对比差异具有统计学意义,患者盆底功能相关指标恢复也较为明显,盆底肌最大收缩压、持续收缩压增大,膀胱颈移动度减小,患者对盆底肌肉掌握度更高,证明其对盆底肌肉恢复的有效性。排尿间隔由 1-2 h/ 次提升到 3 h/ 次,每天排尿频率及夜尿频率也相应减少,每日排尿量明显增加,表明患者对盆底神经的的掌控度更高[18-20]。

综上所述,生物反馈联合电刺激对女性 PFD 具有较好的效果,能提高患者盆底最大收缩压、持续收缩压,减小膀胱颈移动度,改善患者排尿功能。

参 考 文 献(References)

[1] Khatri G, Carmel ME, Bailey AA, et al. Postoperative Imaging after Surgical Repair for Pelvic Floor Dysfunction[J]. Radiographics, 2016, 36(4): 1233-1256

[2] Shelly B. Pelvic Muscle Exercises Using A Home Trainer for Pelvic Muscle Dysfunction: A Case Report[J]. Urol Nurs, 2016, 6(2): 82-87

[3] Nakamura S, Hyuga T, Kawai S, et al. Long-Term Outcome of the Pippi Salle Procedure for Intractable Urinary Incontinence in Patients with Severe Intrinsic Urethral Sphincter Deficiency [J]. J Urol, 2015, 194 (5): 1402-1406

[4] Freeman A, Menees S. Fecal Incontinence and Pelvic Floor Dysfunction in Women:A Review [J]. Gastroenterol Clin North Am, 2016, 45 (2): 217-237

[5] Jin M, Chen Y, Zhou Y, et al. Transplantation of bone marrow-derived mesenchymal stem cells expressing elastin alleviates pelvic floor dysfunction[J]. Stem Cell Res Ther, 016, 7(1): 51

[6] Bennett J, Greenwood A, Durdey P, et al. Prevalence of pelvic floor symptoms in female patients attending the two-week wait clinic with suspected colorectal cancer [J]. Ann R Coll Surg Engl, 2016, 98(6): 413-418

[7] Vonthein R, Heimerl T, Schwandner T, et al. Electrical stimulation and biofeedback for the treatment of fecal incontinence:a systematic review[J]. Int J Colorectal Dis, 2013, 28(11): 1567-1577

[8] Darski C, Barbosa LJ, Paiva LL, et al. Association between the Functionality of Pelvic Floor Muscles and Sexual Satisfaction in Young Women[J]. Rev Bras Ginecol Obstet, 2016, 38(4): 164-169

[9] Alvarez-Guerrico I, Royo I, Andreu M, et al. Protocol for neurophysiological studies of the pelvic floor to appraise anorectal dysfunction in patients with multiple sclerosis[J]. Rev Neurol, 2016, 62(5): 211-217

(下转第 1285 页)

derstanding and clinical utility of miRNAs in esophageal cancer[J]. Semin Cancer Biol, 2013, 23: 512-521

[9] Hong L, Han Y, Brain L. Epidermal growth factor receptor: an important target in esophageal cancer [J]. Expert Opin Ther Targets, 2013, 17(10): 1179-1185

[10] Wong GS, Lee JS, Park YY, et al. Periostin cooperates with mutant p53 to mediate invasion through the induction of STAT1 signaling in the esophageal tumor microenvironment [J]. Oncogenesis, 2013, 2: e59

[11] Yang Y, Tarapore RS, Jarmel MH, et al. p53 mutation alters the effect of the esophageal tumor suppressor KLF5 on keratinocyte proliferation[J]. Cell Cycle, 2012, 11(21): 4033-4039

[12] Ohashi S, Natsuizaka M, Wong GS, et al. Epidermal growth factor receptor and mutant p53 expand an esophageal cellular subpopulation capable of epithelial-to-mesenchymal transition through ZEB transcription factors[J]. Cancer Res, 2010, 70(10): 4174-4184

[13] Sengpiel C, K?nig IR, Rades D, et al. p53 Mutations in carcinoma of the esophagus and gastroesophageal junction[J]. Cancer Invest, 2009, 27(1): 96-104

[14] Zhang Y, Shu L, Chen X. Syntaxin 6, a regulator of the protein trafficking machinery and a target of the P53 family, is required for cell adhesion and survival[J]. J Biol Chem, 2008, 283(45): 30689-30698

[15] Engedal N, Mills IG. Endosomal signaling and oncogenesis [J]. Methods Enzymol, 2014, 535: 179-200

[16] Johnson IR, Parkinson-Lawrence EJ, Shandala T, et al. Altered endosome biogenesis in prostate cancer has biomarker potential [J]. Mol Cancer Res, 2014, 12(12): 1851-1862

[17] Joffre C, Barrow R, Mé nard L, et al. A direct role for Met endocytosis in tumorigenesis[J]. Nat Cell Biol, 2011, 13(7): 827-837

[18] Bock JB, Matern HT, Peden AA, et al. A genomic perspective on membrane compartment organization [J]. Nature, 2001, 409(6822): 839-841

[19] Bock JB, Lin RC, Scheller RH. A new syntaxin family member implicated in targeting of intracellular transport vesicles [J]. Biol Chem, 1996, 271(30): 17961-17965

[20] Bock JB, Klumperman J, Davanger S, et al. Syntaxin 6 functions in trans-Golgi network vesicle trafficking [J]. Mol Biol Cell, 1997, 8(7): 1261-1271

[21] Mallard F, Tang BL, Galli T, et al. Early/recycling endosomes-to-TGN transport involves two SNARE complexes and a Rab6 isoform[J]. Cell Biol, 2002, 156(4): 653-664

[22] Kuliawat R, Kalinina E, Bock J, et al. Syntaxin-6 SNARE involvement in secretory and endocytic pathways of cultured pancreatic beta-cells[J]. Mol Biol Cell, 2004, 15(4): 1690-1701

[23] Manickam V, Tiwari A, Jung JJ, et al. Regulation of vascular endothelial growth factor receptor 2 trafficking and angiogenesis by Golgi localized t-SNARE syntaxin 6 [J]. Blood. 2011, 117 (4): 1425-1435

[24] 史辉, 蒋淑干, 刘俊华, 等. STX6 和 P53 在食管癌组织中的表达及相互关系的研究[J]. 实用肿瘤杂志, 2012, 27(3): 237-239
Shi Hui, Jiang Su-gan, Liu Jun-hua, et al. Expression and relationship of stx6 and p53 in esophageal cancer tissue [J]. Journal of Practical Oncology, 2012, 27(3): 237-239

(上接第 1265 页)

[10] Pierce H, Perry L, Chiarelli P, et al. A systematic review of prevalence and impact of symptoms of pelvic floor dysfunction in identified workforce groups[J]. J Adv Nurs, 2016, 72(8): 1718-1734

[11] Fitz FF, Resende AP, Stü pp L, et al. Biofeedback for the treatment of female pelvic floor muscle dysfunction: a systematic review and meta-analysis[J]. Int Urogynecol J, 2012, 23(11): 1495-1516

[12] Bhan SN, Mnatzakanian GN, Nisenbaum R, et al. MRI for pelvic floor dysfunction: can the strain phase be eliminated?[J]. Abdom Radiol (NY), 2016, 41(2): 215-220

[13] Dobberfuhl AD, Spettel S, Schuler C, et al. A Novel Cystometric Model of Pelvic Floor Dysfunction After Rabbit Pelvic Floor Noxious Electrical Stimulation[J]. Female Pelvic Med Reconstr Surg, 2016, 22 (4): 248-253

[14] Kolberg Tennfjord M, Hilde G, Staer-Jensen J, et al. Effect of postpartum pelvic floor muscle training on vaginal symptoms and sexual dysfunction-secondary analysis of a randomised trial [J]. BJOG,2016, 123(4): 634-642

[15] Goode PS, Burgio KL, Johnson TM 2nd, et al. Behavioral therapy with or without biofeedback and pelvic floor electrical stimulation for persistent postprostatectomy incontinence: a randomized controlled trial[J]. JAMA, 2011, 305(2): 151-159

[16] Dobberfuhl AD, Spettel S, Schuler C, et al. Noxious electrical stimulation of the pelvic floor and vagina induces transient voiding dysfunction in a rabbit survival model of pelvic floor dystonia [J]. Korean J Urol, 2015, 56(12): 837-844

[17] Serati M, Rizk D, Salvatore S. Vaginal birth and pelvic floor dysfunction revisited:Can cesarean delivery be protective?[J]. Int Urogynecol J, 2016, 27(1): 1-2

[18] Bondurri A, Maffioli A, Danelli P. Pelvic floor dysfunction in inflammatory bowel disease [J]. Minerva Gastroenterol Dietol, 2015, 61(4): 249-259

[19] García-Sánchez E, Rubio-Arias JA, Avila-Gandí a V, et al. Effectiveness of pelvic floor muscle training in treating urinary incontinence in women:A current review[J]. Actas Urol Esp, 2016, 40(5): 271-278

[20] Yang EJ, Lim JY, Rah UW, et al. Effect of a pelvic floor muscle training program on gynecologic cancer survivors with pelvic floor dysfunction: a randomized controlled trial [J]. Gynecol Oncol, 2012, 125(3): 705-711