

Effect Analysis of Linear, Low-Energy Extracorporeal Shockwave Therapy for Female Stress Urinary Incontinence (SUI)

China Practical Medicine, March 2024, Vol. 19, No. 6

Authors: Wang Xin, Chen Xian-yan, Zhang Qian, Hu Yan, Jiang Ya

Affiliations:

- Laser Treatment Center of Urinary Nephropathy, Tai'an Central Hospital, Tai'an 271000, China (Wang Xin, Chen Xian-yan, Zhang Qian, Hu Yan)
- Laser Treatment Center of Urinary Nephropathy, Tai'an Fourth People's Hospital, Tai'an 271000, China (Jiang Ya)

Corresponding author: Jiang Ya

DOI: 10.14163/j.cnki.11-5547/r.2024.06.012

Abstract

Objective: To explore the therapeutic effect of linear, low-energy extracorporeal shockwave therapy (Li-ESWT) on female stress urinary incontinence (SUI).

Methods: Fifty women with SUI were treated by fixing the probe on the outer labia and administering Li-ESWT twice weekly for 3 consecutive weeks (10 minutes per session). Each treatment area received 900–1600 pulses, totaling 1800–3200 pulses per session. Energy flux density was 0.09 mJ/mm². The International Consultation on Incontinence Questionnaire–Short Form (ICIQ-SF), the Incontinence Quality of Life Questionnaire (I-QOL), and subjective clinical grading (Ingelman–Sundberg) were assessed before treatment, immediately after treatment, and at 2 months.

Results: Differences in ICIQ-SF and I-QOL across time points were significant ($P < 0.05$). ICIQ-SF decreased from 9.00 (7.00, 11.00) at baseline to 4.00 (1.00, 5.00) both post-treatment and at 2 months; I-QOL increased from 75.57 (68.18, 81.82) to 81.82 (76.14, 84.09) post-treatment and 81.82 (76.14, 85.23) at 2 months (all $P < 0.05$). No significant difference was found between post-treatment and 2-month scores ($P > 0.05$). Ingelman–Sundberg grading also improved significantly over time ($P < 0.05$): baseline mild 38 (76.0%), moderate 12 (24.0%); post-treatment asymptomatic 23 (46.0%), mild 25 (50.0%), moderate 2 (4.0%); at 2 months asymptomatic 23 (46.0%), mild 26 (52.0%), moderate 1 (2.0%).

Conclusion: A 3-week course of linear, low-energy ESWT significantly alleviates SUI symptoms, lowers subjective clinical grade, and improves quality of life.

Keywords: Low-energy linear extracorporeal shockwave; Female stress urinary incontinence; Quality of life

Introduction

Stress urinary incontinence (SUI) is involuntary urine leakage through the urethra when intra-abdominal pressure rises (e.g., coughing, sneezing, laughing). It is the most common cause of urinary incontinence in women and a symptom of pelvic floor dysfunction (PFD). International studies report a prevalence of 17.0%–55.0% among elderly women; surveys in China report 8.7%–38.5%. True prevalence is likely higher given low care-seeking. PFD management includes conservative and surgical approaches (medications, lifestyle changes, biofeedback, transcutaneous or implanted electrical stimulation, magnetic stimulation, traditional Chinese medicine, acupuncture, acupoint injections; surgery for severe cases). Compliance with lifestyle/Kegel training is often poor, and some intravaginal devices can be uncomfortable. Prior studies (abroad and in Taiwan) show 8 weeks of low-intensity shockwave therapy can improve urgency and frequency and enhance quality of life in women with OAB/SUI. Reports from China are scarce. This study evaluated a 3-week Li-ESWT course for mild–moderate female SUI.

Materials and Methods

Participants: Women diagnosed with mild–moderate SUI presenting between Dec 2021 and Apr 2022.

Severity definitions:

- Mild: leakage with coughing/sneezing/laughing, no pad.
- Moderate: leakage during routine activity (stairs, walking, lifting), pad needed.
- Severe: leakage with minimal activity or posture change.

Inclusion criteria: SUI >1 year; oriented and communicative; informed consent; agreed to complete scales.

Exclusion criteria: Pregnancy or within 6 months postpartum; urogenital infection or vulvar surgery within 6 months; psychiatric disease; genital sensory neuropathy; alcohol/drug addiction.

Elimination criteria: Did not complete full treatment or questionnaires (2 patients traveling were excluded).

Final sample: 50 patients; age 30–61 (mean 47.06 ± 8.34) years. SUI history: <5 years 21; 5–10 years 15; 11–20 years 12; >20 years 2. Forty-nine had never sought prior care; 1 had frequency/urgency (20–30 voids/day) with poor response to medication.

Intervention: Israel RENOVA linear ESWT device. Two sessions per week for 3 weeks (6 total). Probe fixed on both outer labia; 900–1600 pulses per area (total 1800–3200 per session); energy flux density 0.09 mJ/mm^2 ; ~10 minutes/session.

Outcomes: ICIQ-SF, I-QOL, and Ingelman–Sundberg grading before, after, and at 2 months. One nurse-therapist performed all treatments and administered/collected questionnaires. Baseline and post-treatment forms were completed on-site; the 2-month follow-up used a structured phone interview.

Scale details: ICIQ-SF (3 items; higher = worse). I-QOL (22 items; 3 domains: behavior limitation, psychological impact, social embarrassment); score = (total – 22)/88 × 100 (0–100; higher = better QoL); Chinese simplified version reliability Cronbach's α 0.963. Ingelman–Sundberg grading: mild (cough/sneeze; no pad), moderate (leak during daily activity; pad), severe (leak with minor activity/posture change).

Statistics: SPSS 26.0. Non-normal data as M(P25, P75), nonparametric tests; categorical data as %, χ^2 test. $P < 0.05$ significant.

Results

ICIQ-SF and I-QOL improved significantly vs baseline ($P < 0.05$); no difference between post-treatment and 2 months ($P > 0.05$).

Time	ICIQ-SF (M[P25, P75])	I-QOL (M[P25, P75])
Before	9.00 (7.00, 11.00)	75.57 (68.18, 81.82)
After	4.00 (1.00, 5.00)*	81.82 (76.14, 84.09)*
2 months	4.00 (1.00, 5.00)*	81.82 (76.14, 85.23)*

* $P < 0.05$ vs before (Bonferroni corrected); $Z = 79.043$ (ICIQ-SF), 66.07 (I-QOL); $P = 0.000$ for both.

Ingelman–Sundberg grading improved significantly across time points ($\chi^2 = 41.328$; $P = 0.000$); no difference between post-treatment and 2 months.

Time	Asymptomatic n (%)	Mild n (%)	Moderate n (%)
Before	0	38 (76.0)	12 (24.0)
After	23 (46.0)	25 (50.0)	2 (4.0)
2 months	23 (46.0)	26 (52.0)	1 (2.0)

Discussion

Li-ESWT produced rapid and sustained symptom relief: many patients noticed improvement after 2 sessions, with peak effect around 4 sessions, and sessions 5–6 consolidating benefits. One case with frequency 20–30/day improved to ~10/day after 3 weeks, without rebound after discontinuing medication. The non-invasive, comfortable modality supports higher acceptance and compliance.

Mechanisms likely include angiogenesis (e.g., VEGF upregulation), enhanced perfusion, anti-inflammatory and analgesic effects, and tissue regeneration, which together increase urethral closure pressure and reduce inflammation in pelvic/urethral tissues.

Conclusion

Three weeks of Renova low-energy linear shockwave therapy effectively reduces urinary leakage, lowers symptom severity, and improves quality of life, with effects persisting at least 2 months. Larger, longer-term studies are recommended.

References (SUI article)

- Abrams P, et al. Neurourol Urodyn, 2002, 21(2):167–178.
- Raza-Khan F. Clin Obstet Gynecol, 2021, 64(2):276–286.
- Lu Shi, et al. Maternal and Child Health Care of China, 2017, 32(16):3896–3900.
- Li Hong, et al. Maternal and Child Health Care of China, 2015, 30(29):5049–5051.
- Fan Liyun, Huang Pei. Primary Health Care of China, 2015, 29(6):57–58.
- Lin KL, et al. Medicina (Kaunas), 2021, 57(9):947.
- Lu JH, et al. Biology (Basel), 2021, 10(6):540.
- Long CY, et al. Sci Rep, 2020, 10(1):5818.
- Su Hengchuan, et al. Modern Urology, 2021, 26(11):989–990.
- Chinese Society of Obstetrics and Gynecology Pelvic Floor Group. Chinese Journal of Obstetrics and Gynecology, 2017, 52(5):289–293.
- Wagner TH, et al. Urology, 1996, 47(1):67–71.
- Wang Xiaoqian. Peking Union Medical College, 2013.
- Lee YC, et al. Biomed Res Int, 2020:9175676.
- Peng Cheng, et al. Chinese Journal of Andrology, 2018, 24(1):78–81.
- Xu Ying, et al. Massage & Rehabilitation Medicine, 2021, 12(11):77–81.
- Ito K, Fukumoto Y, Shimokawa H. Tohoku J Exp Med, 2009, 219(1):1–9.

Translated References from the Preceding Article ([3]–[16])

- Jia Xueqin, Li Wenxia. Nursing care for a single case of breast-conserving surgery combined with latissimus dorsi breast reconstruction in breast cancer. China Contemporary Medicine, 2022, 29(18):172–175.
- Yang Yuyang, Li Jianjuan, Jin Litao, et al. Clinical efficacy of nipple–areola-sparing total gland excision with immediate latissimus dorsi pedicled myocutaneous flap transfer for breast reconstruction in breast cancer. Modern Hospital, 2022, 22(5):811–814.

- Chen Li, Kong Xiangyi, Wang Xiangyu, et al. Progress in immediate latissimus dorsi myocutaneous/muscle flap breast reconstruction after breast cancer surgery. *Chinese Journal of Practical Diagnosis and Therapy*, 2019, 33(8):768–771.
- Wu Chengxing, Wang Yan. Key points of immediate latissimus dorsi flap reconstruction after radical surgery preserving the nipple–areola complex in breast cancer. *Chinese Community Doctors*, 2022, 38(9):48–50.
- Shi Hailiang. Risk factors for postoperative upper-limb lymphedema in breast cancer and comparison of edema after latissimus dorsi flap vs modified radical mastectomy. *Xinjiang Medical University*, 2022.
- Zhou Jia. Feasibility of immediate latissimus dorsi flap breast reconstruction via a single supine incision after breast cancer surgery: a clinical study. *Ningxia Medical University*, 2022.
- Wu Jiahao, Xu Xumin, Wang Yanyan. Value of immediate breast reconstruction with latissimus dorsi myocutaneous flap combined with autologous fat after breast cancer surgery. *Chinese Journal of Frontier Medicine (Electronic Edition)*, 2021, 13(10):99–103.
- Chen Shirui, Xu Yuan, Gu Jun, et al. Immediate breast reconstruction with latissimus dorsi myocutaneous flap combined with prosthesis after modified radical mastectomy. *Tissue Engineering and Reconstructive Surgery*, 2021, 17(5):394–399.
- Li Ping, Yin Yixing, Tan Yaopeng, et al. Effect of immediate latissimus dorsi flap reconstruction after modified radical mastectomy in breast cancer treatment. *Cancer Progress*, 2020, 18(22):2341–2344.
- Liang Hao. Clinical efficacy of immediate latissimus dorsi flap breast reconstruction after modified radical mastectomy. *Sichuan Journal of Anatomy*, 2020, 28(3):50–51, 58.
- Zhou Tao, Zhuang Yaqiang, Cao Yiming, et al. Pedicled latissimus dorsi flap transfer in post-mastectomy repair and reconstruction. *China Practical Medicine*, 2020, 15(24):63–65.
- Wang Hui. Effect of pedicled latissimus dorsi flap transfer in repair and reconstruction after breast cancer surgery. *Chinese and Foreign Medical Research*, 2019, 17(32):27–29.
- Yang Liping. Comparative analysis of clinical efficacy between latissimus dorsi flap and prosthesis in immediate breast reconstruction. *Shenzhen University*, 2020.
- Qin Shuting. Series of studies on prosthesis implantation vs autologous latissimus dorsi flap transplantation for breast reconstruction after breast cancer. *Guangxi Medical University*, 2020.