

# The effect of transcutaneous electrical stimulation treatment in combination with intraoperative nerve staining on sexual function after radical hysterectomy: a pilot study

X. Y. Zhang\*, Y. Fu\*, X. D. Zhang, J. X. Ding, K. Q. Hua

Department of Gynecology, Obstetrics and Gynecology Hospital, Fudan University, Shanghai (China)

## Summary

**Objective:** Cervical cancer treatment by radical hysterectomy is usually associated with sexual dysfunction. The aim of the study was to evaluate the effect of transcutaneous electrical stimulation treatment in combination with intraoperative nerve staining on sexual function after radical surgery. **Methods:** Eligible patients (n = 88) who had undergone laparoscopic nerve sparing radical hysterectomy (Type C1, nerve sparing radical hysterectomy, NSRH), pelvic lymphadenectomy, vaginal extension and ovarian transposition were recruited in the study and allocated (no random assignment) to four groups. Group 1 (biofeedback) received a short-term bio-feedback transcutaneous electrical stimulation treatment after surgery. Group 2 (NSRH) received NSRH with intraoperative nerve staining. Group 3 (electrical) received transcutaneous electrical stimulation after surgery combined with intraoperative nerve staining. Group 4 (placebo) did not receive either transcutaneous electrical stimulation after the surgery or intraoperative nerve staining. Sexual function of the patients and their partners were evaluated using the Female Sexual Function Index (FSFI) 3 months after completion of treatment. Six domains were assessed: desire, arousal, lubrication, orgasm, satisfaction and pain, while the visual analog score (VAS) was used to evaluate partner satisfaction. **Results:** On average, overall sexual function reduced from baseline to 3-month follow-up for Groups 1 (biofeedback), 2 (NSRH) and 4 (placebo). In Group 1, all domain scores reduced from baseline to 3-month follow-up. In Group 2, reductions were observed in desire, arousal and orgasm domains. In Group 3 (electrical) there were no reductions observed in any domains, while in Group 4 reductions were observed in desire, arousal, orgasm and pain. The results revealed that there was no statistical difference between group 2, 3 and 4 in lubrication and satisfaction domains. And there were no statistical difference between group 2 and 3 in pain domain. For the patient partner satisfaction, the difference between baseline and 3 months after treatments of group 3 was significantly lower than the other three groups. And the differences of group 2 and 4 were significantly lower than group 1 respectively. **Conclusions:** The use of transcutaneous electrical stimulation treatment combined with intraoperative nerve staining could improve the sexual function for the patients and the enhance sexual satisfaction for their partners after radical hysterectomy.

**Key words:** Transcutaneous electrical stimulation; Radical hysterectomy; Sexual function.

## Introduction

Cervical cancer remains the second most common cancer among women worldwide [1, 2]. In contrast to other gynecological cancers, the incidence of cervical cancer is higher among women of reproductive age, and who are typically sexually active at the time of diagnosis. The recommended treatment for early-stage cervical cancer consists of a radical hysterectomy (RH) and bilateral pelvic lymphadenectomy [1-3]. However, cervical cancer treatment by radical surgery is usually associated with sexual dysfunction [4, 5].

Previous studies have shown that common sexual dysfunctions affecting women after radical hysterectomy include sexual desire disorder, objective arousal disorder and dyspareunia caused by decreased lubrication and vaginal shortening and narrowing [6, 7]. To improve the overall quality of life of patients, the assessment and treatment of sexual dysfunctions after radical surgery should become an important part of the standard care of women with cervical cancer.

The aim of this pilot study was to compare the effect of using transcutaneous electrical stimulation treatment in combination with intraoperative nerve staining on sexual function after radical hysterectomy with other commonly used treatments by using a validated questionnaire, the Female Sexual Function Index (FSFI).

## Methods

### Patients

The study is a prospective, unblinded study to evaluate the safety and efficacy of transcutaneous electrical stimulation combined with intraoperative nerve staining to improve the sexual function after radical hysterectomy. Patients diagnosed with early cervical cancer in the Obstetrics and Gynecology Hospital of Fudan University, Shanghai, People's Republic of China between January 2016 and September 2017 were included in the study. The study design and protocol were approved by the Institutional Review Board, and all patients provided written informed consent after the study methodology was explained fully.

\*Contributed equally.

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The criteria for recruitment and inclusion were: 1) younger than 50 years at diagnosis; 2) clinically diagnosed with early stage (FIGO IA2 IB1) squamous cell carcinoma or adenocarcinoma cervical cancer; 3) currently sexually active with the intention to be so after recovery from surgery; 4) no prior history of radiotherapy or chemotherapy.

The exclusion criteria of the study were: (1) receipt of adjuvant radiotherapy and chemotherapy after surgery; (2) refused operation; (3) refused transcutaneous electrical stimulation; (4) evidence of intraoperative organ (ureter, bladder, rectum) injury.

After the initial assessment, the patients were divided into 4 groups according to their consent. Group 1 (biofeedback) received a short-term bio-feedback transcutaneous electrical stimulation treatment after surgery. Group 2 (NSRH) received NSRH with intraoperative nerve staining. Group 3 (electrical) received transcutaneous electrical stimulation after surgery combined with intraoperative nerve staining. Group 4 (placebo) did not receive either transcutaneous electrical stimulation after the surgery or intraoperative nerve staining.

All the patients across the four groups initially underwent laparoscopic nerve sparing radical hysterectomy (Type C1 NSRH), pelvic lymphadenectomy, vaginal extension and ovarian transposition. Additional clinical data was obtained, including age, parity, body mass index (BMI), stage, histology, operating time, blood loss, and time to recovery of bladder.

#### *Intervention Protocol*

##### Group 1 (Bio-feedback)

The women in Group 1 received a short-term bio-feedback transcutaneous electrical stimulation treatment in addition to the clinical routine treatment after surgery. The PHENIX U-4/8 plus bio-feedback stimulator was used in the program. The protocol is as follows: (1) commences three days after the radical hysterectomy; (2) the treatment continues for 7 days without intermission; (3) patients received treatment twice a day, 30 minutes for each session. The parameters for every session are as follows: (a) surface electrode: 50\*50 MM electrode pad\*2, one put in the S3 region and the other is opposite to the area immobilized at the bladder area; (b) functional electrical stimulation as the current type; frequency is 4 Hz; pulse duration:300/210/270  $\mu$ s; (c) with the patient's maximum level of tolerable intensity, usually less than 100mA; (d) the length of the session is 30 minutes.

##### Group 2 (NSRH)

The women assigned to Group 2 received NSRH (Type C1) with intraoperative nerve staining. Further details of this procedure have been published previously [8].

##### Group 3 (electrical)

The patients in Group 3 received transcutaneous electrical stimulation after the surgery combined with intraoperative nerve staining.

##### Group 4 (placebo group)

The patients in this group did not receive either transcutaneous electrical stimulation after the surgery or intraoperative nerve staining.

The sexual function of the patients was evaluated by the FSFI questionnaire, which contains 19 self-reported questions and categorizes sexual dysfunction into six domains: desire, arousal, lubrication, orgasm, satisfaction and pain. Individual domain scores are obtained by adding the scores of the individual items that comprise the domain and multiplying the sum by the domain factor. The full-scale score is obtained by adding the six domains' scores. The minimum domain score is 0 and the maximum 6.0, meaning the combined sexual function score ranges from 0.0 to 36.0. The greater the score, the greater the sexual function.

The visual analog score (VAS) was used to evaluate the patient partner satisfaction.

Ten represented the satisfaction before surgery. The patient partner chose a number from 0 to 10 to represent the satisfaction after all the treatments (0 being poor and 10 being excellent). The difference was recorded.

All the enrolled subjects were followed up at 3 months after their treatment.

#### *Data analysis*

The statistical analysis was administrated by SPSS software. A Kruskal-Wallis test was performed to compare baseline measures among the four groups since the variables were not normally distributed. To compare outcomes before and after the intervention in each group, a Wilcoxon test was used. When the overall treatment effect was statistically significant, Kruskal-Wallis test followed by Mann-Whitney U tests were used to determine group differences. A p-value of 0.05 was considered significant for all tests.

## **Results**

From January 2016 to September 2017, 121 women fulfilled the inclusion criteria for our study. Eighty-eight patients enrolled in the study, completed the treatment and follow-up survey (Group 1 = 22, Group 2 = 17, Group 3 = 29, Group 4 = 20). Baseline clinical characteristics of the 88 patients recruited in the final analysis are shown in Table 1, with no evidence of a statistical difference in the demographic variables between the four groups.

The median and range values of the FSFI questionnaire are listed in Table 2. The sexual function was impaired excepted for Group 3. In group 1, all of the domains were impaired. Desire, arousal and orgasm domains were impaired in group 2. No domains were impaired in group 3. All of the domains were impaired except for lubrication and satisfaction domains in group 4.

The results revealed that there were no statistical difference between group 2, 3 and 4 in lubrication and satisfaction domains. And there were no statistical difference between group 2 and 3 in pain domain.

For the patient partner satisfaction index, the difference between baseline and 3 months after treatments of group 3 was significantly lower than the other three groups ( $p =$

0.012, 0.033, 0.038, respectively). And the difference of group 2 and 4 were significantly lower than group 1 ( $p = 0.031, 0.025, respectively$ ) (Table 3).

## Discussion

In this study, we provided evidence that transcutaneous electrical stimulation treatment combined with intraoperative nerve staining improved the sexual function after radical hysterectomy according to the FSFI Index. This treatment not only improved the patients' sexual function but also their partners' sexual function and satisfaction.

There is limited published data about whether electrical stimulation treatment improves sexual function after radical hysterectomy. Aydin indicated that there may be some potential for improved sexual function after vaginal electrical stimulation (VES) in women with female sexual dysfunction. However, the lack of a significant difference between the placebo and VES groups placed doubt on the effectiveness. The same study recommended combining VES with other modalities of pelvic floor rehabilitation as treatment alternatives for female sexual dysfunction [9]. Another randomised controlled trial study also suggested that compared with pelvic floor muscle training, electrical stimulation used alone did not increase sexual function for women with urinary incontinence [10]. Lucio and colleagues demonstrated that pelvic floor muscle training combined with electromyographic biofeedback and sham neuromuscular electrostimulation improved not only arousal, lubrication, satisfaction and total score domains of the FSFI questionnaire, but also contributed to the pelvic floor muscle tone and flexibility of the vaginal opening for the treatment of sexual dysfunction in women with multiple sclerosis [11]. While a recent study reported a favorable effect of transcutaneous electrical stimulation treatment on lower urinary tract symptoms after class III radical hysterectomy in cervical cancer patients [12], it did not investigate the sexual function.

Another study revealed that survivors of early stage cervical cancer treated by modified radical hysterectomy (Piver II/ Type B) have a better sexual function than those operated by classic radical hysterectomy (Piver III/ Type C2). However, the follow up length reported was twenty-four months, and so provided no information about the short-term status of the sexual function after surgery [13]. Bogani observed that both LRH and NS-LRH impacted negatively postoperative FSFI scores [14]. They also revealed that desire, arousal, orgasm, and pain scores were similar between NS-LRH and conventional LRH group, while patients undergoing NS-LRH experienced higher lubrication and satisfaction scores.

The results were similar with ours. Our results showed that all the domains were impaired except for lubrication and satisfaction domains in group 4. Besides lubrication and satisfaction domains, pain domain was not impaired in group 2. It meant intraoperative nerve staining was beneficial for postoperative algopareunia improvement. In our

previous reports, we did not investigate the sexual function improvement after radical hysterectomy with intraoperative nerve staining [8]. However, another three domains, desire, arousal and orgasm were worsened in group 2. It was proved that intraoperative nerve staining alone had limitations.

Our study is unique in that we have also reported information about the sexual satisfaction of the patients' partners after radical surgery. For the patient partner satisfaction, the difference before and after treatment of Group 3 was significantly lower than the other three groups in our study. It suggested that transcutaneous electrical stimulation treatment combined with intraoperative nerve staining improved the sexual satisfaction of the patient partner indirectly.

There were some limitations in our study. First, the stage of the cervical cancer in our study was stage Ib1 or Ia2. It did not include other stages. Furthermore, since all the cases were younger than 50 years in our study, they all underwent laparoscopic nerve sparing radical hysterectomy (Type C1, NSRH) with vaginal extension and ovarian transposition simultaneously. Whether vaginal extension and reserved ovaries impacting on the sexual function or not would be worth considering in future studies.

In conclusion, our data showed that transcutaneous electrical stimulation treatment combined with intraoperative nerve staining could improve the sexual function for the patients and sexual satisfaction for their partners after radical hysterectomy. These positive results must be confirmed through subsequent studies with a larger number of patients.

## Conflict of Interest

The authors declare no competing interests.

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Corresponding Author:

KEQIN HUA, M.D.

Department of Gynecology Obstetrics

and Gynecology Hospital Fudan University,

128 Shen yang Road, Shanghai 200090 (China)

e-mail: huakeqinjiaoshou@163.com