

## THE BENEFIT OF THE INTRAOPERATIVE ELECTRICAL STIMULATION OF PELVIC SPLANCHNIC NERVES DURING NERVE-SPARING RADICAL HYSTERECTOMY

### Hypothesis / aims of study

Nerve-sparing procedures during radical hysterectomy for early cervical cancer have become accepted because they can preserve bladder function. However, the nerve-sparing procedures need improvement because many patients still suffer from various levels of neurogenic bladder after radical hysterectomy. To improve nerve-sparing procedures, it is important to establish precise methods of intraoperative evaluation of nerve preservation. The method to identify pelvic autonomic nerves during radical hysterectomy by using intraoperative electrical stimulation (IES) while monitoring intravesical pressure, and showed that autonomic nerve branches ran from the pelvic plexus to the bladder via the lateral and dorsal surface of the posterior sheath of the vesicouterine ligaments (PVL).

In this study, we determined whether postoperative bladder function could be evaluated and improved using IES. We evaluated whether IES of the PSN roots while monitoring bladder contraction is useful to identify pathways from the PSN roots (S2-4) to the bladder and to predict postoperative bladder dysfunction.

### Study design, materials and methods

41 patients diagnosed as early uterine cervical cancer and received radical hysterectomy. The former 24 patients were received only radical hysterectomy, and the later 17 patients were received IES during radical hysterectomy. All patients received filling cystometry and pressure flow study were performed preoperatively and 3 months after the operation by an experienced technician who was blinded to the IES results.

IES during surgery: IES of the autonomic pelvic nerve fibers was performed with a single long-handled bipolar electrode (handle of 8 mm in diameter and 40 cm in length). IES was maintained at 30 mA for 10 sec using 10 Hz monophasic rectangular pulses with a pulse duration of 1.0 ms. The following structures were stimulated bilaterally before resection of uterus: the bilateral roots of PSN (S2-S4), the bilateral PVL marked with surgical tape and the dorsal part of the vesicouterine ligaments. The stimulation points on the PSN roots were marked by blue dye. The marked points were stimulated again after resection of the uterus. The change of intravesical pressure with IES was monitored on a chart recorder. In this study, we defined the preservation of PSN function as an increase of intravesical pressure by at least 3 cmH<sub>2</sub>O.

### Results

#### Pre operative Urodynamic study

One patient has idiopathic detrusor overactivity in filling cystometry, and all other patients have no abnormal findings in UDS.

#### Intraoperative electrical stimulation

Bilateral PSN roots could be identified in 14 of 17 cases; only unilateral PSN roots could be detected in 2 cases. In one case, right-sided IES could not be performed because of intraoperative severe bleeding. Before resection of the uterus, IES of the PSN root was performed on in all 17 cases. After resection of the uterus, 13 cases had an increase of intravesical pressure in response to IES of the PSN root on at least one side. In 5 of the 13 cases with the nerve-sparing procedure, increased intravesical pressure was observed with bilateral stimulation whereas only unilateral IES increased pressure in 8 cases.

In the remaining 4 cases (cases 14-17), no detrusor contraction was observed in response to IES.

#### Post operative Urodynamic study

In the former 24 patients, without IES, 10 cases (41.7%) were able to void without using abdominal pressure and observed a voluntarily initiated continuous detrusor contraction. In the 13 cases that had nerve-sparing confirmed by IES, all patients showed normal urination, eight patients had normal bladder sensation and the other five cases had reduced bladder sensation. Nine of the 13 cases were evaluated with UDS after surgery and nine cases were able to void without using abdominal pressure. Four of the 13 cases were not evaluated with UDS after surgery, they refused UDS because of the absence of any postoperative urinary disturbance. Three cases that the nerves were not preserved by IES, two cases voided using abdominal pressure with reduced bladder sensation (detrusor contraction was not observed by UDS). One patient urinated with clean intermittent self-catheterization without bladder contraction on UDS and the absence of a desire to void.

### Interpretation of results

With intraoperative electrical stimulation of pelvic splanchnic nerves during nerve-sparing radical hysterectomy, the success rate for nerve sparing surgery improved and we can predict the postoperative lower urinary tract dysfunction.

### Concluding message

Our results strongly suggest that during conventional nerve-sparing radical hysterectomy, IES of the PSN while monitoring bladder contraction is useful to predict postoperative bladder function. Moreover, we showed the potential of this new technique to define the PSN pathway that was injured intraoperatively. This IES procedure may contribute to improved nerve sparing during radical hysterectomy.

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**CLINICAL TRIAL REGISTRATION:**

**This clinical trial has not yet been registered in a public clinical**

**trials registry.**

**HUMAN SUBJECTS:** This study was approved by the IRB TOhoku University and followed the Declaration of Helsinki Informed consent was obtained from the patients.