Application research on nerve sparing radical hysterectomy for rectal function

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Abstract: This paper aims to discuss the clinical significance of laparotomy nerve sparing radical hysterectomy (NSRH) on rectal function of early cervical cancer patients, compared with conventional radical hysterectomy. 30 cases of early cervical carcinoma patients who had received surgery in the First Affiliated Hospital of Zhengzhou University from June 2010 to June 2014 were selected as subjects. Patients were divided into two groups, with 15 in each gorup, in which Group A had received NSRH, B received CRH, and all them were in stage IB-IIA1. In the surgery, 2 cases of patients in NSRH group failed in nerve sparing operation, and were grouped into CRH group. The postoperative condition of two groups were observed, recorded and compared as well, especially the comparison between the postoperative recovery condition of rectal function of two groups. The comparison were conducted between two groups on the operation time, bleeding volume, quantity of cleaned pelvic lymph node, resection length of parametrium, resection length of vagina, etc. There was no statistical significance (P>0.05). The postoperative urinary catheter indwelling time in NSRH group was shorter than CRH group, with statistical significance (P<0.05). The postoperative maximum urine flow, maximum cystometric capacity, maximum detrusor pressure and urinary complications in NSRH group were significantly better than the postoperative condition in CRH group, with statistical significance (P<0.05). NSRH surgery was safe and reliable, which not only had obvious advantage in improving postoperative rectal function and bladder function, but also had a significantly effect on improving postoperative life quality as well. The results proved that patients had low disease morbidity and with great clinical significance.

Keywords: Early stage cervical carcinoma, nerve sparing radical hysterectomy, bladder function.

INTRODUCTION

Cervical cancer, as the worldwide second most common female disease, the morbidity and mortality are different in different region or place. Developed countries have greatly reduced the morbidity and mortality of cervical cancer through extensive screening method. In fact, there are still 500,000 new cases and 273,000 cases of death in each year (Raspagliesi *et al.*, 2006). Theoretically, the ideal ovarian cancer treatment is to ensure the postoperative cervical cancer compliance to be decreased obviously. Conventional radical hysterectomy (CRH) is the main treatment on cervical cancer, especially for patients with early stage cervical cancer. While, the preoperative accurate assessment and intraoperative risk assessments of patients condition have a fatal significance on operation performance and postoperative concurrent rate. In the past 15 years, a great deal of research on the preservation of the autonomic nerve plane during surgery has made further progress. Conventional radical hysterectomy is always accompanied with high postoperative concurrent rate (Bergmark *et al*., 1999; Arbyn *et al.*, 2007; Brown *et al*., 2000). As one of the main treatment on cervical cancer, Piver III type extensive hysterectomy operation is the main method for the treatment of Ib~IIa cervical cancer, and the cure rate has reached 80%~90%. Although surgery and radiation therapy have similar therapeutic effect, due to radioactive treatment on the integrity of ovarian function and the vagina is destructive, most patients preferred hysterectomy, especially for young patients (Zullo *et al*., 2003; Maas *et al*., 2003). For early stage cervical cancer patients, the golden rule of treatment varies from simply hysterectomy (IA1 stage) to conventional radical hysterectomy (CRH, IA2-IB1 stage). Classic CRH includes the extensive excision of corpus uteri, cervix uteri, partial cervix uteri adjacent tissue and partial vaginal tissue, and the ovarian function could be preserved. As the procedure could impair pelvic autonomic nerve structure and cause postoperative bladder dysfunction, which seriously affect the quality of life of patients. Research shows that more than 50% of cervical cancer patients are less than 50 years old. Therefore, the survival for cervical cancer patients is no longer the only factors needed to be considered. How to improve the postoperative patients recovery and life quality has gradually became the key matter. Over the past century, the study of non-conventional hysterectomy has been widely studied and made great achievements in the world, including Europe, Asia, the United States, (Yabuki *et al*., 1991; Hockel *et al*., 1998; Trimbos *et al.*, 2001; Fujii *et al*., 2007; Tamussino *et al*., 1997). In many cancer disease center, NRSH has greatly increased the postoperative quality of life, compared with CRH operation. In 2008, the four classification (A-D) of nerve protection and para cervical lymph node excision surgery

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on HR from Querleu and Morrow were officially recognized by the international community (Kavallaris *et al*., 2010), which includes NSRH. Although there are still some disputes, the classification has been generally accepted.

In this article, we mainly introduce the specific operation method of NSRH surgery and postoperative patients with rectal function and bladder function recovery, and compared it with CRH, to explore the significance and clinical application of its clinical effect

MATERIALS AND METHODS

Clinical material

30 cases of early stage cervical cancer patients admitted to the First Affiliated Hospital of Zhengzhou University from June 2012 to June 2014 were selected, including stage IB-IIA1, cervical tumor size less than 4 cm, aged between 27~40 years old. All patients had received preoperative clinical diagnosis, cervical biopsy, color doppler ultrasonography, chest X-ray, CT and pelvic MRI examination. Inclusion criteria: (1) patients were divided into IB-IIA1 stage according to FIGO2009 clinical classification standard before surgery; (2) preoperative CT detected pelvic lymph nodes were less than 1cm; (3) there was no obvious contraindications on the preoperative detection, no fatal organ function dysfunction, no obvious infection lesions.

The study had received written approval from the First Affiliated Hospital of Zhengzhou University Ethics Committee for Clinical Research. All of the patients participated in the study had signed the informed consent form.

Surgery method

All cases of patients were received pelvic and para-aortic lymph mode excision at first. The subjects were divided into two groups, who were treated with NSRH and CRH, respectively. The features of NSRH was to make full use of the pelvic existed gaps and clean the parametrium and set ureter as the key anatomical marks, preserve the nerve plane, including ureteral mesangial and its extensional tissue. In the surgery, meticulous dissection was conducted on the pelvic autonomic nerve structure (Yabuki *et al.*, 1991).

Ventral nerve plexus (as shown in fig. 1) was a aggregation that composed by neurons, nerve fibers and neural ensembles, which consist of ventral nerve and parasympathetic nerve fibers. fig. 1 had described the pelvic nerve structure.

Group classification

30 patients received NSRH operation were divided into two groups, with 15 in each group. Group A was cervical cancer patients who had performed NSRH surgery, with 10 cases in IB type, 5 in IIA type; Group B was cervical cancer patients who had received CRH operation, with 10 cases in IB type, 5 in IIA type.

Surgery process

Hypogastric nerve (sympathetic nerve) was the abdominal aortic plexus, which started from anterior sacrum, then went beneath ureter and cling to mecorectum and reached pelvic uterine artery level. At the same time, jointed with pelvic autonomic nerve from sacral 2, 3 and 4 and formed pelvic nerve plexus, which was the main nerve to govern uterus, clitoris, bladder and rectum, so as to maintain normal bladder function and rectal function (Chen *et al*., 2010). Therefore, the surgeon shall master the distribution of the pelvic nerves. While cutting the main ligament, surgeon should separate the blood vessels and nerve area according to their position, found out the inferior hypogastric plexus and excise deep tissue under bladder cervical ligaments with the guidance of superior border of inferior hypogastric plexus, so as to maximally remain the pelvic autonomic nerve and ganglion cells. In the NSRH operation, the transverse pelvic splanchnic nerve near main ligament and ventral nerve were reserved according to literature (Hockel *et al*., 1998; Trimbos *et al*., 2001), as seen in fig. 2. In addition, the main ligament nerve endings were maximally reserved. Pelvic fascia was laterally separated to reserve pelvic nerves. During the complicated separation on syndesmodiastasis, lymph tissue near main ligaments were blunt dissected to identify and excise the coterminous vascular pedicles. Through the eliminating the fat and lymphoid tissue near the main ligament, the vessels near main ligaments was separated and the center colon vessels was still reserved, which would reserve pelvic splanchnic nerve. In this two surgery, the ovaries were moved to two sides.

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Table 1: Comparison of two groups intraoperative condition

Items	NSRH (n=12)	CRH (n=18)
Age (years)	34(27-40)	34(27-40)
Pathological classification		
Squamous carcinoma	16	20
Non-squamous carcinoma	6	8
Surgery time (min)	168 (132-255)	152 (116-223)
Bleeding volume (ml)	162 (50-550)	205 (50-750)
Tumor size (cm)	2.2	2.8
Resection length of parametrium (cm)	2.8±0.5	3.0±0.5
Resection length of vagina (cm)	3.1±0.5	3.4±0.5
Quantity of cleaned pelvic lymph node (n)	16.3±5.2	18.3±4.2

Table 2: Comparison of postoperative recovery condition

Postoperative patients condition	NSRH group (n=12)	CRH group (n=18)	*P* (between NSRH and CRH)
Postoperative urinary catheter indwelling time (day)	9.5±1.50	15.38±1.50	<0.0001
Residual urine volume of postoperative 10 days (ml)	25.95±3.45	68.24±6.08	<0.01
Postoperative independent exhaust time (hour)	38.53±4.50	48.00±3.55	<0.01
Postoperative independent defecating time (hour)	64.50±7.25	90.00±5.88	<0.01
Constipation	0	2	<0.05
Enuresis	1	4	0.0001
Dysuresia	1	2	0.003
Urine retention	1	2	0.0004
Incontinence	0	1	0.006
Satisfaction self-evaluation	4.5±0.8	1.9±0.6	<0.0001

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Observation item and time

(1) The operation time, blood loss, the number of pelvic lymph nodes, the length of resection and the length of vaginal resection were observed and recorded in the two groups. (2) Postoperative bladder and rectum function: including indwelling catheter time, residual urine volume, independent exhaust time and independent defecating time. (3) Postoperative complications. All patients were retained ureters untill the urine that ultrasound detected was less than 50 ml.

STATISTICAL ANALYSIS

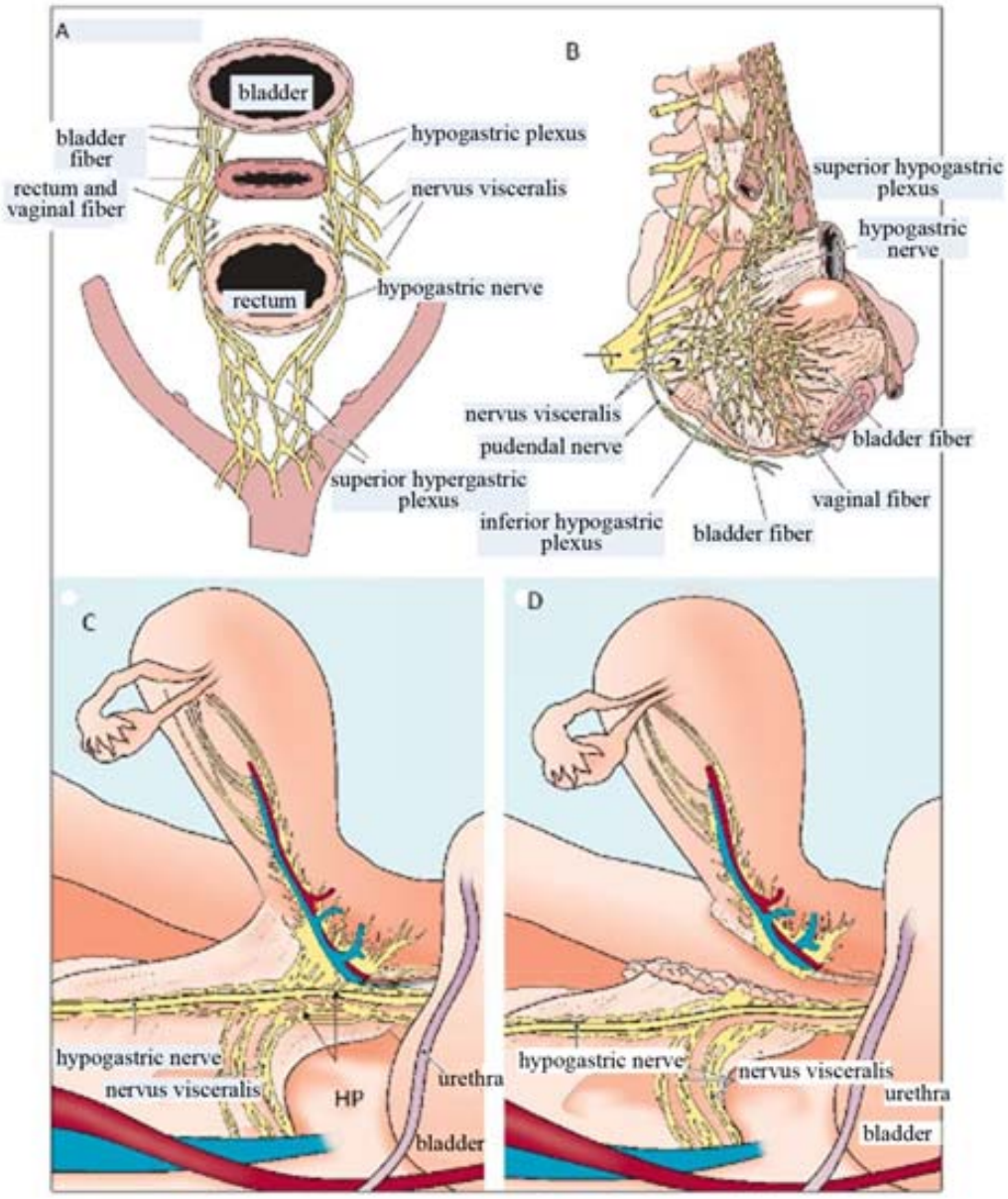
SPSS16.0 software was used for statistical analysis. χ^2 test was applied to compare enumeration data. *T* test was adopted for measurement data. $P<0.05$ represented the statistically significant difference.

Follow-up

The patients were followed up by telephone follow-up and outpatient follow-up. Follow up time was 6 months after initial treatment

RESULTS

In NSRH group, 3 cases failed to complete pelvic nerve preservation and were classified into CRH group, including 1 case in IB stage, 2 cases in IIA stage. Finally, there were 12 cases in NSRH group, and 18 cases in CRH group.



(A) Projection of pelvic autonomic nerve and anterior and posterior nerves
(B) Projection of pelvic autonomic nerve and bilateral nerve
(C) Pelvic autonomic nerve
(D) Pelvic autonomic nerve - nerve excision and inferior hypogastric plexus in CRH operation

Fig. 1: Pelvic nerve structure

Intraoperative condition comparison

There were no significant differences in the operation time, blood loss, the number of pelvic lymph nodes, the length of resection of the adjacent tissues, and the length of vaginal resection between the two groups, without statistical significance (P>0.05). As seen in table 1.

Comparison of postoperative bladder and rectal function

On the bladder function after surgery, the urine tube withdrawn time and postoperative independent exhaust time in NSRH group were significantly shorter than those in CRH group. The residual urine volume of postoperative 10 days in NRSH group was less than that in CRH group, with statistical significance (P<0.05). As shown in table 2.

Postoperative complications

The postoperative complications of the two groups included enuresis, dysuresia, urine retention and incontinence, as shown in table 2. During the 6 months of postoperative follow-up investigation, 3 cases in CRH group still had urinary irritation, frequent micturition, urgent urination and urinary tract infection. While there

was no such condition in NSRH group. The postoperative complications in NSRH group was significantly lower than CRH group, with statistical significance (P<0.05).

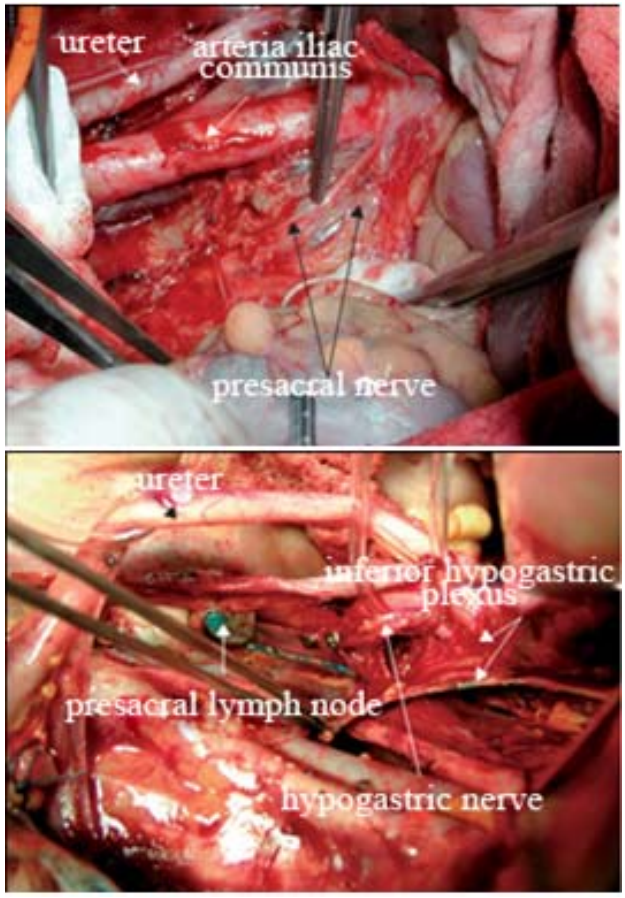


Fig. 2: Presacral nerve, hypogastric nerve and presacral lymph node

DISCUSSION

Laparotomy extensive hysterectomy was a classic operation for the treatment of cervical cancer, which was put forward by Wertheim at the beginning of last century. The excision of uterosacral ligament and cardinal ligament of uterus in the surgery could easily cause the impairment of pelvic autonomic nerve which dominated bladder, so as to affect postoperative bladder function and rectal function, and cause many postoperative complications, such as dysfunction of lower urethra and/or bladder function, dysfunction of anus and/or rectal function, vaginal dysfunctions, and so on (Le, 2005). Therefore, pelvic autonomic nerve preservation is of great significance to reduce the surgical complications, and improve the patient's quality of life (Chen *et al*., 2010).

This research showed that NSRH operation time and intraoperative blood loss was slightly higher than the CRH group, without statistical significance, which might be related to that the anatomy of pelvic autonomic nerve prolonged the surgical time and increased the bleeding volume in the early stage of surgery. The performer mastery of pelvic anatomy and neural identification ability could further shorten the operation time and reduce the bleeding volume (Du *et al*., 2012). In the operation, surgeon would push the hypogastric nerve and the proximal end of inferior hypogastric plexus to posterior-lateral area. The pelvic splanchnic nerve and bladder branch of dissociated inferior hypogastric plexus were researched in cord area, which minimally protected pelvic nerves and nerve impairment, so as to promote the recovery of bladder function and rectal function, shorten urinary catheter indwelling time, independent exhaust time and defecating time. It was consistent with the present study results, which the urinary catheter indwelling time, independent exhaust time and defecating time in NSRH group were respectively lower than that in CRH group. In this study, the postoperative complication incidence rate in NSRH group was apparently lower than that in CRH group. The complication of astriction, urinary irritation, frequent micturition and urgent urination incidence rate were greatly decreased in order to improve the quality of life for postoperative patients.

Research showed that NSRH could not only achieve the same surgical effect with CRH, but also significantly improve the postoperative rectal function and bladder function, and effectively reduce the long-term extensive hysterectomy and postoperative complications. This study adopted laparotomy NSRH surgery. Many studies had already proved the feasibility of laparoscopic NSRH surgery, with smaller trauma and conducive to postoperative recovery (Kavallaris *et al*., 2010; Liang *et al*., 2010; Park *et al*., 2010). Therefore, NSRH surgery had a greater research prospects. Although it still had been controversial whether or not the nerve-sparing pane could affect the radical surgery, there was no research which proved that early stage cervical cancer could transfer to main ligament and nerve infiltration.

CONCLUSION

This study confirmed that it was safe and feasible to apply the nerve sparing radical hysterectomy for early stage cervical cancer patients, especially for young patients. Also, it had significant advantage to improve the recovery of bladder function and rectal function, reduce the postoperative complication. The integrity reservation of autonomic nerve plane greatly improve patients' postoperative bladder function and rectal function, significantly improve postoperative quality of life, which was worthy to be popularized in clinical field.

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