

## Original Article

# The effect of enhanced recovery after surgery on lower limb varicose vein patients undergoing endovascular laser therapy

Jingtao Shao, Xuejun Wang, Xiaoping Zhan, Su Shao, Jianjun Wang

Department of Surgery, Chun'an First People's Hospital, Hangzhou 311700, Zhejiang Province, China

Received August 6, 2020; Accepted September 20, 2020; Epub January 15, 2021; Published January 30, 2021

**Abstract:** Objective: To assess the effect of enhanced recovery after surgery (ERAS) in patients with recurrent lower limb varicose veins (LLVV) who underwent endovascular laser therapy (EVLV). Methods: A total of 80 patients with recurrent LLVV receiving EVLT and the perioperative normal nursing mode from October 2016 to October 2017 were placed in the control group, and another 86 patients who underwent EVLT combined with ERAS from December 2017 to December 2018 were placed in the observation group. The swelling degrees of the affected limbs after the operations, the complications rates, the postoperative first ambulation times, the lengths of the postoperative hospital stays, the nursing quality, and the patients' satisfaction scores were compared between these two groups. Results: The observation group had significantly milder swelling degrees of the affected limbs, lower complication rates, shorter postoperative first ambulation times, shorter lengths of their postoperative hospital stays, higher nursing quality, and higher patient satisfaction scores compared with the control group. The differences were regarded as statistically significant ( $P < 0.05$ ). Conclusion: ERAS has a good effect in the treatment of recurrent LLVV with EVLT and can promote rapid recovery after surgery and improve nursing quality.

**Keywords:** Enhanced recovery after surgery, endovascular laser therapy, recurrent lower limb varicose veins, nursing quality

## Introduction

Lower limb varicose veins (LLVV) is a frequently-occurring disease and a potentially morbid disease seen in vascular surgery departments. If the disease progresses, it can lead to skin ulcers, infections, deep venous thrombosis, lower extremity dysfunction, and so on, affecting the quality of life [1-3]. Clinical treatment advocates early surgery, mainly with high ligation, stripping, and muscle flap loops. Although the effect is exact, the trauma is large, the postoperative recovery time is long, and the morbidity is high. Recently, various studies have confirmed that endovascular laser therapy (EVLV) to treat LLVV exhibits higher safety and efficacy, and it has high acceptance rates among patients [4]. While the LLVV success rate is high, there is still a 3.0-15.0% recurrence rate. However, the clinical treatment of recurrent LLVV is more difficult, and the perioperative nursing strategy is of great importance in improving the surgical effect and promoting postoperative rehabilitation [5]. For patients

with recurrent LLVV, the quality of the rehabilitation must be higher, the expectation of disease cure is increased, and the nursing quality must be higher. At present, enhanced recovery after surgery (ERAS) is extensively adopted in clinical gastrointestinal surgery. It is mainly based on a combination of psychology, clinical medicine, nursing, and nutrition in addition to specialized, evidence-based medicine, emphasizing the concept of "physical and mental health integration", and providing patients with a personalized and optimized nursing process, promoting rapid rehabilitation and improving the quality of the rehabilitation [6, 7]. Based on this, the paper intends to assess the effect of ERAS in patients with LLVV who underwent EVLT.

## Subjects and methods

### *Patient clinical data*

Eighty patients with recurrent LLVV diagnosed in our hospital from October 2016 to October

2017 were placed in the control group, with EVLT for treatment and the application of the routine nursing mode in the perioperative period. Eighty-six patients with recurrent LLVV who received ERAS from November 2017 to November 2018 were enrolled as the observation group. Inclusion criteria: (1) 18-75 years old. (2) Met the LLVV diagnostic criteria, either with previous purely conservative treatment or traditional surgical treatment. (3) Patients with complete clinical data and who signed an informed consent for the treatment plan. Exclusion criteria: (1) Patients with other lower extremity diseases such as atherosclerosis, arteritis. (2) Patients with lower extremity arteriovenous malformations. (3) Patients with systemic diseases such as diabetes, abnormal cardiopulmonary function. (4) Patients unable to obtain an effective scale score while participating. All the procedures performed in the studies involving human participants were carried out in accordance with the ethical standards of Chun'an First People's Hospital and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

The control group had thirty-five males and forty-five females. Their ages ranged from 55 to 74 years old, with a mean age of (66.5±12.3). Among them, there were thirty left side lesions, thirty right side lesions, twenty bilateral lesions, and fifty who had undergone previous surgical treatments.

The observation group had thirty-nine males and forty-seven females. Their ages ranged 57 to 73 years old, with a mean age of (65.4±13.2). Among them there were thirty-two left side lesions, thirty-two right side lesions, twenty-two bilateral lesions, and fifty-nine who had undergone previous surgical treatments. The baseline data of the two groups indicated they were comparable ( $P > 0.05$ ).

### *Research methods*

The two groups of patients received care services from the same nursing team. The EVLT was processed according to the standard surgical procedures. The control group adopted the routine nursing mode, including preoperative health education, preoperative preparation. During the operations, the nursing team closely fulfilled the requirements of the operations. Local anesthesia was adopted for the patients

during the operation, so they were conscious and needed to relieve their tension and fear promptly. Additional nursing objectives: determining whether a wound was bloody or infected, monitoring vital signs, ensuring a reasonable diet, promoting a combination of exercises and rest. Two to three days after the operations the patients were able to carry out lower limb function exercises.

The observation group adopted ERAS. First, a high-quality nursing team needed to be established. The ERAS procedures and operation standard needed to be mastered skillfully. The ERAS nursing procedures on patients with LLVV undergoing EVLT all came from the comprehensive summary of long-term nursing work done in our department. The nursing measures had a scientific basis and the nurses quickly mastered them. At the same time, the tedious and meaningless operations were abandoned. The department operating standard was presented in the form of a table or a flowchart for convenient assessment. Second, the key nursing was placed on psychological guidance, with correct explanations of the operating principles and procedures in order to reduce the patients' fear and uneasiness. The different needs of the patients were promptly determined and as far as possible met to promote a harmonious relationship between the doctors and patients. After the operations, elastic socks were routinely used for pressure banding to promote blood circulation. The patients were supine for six hours with pillows, and the affected limb was raised 30-45°. The swelling of the lower extremity and foot were observed. An individualized rehabilitation strategy was established according to the postoperative recovery. A multi-mode analgesia program was adopted after each operation. The lower extremity function exercises were carried out twelve hours after each operation, lasting 10-15 min each time, depending on the patient's tolerance. The functional exercise was guided during the bed rest period, such as ankle extensions, metatarsal flexions, knee extensions, and flexion exercises to prevent the formation of deep venous thrombosis, so quality control was reasonably carried out. Nursing quality checks were carried out regularly by the expert quality control group, granting rewards and punishment to increase the work motivation of the responsible nurses. Each patient's health file

## Enhanced recovery and lower limb varicose veins

**Table 1.** Comparison of the patients' clinical data in the two groups

Variables	Control group	Observation Group	$\chi^2/t$	P
Age (years)	66.5±12.3	65.4±13.2	0.551	0.582
Location [n (%)]				
Left	30	32	0.007	0.931
Right	30	32		
Bilateral	20	22		
Gender [n (%)]				
Males	35	39	0.042	0.836
Females	45	47		
Educational level [n (%)]				
Primary school	28	35	0.571	0.449
Secondary school	30	27		
University	22	24		

was established. Telephone follow-up was carried out regularly. The healthy activity practices after discharge were presented. When uncomfortable symptoms appeared, the patients were asked to see the doctor promptly.

### *Observation indicators and evaluation criteria*

The swelling degrees of the affected limbs, the complication rates, the postoperative first ambulation times, the lengths of the postoperative hospital stays, the nursing quality, and the patients' satisfaction scores after twelve hours and twenty-four hours from the operations were compared between the two groups. The degree of swelling was measured at 10 cm below the patella (the preoperative sizes were measured in the patients with varicose veins of both lower limbs). A thickening < 2 cm was regarded as no swelling, 2-4 cm was regarded as mild, and 4 cm was regarded as severe. The complications included wound infections, delayed healing, swelling aggravations, severe pain, and deep venous thrombosis. The quality of the care was quantitatively graded according to the nursing process and included 10 items, in which failed (1 point), passing (2 points), better (3 points), excellent (4 points) were scored for each item. The higher the total score, the better the quality of the care. The nursing satisfaction was measured using a self-made survey scale, and included service image and awareness (5 items), work ability (5 items), ward management (3 items), health education (5 items), care and communication (2 items), for a total of 5 parts with 20 items, and each item was

scored from 1-5 points, so 80-100 points indicated very satisfied, 60-80 points indicated general satisfaction, and less than 60 points indicated unsatisfactory. The validity and reliability coefficients were both greater than 0.85 by small samples.

### *Statistical analysis*

SPSS 22.0 was adopted for the statistical analysis. The quantitative data were described as the mean ± standard deviation ( $\bar{x} \pm s$ ). Independent sample t-tests were used for the inter-group comparisons. The t-test uses t-distribution theory to infer the probability of the difference, so as to compare whether the two averages are significantly different. The count data were described as the number of cases or (%). Chi-square ( $\chi^2$ ) tests were used for the inter-group comparisons. The chi-square test is usually used in the statistical inference of categorical data, including chi-square tests for comparing two rates or two constituent ratios, multiple rates or chi-square tests of multiple composition ratio comparisons.  $P < 0.05$  indicated a significant difference.

## **Results**

### *Comparison of the general patient clinical data*

No significant differences existed in the general patient data, including age, disease location, or sex between the two groups ( $P < 0.05$ ), as shown in **Table 1**.

### *The swelling degrees of the affected limbs of the two groups at twelve hours and twenty-four hours after operation*

The observation group presented milder swelling degrees in the affected limbs at twelve hours and twenty-four hours after the operations compared with the control group. The differences were statistically significant ( $P < 0.05$ ), as shown in **Table 2**.

### *Morbidity of the complications in the two groups*

The morbidity of the complications in the observation group decreased, and the difference

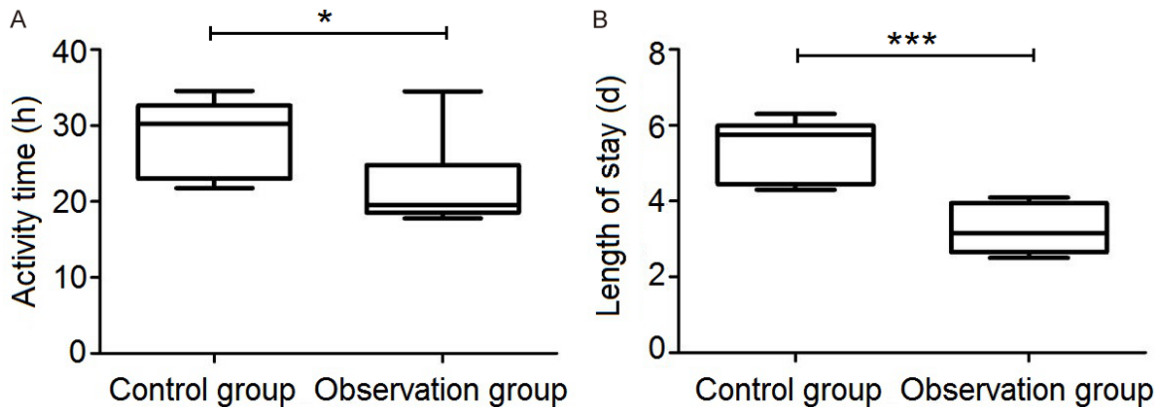
## Enhanced recovery and lower limb varicose veins

**Table 2.** The swelling degrees of the affected limbs in the two groups at twelve hours and twenty-four hours after the operations [case (%)]

Group	Case numbers	12 h after operation			24 h after operation		
		No swelling	Mild	Severe	No swelling	Mild	Severe
Control group	80	32 (40.0)	30 (37.5)	18 (22.5)	51 (63.8)	18 (22.5)	11 (13.7)
Observation Group	86	56 (65.1)	20 (23.3)	10 (11.6)	76 (88.4)	7 (8.1)	3 (3.5)
Z			1.617			1.585	
P			0.011			0.013	

**Table 3.** Morbidity of the complications in the two groups [case (%)]

Group	Case numbers	Wound infection	Delayed healing	Increased swelling	Severe pain	Deep venous thrombosis	Total incidence
Control group	80	2	1	7	8	0	18 (22.5)
Observation Group	86	1	0	3	3	0	7 (8.1)
$\chi^2$							6.682
P							0.010



**Figure 1.** Postoperative first ambulation time and postoperative hospital stay in observation group shortened, and the difference was regarded as statistically significant (\* $P < 0.05$ , \*\*\* $P < 0.0001$ ).

was statistically significant ( $P < 0.05$ ), as shown in **Table 3**.

### *Postoperative first ambulation times and postoperative length of the hospital stays of the two groups*

The postoperative first ambulation times and the lengths of the postoperative hospital stays in the observation group were decreased, and the differences were statistically significant ( $P < 0.05$ ), as shown in **Figure 1**.

### *Nursing quality and the patients' satisfaction scores in the two groups*

The nursing quality and the patients' satisfaction scores in the observation group were increased, and the differences were statisti-

cally significant ( $P < 0.05$ ), as shown in **Figure 2**.

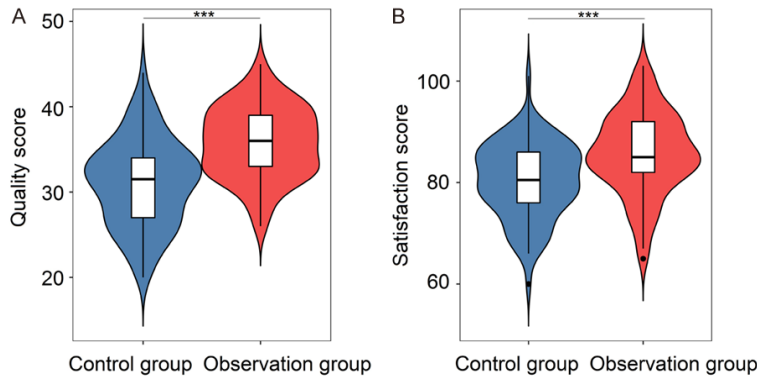
### *Patients' satisfaction distribution*

86.0% of the patients in the observation group were absolutely satisfied, but the value was 71.3% in the control group. The difference was statistically significant ( $P < 0.05$ ), but the unsatisfactory rate of the care in the control group was higher than it was in the observation group (11.2% vs. 3.5%). The difference between the two groups was statistically significant ( $P < 0.05$ ), as shown in **Table 4**.

## **Discussion**

We found that the observation group presented milder swelling degrees of the affected

## Enhanced recovery and lower limb varicose veins



**Figure 2.** The nursing quality and the patients' satisfaction scores in the observation group were increased, and the difference was statistically significant ( $P < 0.05$ ).

**Table 4.** Satisfaction distribution

Group	Case numbers	Very satisfied	General	Not satisfied
Control group	80	57 (71.3)	14 (17.5)	9 (11.2)
Observation Group	86	74 (86.0)	9 (10.5)	3 (3.5)
t/ $\chi^2$			6.084	
P			0.048	

limbs, a lower complication rate, shortened postoperative first ambulation times, shorter lengths of the postoperative hospital stays, elevated nursing quality, and higher patient satisfaction scores compared with the control group, and the differences were statistically significant ( $P < 0.05$ ). Tayrose et al. found that rapid rehabilitation decreases lengths-of-stay in joint replacement patients [8]. Pagnotta et al. evaluated the length of hospital stay and functional recovery of patients undergoing total knee arthroplasty with rapid rehabilitation care. They found that the length of hospital stay and functional recovery of the rapid rehabilitation care group were significantly better than those of the control group [9], which is consistent with the results of this study. According to the results of this study, the ERAS group presented milder swelling degrees of the affected limbs, a lower complication rate, shortened postoperative first ambulation times, shorter lengths of their postoperative hospital stays, elevated nursing quality, and higher patient satisfaction scores compared with the control group. Therefore, we believe that ERAS has a better application effect of EVLT on LLVV and can promote rapid postoperative recovery and improve nursing quality.

Based on the association of multi-disciplinary science and technology, ERAS emphasizes the evidence-based principle, ensuring the scientific nature of the nursing. The ultimate goal is to quickly promote post-operative rehabilitation, reflecting the principle of nursing, in order to alleviate patients' psychological and physiological trauma stress responses and reduce their complications [10, 11]. Patients with recurrent LLVV have higher quality requirements for rehabilitation, higher expectations for disease cure, and higher requirements for quality of care, which requires that the nursing work must be in place [1, 12]. The application of local anesthesia in EVLT operations is beneficial to the early postoperative exercise of lower limb function, avoiding general an-

esthesia to better affect the recovery of consciousness and gastrointestinal function, and to not affect postoperative eating [13]. A high-quality nursing team is the premise to ensure the smooth implementation of ERAS, requiring that responsible nurses be able to master the ERAS process and operation norms skillfully, forming the department operation norms with tables or flow charts for easy assessment. The use of the most comfortable and convenient nursing program is conducive to relieving the stress response and accelerating patient recovery [14]. Secondly, key nursing requires wholistic psychological guidance, in order to reduce the patient's fear and uneasiness. Negative psychology is an importantly adverse factor affecting postoperative rehabilitation, and the different needs of patients should be promptly understood and met, and the harmony of the doctor-patient relationship needs to be promoted [15]. Positioning should be done correctly, elastic socks are worn to promote blood circulation, the swelling of the lower limbs and feet needs be observed, and individualized rehabilitation strategies need be formulated, etc. [16]. The control of fluid input on the day of and the day after the operation is also the focus of ERAS; blood circulation and blood stasis drugs



are adopted, with no more than 500 mL of liquid daily. The inspection is strengthened, the focus is placed on the affected side of the limb feeling the pain, swelling, temperature and color, and so on. The doctor should be informed once an abnormality is found [17]. Quality control should be processed reasonably. The nursing quality checks were carried out regularly by the expert quality control group, granting rewards and punishment to increase the work motivation of the responsible nurses [18, 19]. Each patient's health file was established, and telephone follow-up was carried out regularly. The healthy activity procedures after discharge were guided, and the patients were reminded of their follow-up visits [20].

To sum up, ERAS has a better application effect in EVLT on LLVV, and it can promote rapid postoperative recovery and improve nursing quality. However, this study has certain limitations. (1) The number of samples collected was small, and the research results may have certain deviations. We will collect more samples to make the research results more accurate. (2) As far as we know, there are few studies on rapid rehabilitation care, the research topics are different in scope, and there are few related studies that compare with this research.

### Acknowledgements

This research was supported by the Zhejiang Medical and Health Science and Technology Project (grant no. 2015113468).

### Disclosure of conflict of interest

None.

**Address correspondence to:** Jianjun Wang, Department of Surgery, Chun'an First People's Hospital, 1869 Huanhu North Road, Chun'an County, Hangzhou 311700, Zhejiang Province, China. E-mail: jiantjwwe896579@163.com

### References

[1] Chwala M, Szczeklik W, Szczeklik M, Aleksiejew-Kleszczynski T and Jagielska-Chwala M. Varicose veins of lower extremities, hemodynamics and treatment methods. *Adv Clin Exp Med* 2015; 24: 5-14.

[2] Li X, Feng Y, Liu Y and Zhang F. Varicose veins of the lower extremity secondary to tricuspid regurgitation. *Ann Vasc Surg* 2019; 60: 477.e1-477.e6.

[3] Kheirelseid EAH, Crowe G, Sehgal R, Liakopoulos D, Bela H, Mulkern E, McDonnell C and O'Donohoe M. Systematic review and meta-analysis of randomized controlled trials evaluating long-term outcomes of endovenous management of lower extremity varicose veins. *J Vasc Surg Venous Lymphat Disord* 2018; 6: 256-270.

[4] Jacquet R. Treatment of lower limb varicose veins in 2015: the present and the future. *Ann Dermatol Venereol* 2015; 142: 483-492.

[5] Luo LH, Chen Z, Hu LN, Ma C and Xiao EH. Tumescence anesthesia solution-assisted laser ablation treatment of lower limb varicose veins: the effect of temperature of the tumescence anesthesia solution on intraoperative and postoperative pain, clinical observations, and comprehensive nursing care. *J Perianesth Nurs* 2019; 34: 368-375.

[6] Ljungqvist O, Scott M and Fearon KC. Enhanced recovery after surgery: a review. *JAMA Surg* 2017; 152: 292-298.

[7] Azhar RA, Bochner B, Catto J, Goh AC, Kelly J, Patel HD, Pruthi RS, Thalmann GN and Desai M. Enhanced recovery after urological surgery: a contemporary systematic review of outcomes, key elements, and research needs. *Eur Urol* 2016; 70: 176-187.

[8] Tayrose G, Newman D, Slover J, Jaffe F, Hunter T and Bosco J 3rd. Rapid mobilization decreases length-of-stay in joint replacement patients. *Bull Hosp Jt Dis (2013)* 2013; 71: 222-226.

[9] Pagnotta G, Rich E, Eckardt P, Lavin P and Burriesci R. The effect of a rapid rehabilitation program on patients undergoing unilateral total knee arthroplasty. *Orthop Nurs* 2017; 36: 112-121.

[10] Melloul E, Hubner M, Scott M, Snowden C, Prentis J, Dejong CH, Garden OJ, Farges O, Kokudo N, Vauthey JN, Clavien PA and Demartines N. Guidelines for perioperative care for liver surgery: enhanced recovery after surgery (ERAS) society recommendations. *World J Surg* 2016; 40: 2425-2440.

[11] Zhu S, Qian W, Jiang C, Ye C and Chen X. Enhanced recovery after surgery for hip and knee arthroplasty: a systematic review and meta-analysis. *Postgrad Med J* 2017; 93: 736-742.

[12] Bogossian F, Winters-Chang P and Tuckett A. "The pure hard slog that nursing is...": a qualitative analysis of nursing work. *J Nurs Scholarch* 2014; 46: 377-388.

[13] Alder LS and Rahi MA. Single-visit endovenous laser treatment and tributary procedures for symptomatic great saphenous varicose veins. *Ann R Coll Surg Engl* 2014; 96: 279-283.

[14] Stone R. The research nursing team: providing evidence, promoting high-quality care. *Br J Nurs* 2017; 26: 243.

## Enhanced recovery and lower limb varicose veins

- [15] Gladwell PW, Pheby D, Rodriguez T and Poland F. Use of an online survey to explore positive and negative outcomes of rehabilitation for people with CFS/ME. *Disabil Rehabil* 2014; 36: 387-394.
- [16] Patsaki I, Gerovasili V, Sidiras G, Karatzanos E, Mitsiou G, Papadopoulos E, Christakou A, Routsis C, Kotanidou A and Nanas S. Effect of neuromuscular stimulation and individualized rehabilitation on muscle strength in intensive care unit survivors: a randomized trial. *J Crit Care* 2017; 40: 76-82.
- [17] Cavallaro P and Bordeianou L. Implementation of an ERAS pathway in colorectal surgery. *Clin Colon Rectal Surg* 2019; 32: 102-108.
- [18] Wu H, Yan J, Wang J and Ouyang W. Compilation and evaluation of perioperative nursing quality assessment scale. *Zhong Nan Da Xue Xue Bao Yi Xue Ban* 2014; 39: 733-738.
- [19] Vafaei SM, Manzari ZS, Heydari A, Froutan R and Farahani LA. Improving nursing care documentation in emergency department: a participatory action research study in Iran. *Open Access Maced J Med Sci* 2018; 6: 1527-1532.
- [20] Lujan J, Tuero C, Landecho MF, Moncada R, JAC, Rotellar F, Silva C, Lapuente F, Martinez P, Fruhbeck G and Valenti V. Impact of routine and long-term follow-up on weight loss after bariatric surgery. *Obes Surg* 2020; 30: 4293-4299.