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## Effect of Suyuping combined with semiconductor laser irradiation on wound healing after anal fistula surgery

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## ABSTRACT

**Objective:** To explore the effect of Suyuping combined with semiconductor laser irradiation on the wound healing after anal fistula surgery. **Methods:** A total of 180 patients with anal fistula who were admitted in our hospital from October, 2013 to May, 2015 for surgery were included in the study and randomized into the treatment group and the control group with 90 cases in each group. The patients in the control group were given the conventional surgical debridement dressing, a time a day. On this basis, the patients in the treatment group were given Suyuping smearing on the wound sinus tract combined with semiconductor laser irradiation, a time a day for 10 min, continuous irradiation until wound healing. The postoperative wound swelling fading, wound surface secretion amount, and the clinical efficacy in the two groups were recorded. **Results:** The wound surface swelling degree and wound pain degree at each timing point after operation in the treatment group were significantly lower than those in the control group ( $P<0.05$ ). The wound surface area at each timing point after operation in the treatment group was significantly lower than that in the control group ( $P<0.05$ ). The wound surface secretion amount 6, 9, and 12 days after operation in the treatment group was significantly lower than that in the control group ( $P<0.05$ ). The total effective rate in the treatment group was significantly higher than that in the control group ( $P<0.05$ ). The average healing time in the treatment group was significantly faster than that in the control group ( $P<0.05$ ). **Conclusions:** Suyuping combined with semiconductor laser irradiation in the treatment of patients after anal fistula can effectively improve the local blood and lymphatic circulation of wound surface, promote the growth of granulation tissues, and contribute the wound healing.

## 1. Introduction

Anal fistula is a common anorectal disease, mainly invading the anal canal, and refers to the granulomatous tube surrounding the anus, with internal opening usually locating in the inferior rectum or anal canal, several external openings locating in the perianal skin, and morbidity only second to hemorrhoid, which can severely affect

the patients' living qualities[1-3]. Currently, the incision line drainage is a main means for the treatment of anal fistula, with an accurate efficacy, but it has disadvantages of large trauma, long healing time, and severe postoperative pain; moreover, the postoperative edema, pain, and infection are also the important factors to affect the postoperative efficacy[4]; therefore, how to effectively prevent the postoperative pain, pain, and infection is of great significance in assessing the prognosis of anal fistula patients. The study is aimed to explore the effect of Shuyuping (artificial cell healing membrane) combined with semiconductor laser irradiation on the wound healing after anal fistula surgery.

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## 2. Materials and methods

### 2.1. Clinical materials

A total of 180 patients with anal fistula who were admitted in our hospital from October, 2013 to May, 2015 for incision line drainage were included in the study and randomized into the treatment group and the control group. The patients were in accordance with the diagnostic criteria of anal fistula of Anorectal Branch of China Association of Chinese Medicine[5], with a normal anal morphology and function. In the treatment group, there were 90 cases, among which 49 were male, and 41 were female; aged from 20 to 67 years old, with an average age of  $(48.60 \pm 12.65)$  years old; course from 8 to 18 months, with an average course of  $(12.43 \pm 4.01)$  years old. In the control group, there were 90 cases, among which 50 were male, and 40 were female; aged from 22 to 65 years old, with an average age of  $(48.93 \pm 13.33)$  years old; course from 8 to 16 months, with an average course of  $(12.27 \pm 1.82)$  years old. The comparison of age, gender, and the general materials between the two groups was comparable ( $P > 0.05$ ). Those who had high position anal fistula, complex anal fistula, anal fistula at an acute inflammation phase, allergic constitution, merged with severe cardiovascular diseases, anal fistula merged with anorectal tumors, tuberculous anal fistula, and Crohn disease were excluded from the study.

### 2.2. Methods

The patients in the control group were given the conventional surgical debridement dressing, a time a day. On this basis, the patients in the treatment group were given Shuyuping smearing on the wound sinus tract combined with semiconductor laser irradiation. After the conventional treatment, the wound sinus tract was evenly smeared with Shuyuping. After Shuyuping smearing in a membrane shape, the semiconductor laser irradiation was given. LS-600 semiconductor laser treatment apparatus (produced by Tianjing Leiyi Laser Technology Co. Ltd) was adopted, with a power of 600 mW, a distance between the probe and wound surface of 10-15 cm, a time a day for 10 min, continuous irradiation until wound healing.

### 2.3. Observation indicators

The postoperative wound swelling fading, wound surface area, and wound surface secretions in the two groups were recorded. Edema evaluation criteria[6]: 0 score: no edema on the anal verge and around the wound surface; 3 scores: mild edema on the anal verge and around the wound surface; 5 scores: obvious edema on the anal verge and around the wound surface; 10 scores: severe edema on the anal verge and around the wound surface. VAS was used to evaluate the pain remission 3, 7, and 14 d after operation. The healing effect was evaluated according to the efficacy criteria formulated by the Chinese National Anorectal Surgical Conference[7]: cured: the wound was completely cured, the symptoms and signs were disappeared;

effective: wound was not completely cured, but the symptoms and signs were significantly improved; not healed: the wound was not cured, secretions were discharged, the symptoms and signs were not significantly improved.

### 2.4. Statistical analysis

SPSS 19.0 software was used for the statistical analysis. *Chi-square* test was used for the enumeration data. The measurement data were expressed as mean $\pm$ SD, and the paired *t* test was used.  $P < 0.05$  was regarded as statistically significant difference.

## 3. Results

### 3.1. Comparison of postoperative swelling and pain

With the treatment timing extending, the swelling degree around the wound surface and the wound pain degree after operation in the two groups were gradually reduced, and the comparison at each timing point was statistically significant ( $P < 0.05$ ). The wound surface swelling degree and wound pain degree at each timing point after operation in the treatment group were significantly lower than those in the control group ( $P < 0.05$ ) (Table 1).

### 3.2. Comparison of wound surface and healing time at each timing point after operation between.

The postoperative wound surface in the two groups was gradually reduced with the time extending ( $P < 0.05$ ). The wound surface area at each timing point after operation in the treatment group was significantly lower than that in the control group ( $P < 0.05$ ) (Table 2).

### 3.3. Comparison of postoperative wound surface secretion

The comparison of secretion amount 3 d after operation between the two groups was not statistically significant ( $P > 0.05$ ). The wound surface secretion amount 6, 9, and 12 days after operation in the treatment group was significantly lower than that in the control group ( $P < 0.05$ ) (Table 3).

### 3.4. Comparison of clinical efficacy and the wound surface healing time

In the treatment, 79 were cured, 10 were effective, 1 was not cured, and the total effective rate was 98.9%. In the control group, 41 were cured, 38 were effective, 11 was not cured, and the total effective rate was 87.8%. The total effective rate in the treatment group was significantly higher than that in the control group ( $P < 0.05$ ). The average healing time in the treatment group ( $21.21 \pm 1.80$  d) was significantly faster than that in the control group ( $29.50 \pm 1.91$ ) ( $P < 0.05$ ).

**Table 1**

Comparison of postoperative swelling and pain.

Groups	n	Swelling			Pain		
		7 d after operation	14 d after operation	21 d after operation	7 d after operation	14 d after operation	21 d after operation
Treatment group	90	6.10±0.92*	3.90±0.85*	1.65±1.53*	7.62±1.76*	3.30±1.02*	2.37±1.32*
Control group	90	7.35±2.50	6.00±2.05	4.40±1.47	8.05±1.07	6.87±1.37	5.05±1.30

\* $P < 0.05$ , when compared with the control group.**Table 2**Comparison of wound surface and healing time at each timing point after operation (cm<sup>2</sup>).

Groups	n	7 d after operation	14 d after operation	21 d after operation
Treatment group	90	9.55±0.33*	7.01±0.12*	2.11±0.23*
Control group	90	10.83±0.44	8.36±0.112	3.46±0.33

\* $P < 0.05$ , when compared with the control group.**Table 3**

Comparison of thpostoperative wound surface secretion.

Groups	n	3 d after operation	6 d after operation	9 d after operation	12 d after operation
Treatment group	90	4.89±0.14	3.39±0.22*	2.69±0.21*	1.62±0.16*
Control group	90	4.96±0.18	4.26±0.19	3.46±0.17	2.49±0.16

\* $P < 0.05$ , when compared with the control group.

## 4. Discussion

The incision line drainage is an effective method for the treatment of anal fistula, but due to the specific operation location, the wound will be infected with feces; moreover, the painful dressing change for the wound, the surrounding tissue fibrosis, and local blood supply obstacle are the important factors to affect the wound healing. The wound healing after anal fistula surgery can be divided into three stages, similar to the burn wound healing, i.e. inflammation reaction stage, granulation tissue formation stage, and matrix formation and remodeling stage, which means that the wound healing is a long process[8-10]. After anal fistula surgery, Huangqin ointment gauze and silver ion are mainly adopted for dressing change, and even intermittent vacuum sealing drainage combined with Shengjigao are utilized to treat anal fistula in order to promote the postoperative wound healing and shorten the treatment time. The semiconductor laser irradiation is adopted by the domestic scholars to treat the refractory wound and bedsore wound, which has achieved a preferable clinical efficacy. The deepest penetration depth of human tissues by the semiconductor laser can reach 7 cm, which can promote the growth of new blood vessels and the proliferation of granulation tissues, and stimulate the synthesis of proteins. On the basis of the above theoretical foundation, the author is motivated to utilize the semiconductor laser irradiation to treat the anal fistula[11,12].

Suyuping, including a large amount of artificial cells, protein hydrolysate, glucose, and microelements, can form a kind of skin protection membrane on the wound surface to promote the wound healing from the cell level, which can provide a favorable material basis and environment for the wound healing[13]. Some researches demonstrate that[14] Suyuping combined with semiconductor laser irradiation can keep the skin around the wound surface clean, and

accelerate the establishment of lateral branch and blood circulation. The results in the study showed that the wound surface area at each timing point after operation in the treatment group was significantly lower than that in the control group ( $P < 0.05$ ); the wound surface secretion amount 6, 9, and 12 days after operation in the treatment group was significantly lower than that in the control group ( $P < 0.05$ ), suggesting that Shuyuping combined with semiconductor laser irradiation in the treatment of patients after anal fistula can effectively improve the local microcirculation and alleviate the pain. It is reported by some scholars that[15] adoption of laser irradiation to treat 35 cases with anal fistula and 20-month follow up visit show that 2 cases have recurrence after 3 and 6 months, and no patients have anal incontinence, which has received a preferable clinical effect. The laser irradiation energy can shrink the tissues around the anal fistula to seal the fisula; therefore, the laser irradiation is a safe, minimally invasive, and simple method to treat the anal fistula. Some other researches demonstrate that[16] adoption of laser irradiation for the treatment of 341 cases with II-IV hemorrhoids and mixed hemorrhoids and follow-up visit show that 12 cases have mild pain, 8 cases have edema, and no patients have anorectal stenosis and recurrence. The results in the study showed that the wound surface area at each timing point after operation in the treatment group was significantly lower than that in the control group ( $P < 0.05$ ); the average healing time in the treatment group was significantly faster than that in the control group ( $P < 0.05$ ); the total effective rate in the treatment group was significantly higher than that in the control group ( $P < 0.05$ ), proving that Shuyuping combined with semiconductor laser irradiation in the treatment anal fistula can significantly promote the postoperative wound healing.

In conclusion, Suyuping combined with semiconductor laser irradiation in the treatment of patients after anal fistula can effectively improve the local blood and lymphatic circulation of wound surface, promote the growth of granulation tissues, and

contribute the wound healing; therefore, it deserves to be widely recommended in the clinic.

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