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Loop Electrosurgical Excision Procedure under Propofol Intravenous Anesthesia Combined with Nano-Silver Gel in the Treatment of Cervicitis

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ABSTRACT

It was aimed at the therapeutic value of loop electrosurgical excision procedure (LEEP) under propofol intravenous anesthesia combined with nano-silver gel in chronic cervicitis. 100 patients with chronic cervicitis were selected and randomly divided into the control group with 50 cases (LEEP under intravenous anesthesia with fentanyl) and the experimental group with the other 50 cases (LEEP under propofol intravenous anesthesia combined with the nano-silver gel). It was suggested from the results that the mean arterial pressure (MAP) and heart rate (HR) (76.88±5.65mmHg, 75.45±5.06beats/min) of patients in the experimental group at T1 time were better than those of the control group (83.76±5.43mmHg, 68.31±5.28beats/min). Visual analogue scale (VAS) (1.85±0.73 points), onset time of anesthesia (0.56±0.21min), time to open eyes (2.45±1.38min) and time of consciousness recovery (5.22±1.42min) were all lower than those of the control group (2.83±0.79 points, 0.93±0.25min, 4.33±1.45min, and 7.15±1.34min, respectively). The incidence of adverse reactions, the effective rate of treatment, the time of wound healing, and the incidence of complications (6%, 94%, 23.83±2.05 days, and 6%, respectively) were all better than those of the control group (24%, 70%, 29.25±2.16 days, and 6%) (P<0.05). All in all, intravenous anesthesia with propofol was beneficial to perform LEEP better, and the combination of LEEP combined with nano-silver gel had an important value in the treatment of chronic cervicitis and was worthy of clinical promotion.

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Introduction

Chronic cervicitis is a common gynecological disease that is more common in multiparous women. In most cases, chronic cervicitis is caused by the no treatment or incomplete treatment of acute cervicitis. But there are also a small number of patients who are directly manifested as chronic cervicitis with no history of acute cervicitis (1,2). The etiology is due to damage to the cervix during sexual life or childbirth, leading to bacterial invasion and disease; or it can also be caused by persistent infection of pathogens. The pathogens causing chronic cervicitis and acute cervicitis are similar, mainly including Neisseria gonorrhoeae or chlamydia (3-5). There are also some rare bacteria such as Staphylococcus, Streptococcus, and Escherichia coli, which can cause chronic cervicitis. Some patients with chronic cervicitis show no obvious clinical symptoms. Symptomatic patients usually have persistent or recurrent increased leucorrhea, which is often milky white or pale yellow in color, and the leucorrhea is viscous and purulent, sometimes with blood streaks (6,7). It can also be manifested as frequent pain in the lower abdomen or lumbosacral region, as well as some bladder and bowel symptoms. The concomitant diseases of chronic cervicitis include cervical erosion, cervical valgus, cervical polyps, cervical retention cyst, and endocervicitis (8,9). It seriously affects the quality of life of patients and brings a huge burden to the body and mind of patients.

Clinically, the diagnosis of chronic cervicitis can be made by enzyme-linked immunosorbent assay as well as secretion examination, bacterial culture and bacterial sensitivity test to drugs, vaginal B-mode ultrasonography, etc. (10). The treatment methods for chronic cervicitis are mainly divided into physical therapy, drug therapy, and immunotherapy. Physical therapy includes cryotherapy, laser, microwave, and infrared therapy; and drug therapy includes vaginal douching and medicine (11). The short-term effects of

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these treatment methods are acceptable, but the mid-term and long-term effects are not ideal, and the acceptance of patients is low. Loop electrosurgical excision procedure (LEEP) is a commonly used clinical treatment for chronic cervicitis in recent years. LEEP makes use of high-frequency radio waves to remove eroded and necrotic cervical tissues circularly, to treat chronic cervicitis effectively (12,13). Compared with laser, cryotherapy, and other treatment methods, the operation time of LEEP is shorter, the pain is not strong, the incision edge tissue is not affected, and the cost is lower; thus, it has great advantages (14,15). However, because some patients are afraid of surgery and can't cooperate well with the surgery, anesthesia is usually used to assist surgery to avoid affecting the surgical process. Propofol is an intravenous anesthetic that is widely used in clinical practice. It has the advantages of fast onset of anesthesia, rapid recovery of consciousness, and complete functional recovery (16). Its pharmacological effects are irreplaceable by other anesthetics. As a potent sedative, propofol is commonly used for general anesthesia, but also for minor procedures or examinations with short operation time (17).

The nano-silver gel is an antibacterial drug composed of nano-silver and medical polymers. It has a strong killing effect on pathogenic microorganisms such as bacteria, fungi, Candida, viruses, mycoplasma, and chlamydia (18). It applies to gynecological inflammations and vaginal infections caused by pathogenic microorganisms. The nano-silver gel does not irritate the stomach and has no chronic side effects. It can be directly applied to the affected area, with quick effect and good curative effect. In recent years, it has been commonly used in the clinical treatment of various gynecological diseases (19). According to the pharmacological analysis, the nano-silver gel will promote the therapeutic effect of LEEP and accelerate the postoperative recovery of patients.

100 patients with chronic cervicitis were selected as the research objects. They were randomly divided into the control group in which LEEP under fentanyl intravenous anesthesia was given and the experimental group in which the patients were treated with LEEP under propofol intravenous anesthesia combined with nano-silver gel. After the comprehensive evaluation, the application value of LEEP under propofol intravenous anesthesia combined with nano-silver gel in the treatment of chronic cervicitis was discussed. It provided a certain reference for better clinical treatment of chronic cervicitis.

Materials and methods

Research objects

100 chronic cervicitis patients who were treated and hospitalized in the Obstetrics and Gynecology Department of the Hospital from July 2019 to July 2021 were selected. They had the age range of 24-50 years old with an average age of 32.5 years old. The 100 patients were randomly divided into a control group and an experimental group, with 50 cases in each group. The patients in the control group were only treated with LEEP, and fentanyl was used for intravenous anesthesia during the surgery. The patients in the experimental group were treated with LEEP combined with nano-silver gel, and propofol was also used as the anesthetic in surgery.

Patients who met the following inclusion criteria were included. Patients were diagnosed with chronic cervicitis by transvaginal ultrasound, colposcopy, or postoperative pathology. They had a childbearing history and were not in pregnancy. They had no history of severe liver and kidney diseases or history of drug allergies. Their clinical data were complete.

As the exclusion criteria below were followed, the patients who met the situations were excluded. Patients had other gynecological diseases. Patients were in pregnancy or breastfeeding. Patients had mental illness or malignant tumors. Patients were contraindicated to LEEP as well as nano-silver gel. Patients went with poor compliance and did not cooperate with the experiments. Patients had coagulation dysfunction.

The objective, process, precautions, and legitimacy of the research were explained specifically for the patients. In addition, the research objects agreed to sign informed consent forms with the consent of their family members. It had been approved by the Ethics Association of the hospital. The guarantee was made that no harm would be caused to the patients during the research. The obtained research subjects and private data were confidential data for research use only, and shall not be put to other uses.

LEEP under intravenous anesthesia

The patients were asked for fasting 8 hours before surgery and emptying the bladder 30 minutes before surgery, the intramuscular injection of 0.5mg atropine was given (20). After the patient entered the operating room, a venous channel was established. Vital signs such as mean arterial pressure (MAP), heart rate (HR), and oxygen saturation (SaO_2) were monitored, and oxygen was given by mask. For the patients in the control group, an intravenous injection of 3.0-3.5μg/kg fentanyl was given. Patients in the experimental group were given an intravenous injection of 2.5-4.0mg/kg propofol, and the induction rate was 5-10mL/min. When the patient's eyelash reaction disappeared, the surgery was started. The patient was in the lithotomy position, and the vulva was routinely disinfected from the inside to the outside, with draping preoperatively. The speculum was put into the vagina to fully expose the cervix, then sterile gauze and cotton balls were used to clean the secretions around the cervix and vagina. Iodine solution was used to mark the lesions of the cervix. A clockwise circumcision was performed using a high-frequency LEEP scalpel at the 12 o'clock direction of the longitudinal axis of the cervix and 0.5cm from the periphery of the lesion tissues. What called the attention should be the gentle actions. The scalpel was rotated for 360° uniformly and uninterruptedly to excise the diseased tissues. When circumcision was performed, large or small conization could be applied according to the size of the lesion. After the surgery, electrocoagulation was used to stop bleeding, and iodine solution was used to disinfect the wound. The diseased tissues were sent for pathological examination after surgery. If the patient had limb movement, moaning, frowning, and other phenomena during the surgery, additional anesthetics could be added until making the patient to quiet down.

Use of nano-silver gel

The patients in both groups were given oral antibiotics after the surgery. In the experimental group, it was started to apply the nano-silver gel on the 2nd day after the surgery. One tube of nano-silver gel was injected into the vaginal fornix of the patients once a day, which was for 6 consecutive days.

Observation indicators and evaluation indicators

The MAP, HR, SaO_2, and other indicators of patients were monitored at T0 (room admission) and T1 (starting surgery) moments. The patient's pain visual analog scale (VAS) (21), time of the onset of anesthesia, time to open eyes after they were called, time of consciousness recovery, etc. were observed and recorded. The number of cases with adverse reactions (body movement, respiratory depression, nausea, vomiting, headache, etc.) was also counted. The postoperative wound healing days and complications were investigated by follow-ups.

After the treatment, the cervical morphology of the patients was observed by colposcopy to evaluate the treatment effect (22). If it was assessed as cured, there was no abnormality in the cervical morphology and vaginal secretions, the eroded tissues were completely repaired, and the cervix was smooth and free of adhesions. If it was effective, the eroded tissues were repaired, and a small amount of red granulation tissue was still attached to the cervix. If it was ineffective, no obvious change or even aggravation was observed after treatment. Total effective rate (%) = the number of (cured + effective) cases / total number of cases × 100%.

Statistical analysis

All experimental data were statistically analyzed by SPSS 24.0, and measurement data were expressed as mean + standard deviation ($\bar{x}\pm s$). Enumeration data were statistically inferred by χ^2 test, and measurement data conformed to a normal distribution with t-test was used. When $P<0.05$, a difference was considered statistically significant.

Results and discussion

Comparison of general data of two groups of patients

In comparison, it could be observed that there was no statistically significant difference between the control group and the experimental group in terms of age, body mass index (BMI), course of the disease, and grading standards of the American Society of Anesthesiologists (ASA) ($P>0.05$). More details could be found in Figure 1 below.

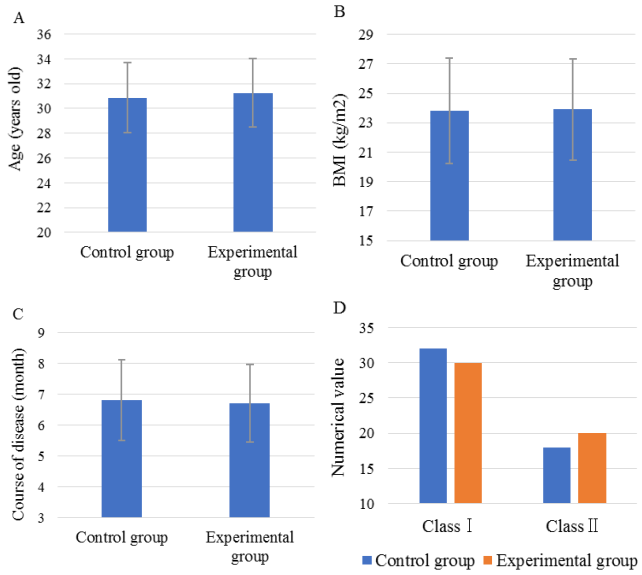

Figure 1. Comparison of the patients' general data in the two groups. Note: Figures A, B, C, and D represented the comparison of the age, BMI, course of the disease, and ASA classification of patients between two groups, respectively.

Comparison of MAP, HR, and SaO_2 of patients between the two groups

As shown in Figure 2, the MAP of patients in the control group at T0 and T1 were 88.54±6.93mmHg and 83.76±5.43mmHg, respectively. While MAP of the experimental group at T0 and T1 moments were 87.63±6.95mmHg and 76.88±5.65mmHg, respectively. The MAP at T1 of the experimental group was lower than that of the control group, showing a statistically significant difference (P<0.05). The HR of the control group at T0 and T1 were 77.36±7.57 beats/min and 68.31±5.28 beats/min, respectively; while that of the experimental group at T0 and T1 were 77.59±7.83 beats/min and 75.45±5.06 beats/min, respectively. The HR at the T1 moment of the experimental group was higher than that of the control group, and the difference was statistically significant (P<0.05). In the control group, SaO_2 at T0 and T1 were 98.5±0.91% and 97.3±0.85%, respectively; those of the experimental group were 99.1±0.89% and 97.4±0.82%, respectively. There was no significant difference between the two groups in SaO_2, which was not statistically significant (P>0.05).

Comparison of anesthesia effects between the two groups

As shown in Figure 3 below, the VAS score of the control group was 2.83±0.79 points, and that of the experimental group was 1.85±0.73 points. The onset time of anesthesia, was 0.93±0.25min in the control group, and was 0.56±0.21min in the experimental group. For time to open eyes as the patients were called, the result was 4.33±1.45min and 2.45±1.38min in the control group and the experimental group, respectively. The time of consciousness recovery in the control group was 7.15±1.34min, while that in the experimental group was 5.22±1.42min. In all the aspects of the anesthesia effect, the indicators of the experimental group were lower than those of the control group with statistically significant differences (P<0.05).

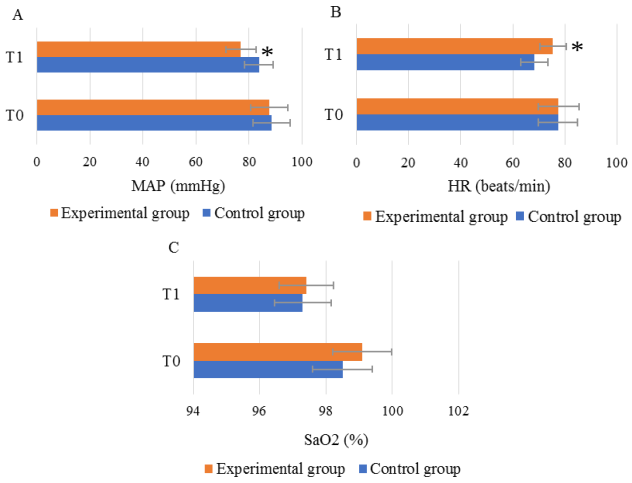

Figure 2. Comparison of MAP, HR, and SaO_2 between the two groups. Notes: Figures A, B, and C showed the comparison of MAP, HR, and SaO_2 of patients between the two groups, respectively. * indicated that the MAP and HR levels of the experimental group were significantly different from those of the control group (P<0.05).

Comparison of adverse reactions of patients between the two groups

From Figure 4, it was found that the adverse reactions due to anesthesia were manifested as body movement, respiratory depression, nausea, vomiting, and headache. There were 2, 2, 5, 3, and 2 cases that showed the above adverse reactions, respectively in the control group. There was 0, 0, 1, 1, 1 case in the experimental group that suffered from those adverse reactions, respectively. A total of 14 patients in the

control group experienced adverse reactions, with an incidence of 28%; while only 3 patients in the experimental group had adverse reactions, with an incidence of 6%. The adverse reactions in the experimental group were significantly lower than those in the control group with the difference statistically significant (P<0.05).

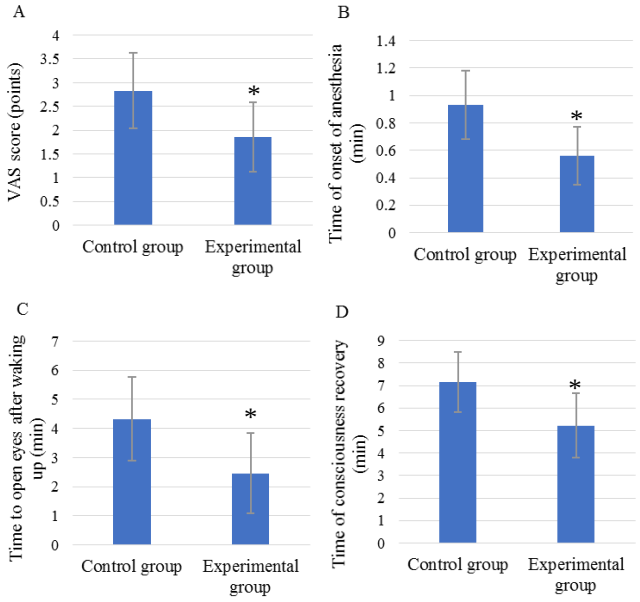

Figure 3. Comparison of anesthesia effects on patients between the two groups. Notes: The comparison of the VAS scores, the onset time of anesthesia, the time to open eyes, and the time for consciousness recovery between the two groups were represented in Figures A, B, C, and D, respectively. * suggested that the four indicators of the experimental group were significantly different from those of the control group (P<0.05).

Comparison of treatment effects between the two groups of patients

As suggested in Figure 5 below, the 50 patients in the control group were treated with LEEP under intravenous fentanyl anesthesia, of which 25 cases were cured, 10 were treated effectively, and 15 were ineffective. The effective rate was 70% of the control group. In the experimental group after propofol intravenous anesthesia, 32 cases were cured, 15 cases achieved the effective treatment, and 3 cases were ineffective; the effective rate was 94%. The effective rate of treatment in the experimental group was significantly higher than that of the control group, and the difference was of statistical significance (P<0.05).

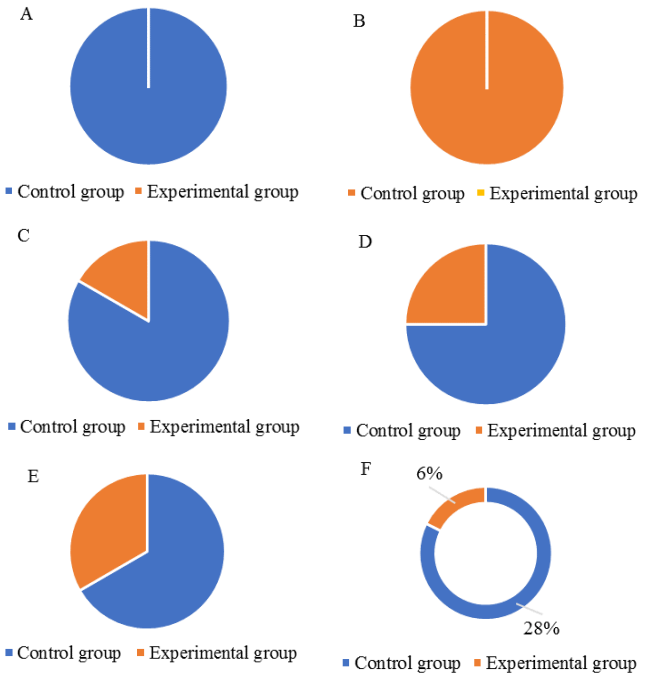

Figure 4. Comparison of adverse reactions between the two groups of patients. Note: Figures A-E represented the comparison in the number of cases with body movement, respiratory depression, nausea, vomiting, and headache between the two groups, respectively. Figure F was of the comparison of the incidence of adverse reactions between the two groups.

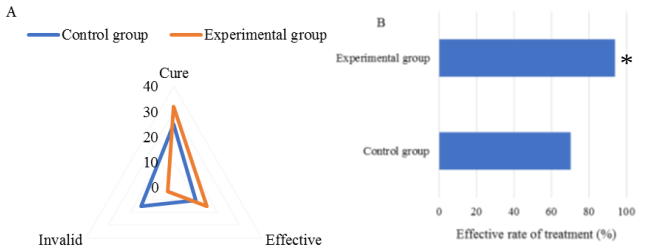

Figure 5. Comparison of the treatment effects on patients of the two groups. Notes: Figure A represented the treatment results on patients in the two groups, while Figure B represented the comparison of the effective rate of treatment of the two groups. * indicated that the effective rate of the experimental group was significantly different from that of the control group (P<0.05).

Comparison of wound healing time after surgery between two groups

It was represented in Figure 6 below that the postoperative wound healing time of the control group was 29.25±2.16 days, while that of the experimental group was 23.83±2.05 days. The wound healing time of the experimental group was significantly shorter

than that of the control group, and the difference was statistically significant (P<0.05).

Comparison of the probability of postoperative complications between the two groups

It was shown in Figure 7 that, among the postoperative complications, the number of cases of cervical external adhesion, vaginal bleeding, vaginal discharge, and vaginal infection was 2, 3, 4, and 3, respectively in the control group. Those in the experimental group occurred in 0 cases, 1 case, 1 case, and 1 case, respectively. The incidence of complications was 24% in the control group, while that was 6% in the experimental group, which was significantly lower than that in the control group with a statistically significant difference (P<0.05).

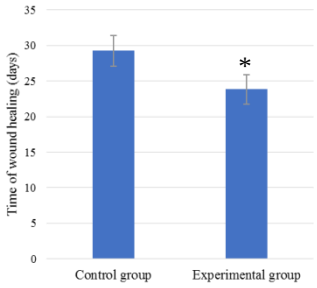

Figure 6. Comparison of postoperative wound healing time of patients between two groups. Note: * stood for that the wound healing time after surgery of the experimental group was significantly different from that of the control group (P<0.05).

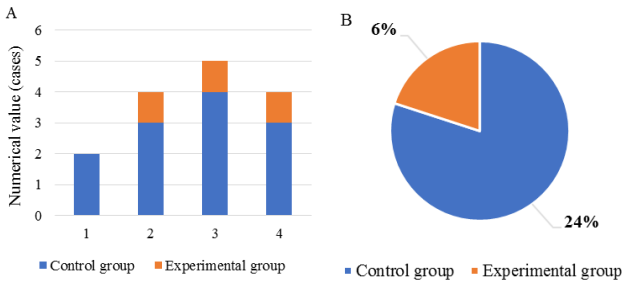

Figure 7. Comparison of the probability of postoperative complications between the two groups. Notes: Figure A showed the number of cases with different postoperative complications in the two groups, and Figure B represented the comparison of the incidence of postoperative complications between the two groups. Figures A, 1, 2, 3, and 4 on the abscissa stood for the cervical adhesion of the external orifice, vaginal bleeding, vaginal discharge, and vaginal infection, respectively.

Chronic cervicitis is the most common female reproductive organ inflammation, with high morbidity accounting for more than half of married women (23). Chronic cervicitis may occur after acute cervicitis, or the cervix is deformed due to cervical laceration caused by various reasons, and it is easy to be infected by external bacteria (24). Therefore, it is necessary to take timely treatment after diagnosis to prevent further development of the disease. Chronic cervicitis is mainly treated locally, and physical therapy, drug therapy, and surgery can be used. Compared with traditional surgery, LEEP does not require laparotomy, and the surgical incision is small, which reduces the pain of patients (25,26). However, it still causes a certain pain to patients, which is easy to causes mental tension and fear for patients who do not understand the disease, which affects the surgical process and postoperative recovery. In addition, there are many nerves densely distributed in the cervix, and these vagus nerves are easily stimulated during surgical operations. This would lead to some gastrointestinal symptoms, resulting in increased HR and even fainting in severe cases (27). Therefore, it is necessary to apply an effective and appropriate anesthesia method during the surgery.

Propofol was used for intravenous anesthesia. The results showed that in terms of anesthesia effect, the VAS score of the experimental group (1.85±0.73 points), the onset time of anesthesia (0.56±0.21min), the time to open eyes when called (2.45±1.38min), and time for consciousness recovery (5.22±1.42min) were all superior to those of the control group (2.83±0.79 points, 0.93±0.25min, 4.33±1.45min, and 7.15±1.34min), and the differences were statistically significant (P<0.05). The experimental results were consistent with the conclusions of Du et al. (2021) (28). The use of propofol is simple and convenient, the onset time of anesthesia is short, the analgesic effect is good, and the patients wake up quickly after surgery. In terms of postoperative adverse reactions including body movement, respiratory depression, nausea, vomiting, and headache, the number of patients in the experimental group with the five adverse reactions were 0, 0, 1, 1, and 1, respectively. The incidence of adverse reactions was 6%, which was much lower than 28% of the control group (P<0.05). This suggested that propofol gave a low incidence of adverse reactions after intravenous

anesthesia, so it was a safe anesthetic drug. In the control group, since fentanyl had a certain effect on inhibiting respiration and circulation, the vital signs of patients in the experimental group at T1 moment were better (P<0.05) according to the monitored MAP and HR. Propofol had little impact on patients' respiratory indicators, which was conducive to strengthening the analgesic effect, and the onset of anesthesia was fast. Liu et al. (2017) (29) point out that nano-silver gel does well in antibacterial sterilization, and promotes tissue repair and regeneration. Good therapeutic effect, simple operation, and high acceptance of patients are shown in the treatment of different types of vaginitis. In surgical treatment effect, after the combined treatment of LEEP combined with nano-silver gel, 32 cases were cured, 15 cases were treated effectively, and 3 cases were assessed to be ineffective in the experimental group. The effective rate was 70% in the experimental group, which was significantly higher than that of the control group with LEEP alone (P<0.05), confirming the reliability of this statement. For the postoperative complications, external cervical adhesion, vaginal bleeding, vaginal discharge, and vaginal infection occurred in 0, 1, 1, and 1 cases in the experimental group, respectively. The incidence of complications was 6%, far lower than 24% of the control group (P<0.05), which indicated that the nano-silver gel had good bactericidal and bacteriostatic effects. LEEP combined with nano-silver gel was more effective than the single LEEP in the treatment of chronic cervicitis. The incidence of postoperative complications was reduced, the wound healing time was shorter, and the treatment effect was better.

Conclusions

100 chronic cervicitis patients were selected as the research objects; those in the control group were treated with LEEP under intravenous fentanyl anesthesia, and those in the experimental group were given the synergistic therapy of LEEP combined with nano-silver gel. It was found that propofol as an intravenous anesthetic could not only reduce the pain of patients but also greatly eliminate the patients' fear of surgery. Under the effective anesthesia, the patients slept comfortably, which was conducive to the smooth development and completion of the surgery. There were few adverse reactions after surgery. LEEP combined with nano-silver gel had a good curative effect and low incidence of complications in the treatment of chronic cervicitis, so it was worthy of promotion in clinical practice as an effective treatment method. The shortcomings lay in that the sample size included was small and the sample diversity was insufficient, thus the results might show certain limitations and one-sidedness. Therefore, in future research, it was considered that the sample size should be expanded and the diversity of samples should be increased, so as to provide a more convincing reference for the clinical treatment of chronic cervicitis.

Acknowledgments

Not applicable.

Conflict interest

The authors declare that they have no conflict of interest.

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