Revista Argentina de Clínica Psicológica
2020, Vol. XXIX, N°3, 1047-1053
DOI: 10.24205/03276716.2020.931

Clinical effect nano-silver burn dressing combined with comprehensive high-quality care on patients with severe burns

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Abstract

This study investigated the effect of nano-silver dressing combined with quality care in the treatment of burn patients. This time from February 2018 to August 2019, a total of 100 patients with severe burns were admitted to our hospital. They were divided into the observation group and the control group. When the control group received conventional treatment; the observation group received nano silver dressing combined with quality care, 50 cases each. The treatment efficiency, bacterial infection, high fever, incidence of toxic and side effects, wound healing time, hospital stay compared for the two groups; with the results showed that total effective rate in observation group was higher than control group(P<0.05). Moreover, the incidence of bacterial infection, high fever, toxic and side effects in the observation group was lower than control group, with differences statistically significant (P<0.05). The wound healing time and hospitalization time from the observation group were both less than those of the control group, with difference statistically significant(P<0.05). While the complications incidence in observation group was lower than in control group; the score of nursing satisfaction in observation group was higher than in control group, with value P < 0.05. Meantime, the scores of mental health, physical function, physiological function, emotional function, social function in observation group were higher than in control group (P < 0. 05). In conclusion, the combination between nano-silver dressing and high-quality nursing treatment for burn patients may ensure higher clinical efficacy, reduce the incidence of toxic, side effects, also shorten the length of hospital stay, which is worth promoting.

Keywords: nano-silver dressing; burn; quality care

1 Introduction

Burn refers to a traumatic disease mainly caused by thermal, chemical, electrical and other factors. Therefore, the condition is severe, complicated and urgent, resulting in a high disability rate and mortality. Patients with large-area burns refer to body skin burns of up to 50%. The body-wide skin barrier of patients with large-area burns is severely damaged, which causes the body's immunity and resistance to decrease rapidly. At the same time, the body's water and electrolyte balance will be damaged, and the body is in a malnourished status, increasing the risk of infection (Simko et al., 2018). Hence, infection may be one leading causes of death in burn (Stanojcic et al., 2018), also main source of invasive infections in wounds. When the local blood vessel embolism of the burn wound occurs, and the systemic antibiotics may not effectively affect the burn site, it is difficult to achieve effective results with simple intravenous antibacterial or anti-infective measures. (Finley PJ et al., 2013) Therefore, in the early treatment of burn wounds, reasonable external means of sterilization & bacteriostasis are particularly important. This time, studies have shown that patients with large-area burns have a fatality rate of up to 70% during clinical treatment. Therefore, it is particularly important to provide necessary high-quality nursing interventions for patients with large-area burns. (Epstein et al., 2004) As a kind of advanced nanotechnology, nano silver dressing mainly uses silver particles as raw materials, it can

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timely drain necrotic tissue, contain good activation effect on human cells, promote improvement of microcirculation, and have less adverse reactions, which is beneficial to promote wound repair (Madhumathi et al., 2010；Ciloglu et al., 2014；Zheng et al., 2010; Ah et al., 2004).

Based on this study, there are 100 patients with severe burns treated in our hospital from February 2018 to August 2019 as subjects. By grouping the patients with different dressing accessories, the silver silver dressings were compared and discussed in the prevention and healing of wound infections. The role of high-quality care in patients with large-scale burns was discussed, while details as follow.

2. Material and method

2.1 General information

Selection in our hospital in February 2018 - August 2019, 100 cases of burn patients treated during deep Ⅱ degrees; with 50 cases each, according to random number table method, divided into observation group and control group. Details as follow: in the observation group, 24 men and 26 women (age 23-57 years), with an average age 42.43±2.82 years; in control group, there were 25 man and 25 women (age 26 to 55 years), with an average age 43.72±2.62 years.

Inclusion criteria: (1) all conform to the diagnostic criteria for burns in the blue book of burn surgery; (2) no drug allergy; (3) all signed informed consent.

Exclusion criteria :(1) body with poor condition; (2) patients with treatment contraindications to some traditional Chinese medicine such as MEBO or more; (3) patients with cardiac, hepatic and renal insufficiency. With no statistically significant difference between the two groups (P>0.05).

2.2 Method

Since admission, two groups of patients were treated with 10% iodine volts for conventional wound cleaning treatment, sufficient drainage of blisters to completely eliminate the separated epidermis, then the wound was washed with 1:2000 chlorhexidine solution. Meanwhile, routine treatment such as anti-infection, anti-shock and anti-tetanus were provided while patients in the control group receive routine treatment and routine nursing. Saying about the observation group which treated with nanometer silver dressing which produced by Hunan Anxin Medical Polymer Material Co., LTD., Hunan food and drug supervision equipment 2006 no. 2640044; and the dressing was changed once a day. The effective rate of treatment, the incidence of bacterial infection, high fever, toxic and side effects, wound healing time and hospital stay were counted.

Control patients with routine nursing care, patients after admission, nursing staff quickly assess the patient's vital signs, according to the evaluation results, give first aid to prescribed drugs, in a timely manner to give patients psychological nursing intervention measures, hospitalization diet nursing care plan for patients, the patients in stable condition after discretionary changes nursing plan [9]. On the basis of routine nursing, specific measures were as follows :(1) quality psychological nursing. After regain consciousness, in the face of the whole body skin burns up to half, physical activity is restricted, worried that after the treatment, large area leave scar, affect the body in daily life and daily work, easily lead to anxiety, depression, fear of the occurrence of negative emotions, negative emotions will happen even more severe patients refused to accept treatment, have the idea of suicide. Nursing staff should be talking to each large area burn patients in time, record the causes of patients with negative emotions, establish a good relationship between nurses and patients, and patients can make patients feel the nurse's care, encourage patients poured their own troubles, by collecting data, implement psychological nursing for patients, as far as possible to satisfy patients' reasonable requirements. (2) Quality living guide. During the period of hospitalization, patients' self-care ability is limited by certain diseases. Nursing staff should increase the number of visits to the patients, and change the body position for the patients every 2 hours to prevent the occurrence of pressure ulcers as soon as possible. After the patient's disease is stable, make a targeted diet and nursing plan for the patient, enhance the nutrition of the patient, let the patient eat more fresh fruits and vegetables, timely supplement vitamins. Nursing staff should ventilate the ward twice a day and disinfect it with ultraviolet ray once a day. The temperature and humidity of the ward should be controlled within the comfort range of the patient to ensure that the patient feels comfortable and warm during the stay in the hospital. (3) Quality rehabilitation care. Patients in the stable condition after the early rehabilitation exercise, early nursing staff can guide and assist patients in the bed to implement passive movement, such as turning over, lifting hands, lifting feet, etc. With the improvement of the disease, the intensity and difficulty of exercise are gradually increased, and the implementation of all rehabilitation exercise plans should be based on the patient's endurance (Lewis, 1994;

Mullins et al., 2012; Jeanne et al., 1999).

2.3 Criteria for efficacy determination

The criteria for efficacy are shown in Table 1.

Table 1. **Evaluation criteria of efficacy**

The curative effect	Decision criteria
Heal	The wound surface of the patient completely healed, non-toxic side effects
Excellent	The wound surface of the patient was basically healed without obvious toxic or side effects
Effective	The patient's wound healed while value >1/3, without obvious toxic or side effects
Invalid	The wound healing of patient's value was <1/3, showing obvious toxic and side effects

Total effective rate equal to 'number of cured cases' plus 'number of obvious cases' and 'number of effective cases', then divided the total number of cases'100%.

Complications, nursing satisfaction and quality of life scores were compared with details as follow: (1) The infection, shock, malnutrition, sepsis, other complications were calculated. (2) Nursing department self-made questionnaires distributed to each patient, let patients clinical operation technology, theory of knowledge of nursing staff, nursing services, and to evaluate the relationship between nurses and patients, hospital propaganda and education, et al, shall be carried out in accordance with the 0 score, while value > 80 divided into very satisfied, value 60 ~ 80 were divided into satisfactory, value < 60 divided into not satisfied. (3) Nursing staff used the life quality rating scale to assess the patients' mental health, physical function, physiological function, emotional function, social function, each score is 20 points.

2.4 Statistical treatment

Software SPSS22.0 was used for statistical analysis data. At that meantime, data expressed as mean ± standard deviation (x-±s), while 't test' was used for comparison. The enumeration data expressed as rate (%), and the comparison is tested by word 2. While considered statistically significant with value P<0.05.

3. Result and discussion

3.1 Scanning electron microscopy silver dressing

This time the observation results of nano-silver antibacterial dressing under scanning electron microscope in Figure 1.

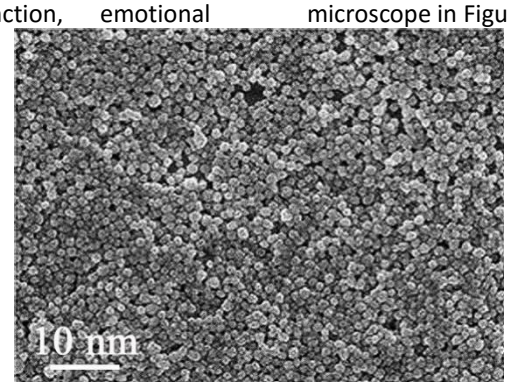

Figure 1 Scanning electron microscope image of nano-silver antibacterial dressing

3.2 Comparison of clinical efficacy between the two groups

The total effective rate of observation group was 96.77%, higher than control group (86.28%). With difference statistically significant (P<0.05), as shown in Figure 2.

3.3 Comparison of bacterial infection, high fever and toxic and side effects between the two groups

The incidence of bacterial infection, high fever, toxic and side effects in observation group was lower than in control group; with difference statistically significant and value P<0.05, as shown in Figure 3.

3.4 Comparison of wound healing time & hospitalization time

This time, the 'wound healing time' & 'hospitalization time' of the observation group were shorter than those of the control group; with difference statistically significant (P<0.05); details as shown in Figure 4.

3.5 Complication rate and nursing satisfaction

The incidence complication in observation group was lower than in control group, additionally, the 'score of nursing satisfaction' in observation was higher than in control group, with difference statistically significant (P < 0. 05), as shown from Figure 5 to Figure 6.

3.6 Quality of life score

The scores of mental health, limb function, physiological function, emotional function and social function in observation group all higher than those in control group, with difference statistically significant while value P < 0. 05, details shown in Figure 7.

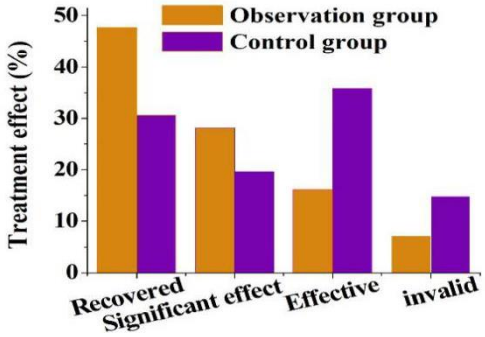

Figure 2. **Comparison clinical efficacy between the follow two groups**

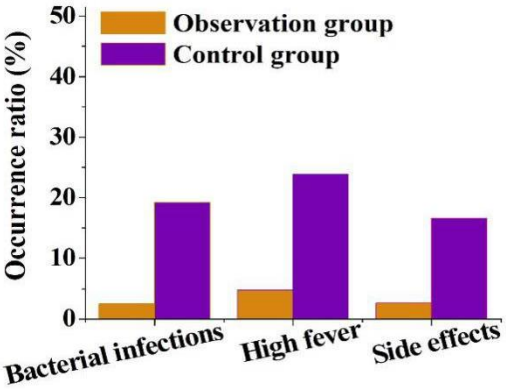

Figure 3. **Comparison of bacterial infection, high fever and toxic and side effects between the two groups**

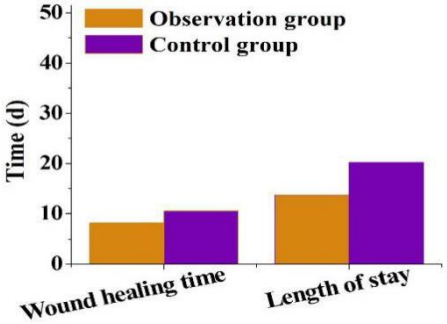

Figure 4. **Comparison of wound healing time & hospitalization time between the two groups**

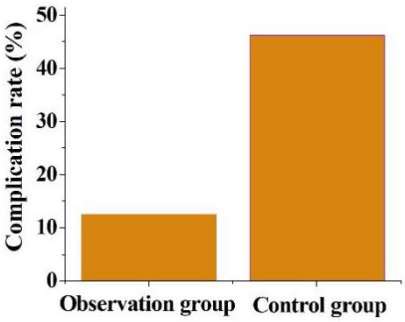

Figure 5. **Complication rates between Observation group and Control group**

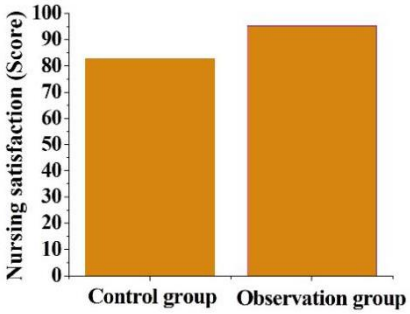

Figure 6 **Comparison of nursing satisfaction scores between the two groups**

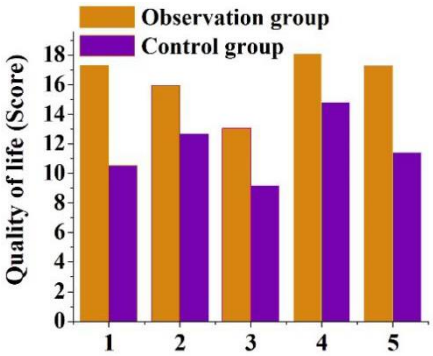

Figure 7. **Life quality score ratio between the two groups (1. Mental health; 2. Limb function; 3. Physiological function; 4. Emotional function; 5. Social function.**

3.7 Discussion

Burn is a traumatic disease caused by physical or chemical factors. At that meantime, small area burns may cause slight damage to the skin and mucosal tissues, however, large area burns may cause severe damage to the body system, which may easily lead to shock, sepsis, multi-organ failure or other complications, even pose serious threat to patients' life safety (Simko et al., 2018). The treatment of burn wounds is complicated and takes a long time, which may cause serious sequelae. Moreover, the incidence of infection is a key factor

inducing the death of burn patients, resulting in difficulty for systemic antibiotics to reach the local area (Epstein et al., 2004). At present, burn wound medicine is various, the curative effect is different. Hence, it is necessary to provide patients with appropriate drug treatment to reduce toxic & side effects in order to reduce wound infection rate also promote wound healing.

Silver nanoparticles usually refer to metallic silver elements with particle size less than 100 nm. Due to the surface effect of silver nanoparticles, the bacteriostatic ability of silver nanoparticles at the same concentration is obviously better than that of large silver particles (Pauksch et al., 2014). In addition, nanoscale silver has better bacteriostatic effect than silver ion (Edmiston and Markina, 2010). Furthermore, in medical use, silver does not lose its potency due to bacterial resistance, as antibiotics do. Because of this, the application of nano-silver in the medical and health field has become a research hotspot in recent years (Takenaka et al., 2001; Soto et al., 2007; Lu et al., 2014; Poon and Burd, 2004; Gopee et al., 2007). At present, medical products such as nano-silver antibacterial fiber, nano-silver antibacterial gel and nano-silver antibacterial dressing have been developed successively (Chen and Schluesener, 2008). Its application scope includes the treatment of acne, prostatitis, ringworm, gynecological diseases, burns and trauma, et al. (De et al., 2013; Feng et al., 2015; Bar-llan et al., 2009; Lee et al., 2011; Sahu et al., 2014) Compared with other chemically-synthesized fungicides, the bactericidal mechanism of silver has obvious uniqueness. It denatures bacterial proteins by means of heavy metal ions, thus playing a good antibacterial, bactericidal, non-resistant and other functions. This topical application plays important role in control of burn wound infection (Xiu et al., 2012). Nano silver dressing as a new type of antibacterial dressing, mainly will be attached to the medical absorbent gauze, silver nanoparticles after contact with the wound, sustainable release the nanosize silver particles, made into a wound bacteria perish in time, effectively control fungi and other pathogens, thereby avoiding the phenomenon of infection, given full play to the role of anti-inflammatory analgesic, promote healing of the wound as early as possible. Application of nano silver dressing treatment in burn patients, 25 nm on cotton planting silver particles, after fully release silver ions, effective junction protein negative bacteria, and denatured protein precipitation of the negatively charged bacteria, at the same time, combining with the enzyme thiol to form a stable sulfate, effectively restrain a series of s-based enzyme activity, eventually attain the goal of antibacterial, sterilization, et al. Clinical studies have demonstrated that nano silver dressing on staphylococcus aureus, c. albicans, pseudomonas aeruginosa and other microbes have antibacterial, sterilization effect, applied to small area Ⅱ degree burns, which may promote early healing of burn wounds (Echegoyen and Nerin, 2013). The mechanism of wound healing promotion is still unclear, which may be the nano-silver dressing can effectively reduce local infection of burn wounds, improve local microenvironment and accelerate wound healing. The nano-silver dressing has high permeability, also the wound inflammation subsides, dryness, and scab forms quickly, in this case the wound exudation can be treated by drainage, so as to avoid external medication and deepen wound (Zheng et al., 2010). Nanometer silver contains the function of drug slow release, without local stimulation, allergy symptoms or systemic reaction, ensure good anti-infection effect of nanometer silver dressing, it may quickly promote wound healing. In this study, nano-silver antibacterial dressing was used to treat severe burn patients. Meantime, it was found that 'the total effective rate' in observation group was higher than control group; with the difference statistically significant value $P<0.05$. Furthermore, incidence of bacterial infection, high fever, toxic and side effects in observation group was lower than control group, with difference statistically significant when value $P<0.05$. The wound healing time and hospitalization time in the observation group both shorter than in control group, with difference statistically significant ($P<0.05$). It shows that nano-silver dressing in treating burn patients can ensure a higher clinical efficacy, reduce the incidence of toxic and side effects, and shorten the length of hospital stay, which is worthy of promotion.

Large area burns will also lead to severe skin damage all over the body, increasing the risk of various serious complications, after large area burns, the body resistance and immunity is not good, resulting in high clinical mortality, so it is very important to strengthen the quality of nursing intervention for large area burns. Quality nursing intervention means that nurses provide patient-centered clinical nursing services for patients, so that patients can get the best care during their hospitalization, which can promote the recovery (Shirom et al., 2006). Furthermore, it shows that high quality nursing in patients with large area burns is accurate, which can effectively reduce complication incidence, improve the satisfaction

degree of patients with nursing, also improve patient life quality which is worthy of clinical application.

Conclusion

This time in conclusion, the application of nano-silver dressing in the treatment of burn patients has obvious safety and efficacy, which can ensure a high treatment effect, reduce the incidence of toxic and side effects, promote wound healing, shorten the length of stay, meantime fully improve the prognosis situation of patients'. Moreover, high-quality nursing in patients with large-area burns is accurate, which may effectively reduce the incidence of complications, improve the satisfaction degree patients with nursing, and improve patients' life quality. Therefore, it is worthy of clinical application.

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