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Application Effect of Cosmetic Surgery Repair Techniques in the Treatment of Facial Trauma Patients

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Abstract: *Objective*: To explore the application effect of cosmetic surgery repair techniques in the treatment of facial trauma. *Methods*: 200 patients with facial trauma who visited the hospital from January 2022 to December 2024 were selected and divided into an observation group and a control group according to the random number table method, with 100 cases in each group. The observation group was treated with cosmetic surgery repair techniques, while the control group was treated with traditional facial trauma repair techniques. The wound healing time, scar score, patient satisfaction, and complications were observed in both groups. *Results*: The average wound healing time in the observation group was 6.23 ± 1.05 days, which was significantly shorter than that in the control group (8.76 ± 1.32 days), and the difference was statistically significant ($P < 0.05$). The average score of the Vancouver Scar Scale (VSS) in the observation group was 2.85 ± 0.76, which was significantly lower than that in the control group (5.12 ± 1.08), and the difference was statistically significant ($P < 0.05$). The satisfaction rate of patients in the observation group was 90.00%, which was significantly higher than that in the control group (72.00%), and the difference was statistically significant ($P < 0.05$). The incidence of complications in the observation group was 5.00%, which was significantly lower than that in the control group (16.00%), and the difference was statistically significant ($P < 0.05$). *Conclusion*: Cosmetic surgery repair techniques have significant advantages in the treatment of facial trauma, which can effectively shorten the wound healing time, reduce scar formation, improve patient satisfaction, and reduce the incidence of complications. It is worthy of promotion and application in clinical practice.

Keywords: Cosmetic surgery repair techniques; Facial trauma; Wound healing; Scar; Satisfaction

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1. Introduction

Facial trauma is relatively common in emergency surgery, accounting for approximately 12% to 18% of

emergency trauma patients. With the development of transportation and industry, the incidence of facial trauma is on the rise. It not only causes tissue damage but also affects facial aesthetics and function, imposing both physical and psychological burdens on patients. Although traditional repair techniques can close the wound surface, postoperative scars are often noticeable, affecting patients' quality of life [1]. In recent years, cosmetic repair techniques have gradually been applied to the treatment of facial trauma, balancing both functional recovery and aesthetic effects. In cosmetic repair techniques, debridement is a crucial first step [2]. Unlike traditional debridement methods, cosmetic repair techniques emphasize the precision and gentleness of debridement [3]. Gentle disinfectants such as normal saline, hydrogen peroxide solution, and povidone-iodine are used to repeatedly irrigate the wound surface, thoroughly removing foreign bodies, necrotic tissue, and bacteria while maximizing the protection of normal tissue [4]. For deep trauma, auxiliary equipment such as microscopes or magnifying glasses can be used to more precisely remove deep contaminants, avoiding unnecessary damage to surrounding healthy tissue and creating good conditions for subsequent repairs. For large facial trauma or cases involving tissue defects, skin flap transplantation and skin grafting are commonly used repair methods [5]. Skin flap transplantation includes local rotation flaps, advancement flaps, free flaps, etc. The appropriate flap type is selected based on the location, size, and shape of the trauma. The skin flap has its own blood supply, resulting in a high survival rate after transplantation. It can effectively repair tissue defects, and the color and texture of the flap are similar to the surrounding skin, resulting in a better postoperative appearance [6]. Skin grafting is suitable for cases where the skin defect is large and cannot be repaired by a skin flap. Both autologous skin grafting and allogeneic skin grafting are options, with autologous skin grafting yielding more ideal results. During the skin grafting process, emphasis is placed on the selection, fixation, and postoperative care of the skin graft to improve the survival rate and appearance quality of the graft. This study compares and analyzes the application effects of cosmetic repair techniques and traditional repair techniques in the treatment of facial trauma, providing a reference for clinical treatment.

2. Materials and methods

2.1. General information

A total of 200 patients with facial trauma who visited our hospital from January 2022 to December 2024 were selected as the research subjects. The patients were randomly divided into an observation group and a control group, with 100 patients in each group. In the observation group, there were 58 males and 42 females, aged between 18 and 62 years, with an average age of 35.62 ± 8.51 years. The causes of injury were as follows: 40 cases due to traffic accidents, 25 cases due to violent conflicts, 18 cases due to work accidents, and 17 cases due to accidents in daily life. In the control group, there were 60 males and 40 females, aged between 19 and 65 years, with an average age of 36.22 ± 9.11 years. The causes of injury were as follows: 38 cases due to traffic accidents, 27 cases due to violent conflicts, 16 cases due to work accidents, and 19 cases due to accidents in daily life. There was no statistically significant difference between the two groups in terms of gender, age, and cause of injury ($P > 0.05$), making them comparable.

Inclusion criteria: (1) Age between 18 and 65 years old; (2) Fresh facial trauma, with the time from injury to consultation within 24 hours; (3) Trauma area greater than 1cm²; (4) Patients voluntarily signed the informed consent form.

Exclusion criteria: (1) Severe heart, liver, kidney, and other important organ diseases; (2) Coagulation

dysfunction or immunocompromised state; (3) Obvious infection at the site of trauma; (4) Mental illness.

2.2. Methods

The control group was treated with traditional facial trauma repair techniques. Initially, routine wound debridement was performed, rinsing the wound with normal saline to remove foreign bodies and necrotic tissue. Then, a thicker silk suture was used for simple suturing to close the wound.

The observation group was treated with cosmetic repair techniques. The specific operations are as follows:

(1) Debridement: Gentle disinfectants such as normal saline, hydrogen peroxide solution, and povidone-iodine were used to repeatedly irrigate the wound surface, thoroughly removing foreign bodies, necrotic tissue, and bacteria. For deep wounds, a microscope or magnifying glass was used to more precisely remove deep contaminants and maximize the protection of normal tissue.

(2) Tissue reduction and reconstruction: Based on the facial anatomical structure, displaced muscles, nerves, blood vessels, and other tissues were accurately repositioned. The ruptured muscles were anastomosed end-to-end, the damaged nerves were repaired or transplanted, and the fractured sites were anatomically reduced and fixed. For tissue defects, autologous tissue transplantation was used for repair.

(3) Suturing: Minimally invasive suturing techniques were employed, using 5-0 or 6-0 absorbable sutures. Following the principle of "tension-free, layered suturing," the subcutaneous tissue was first sutured in layers to distribute skin tension, and then fine skin suturing was performed to ensure precise alignment of skin edges. Special methods such as intracutaneous continuous suturing and mattress suturing were used for specific areas like the eye corners and mouth corners.

(4) Skin flap transplantation and skin grafting: For patients with large trauma or tissue defects, appropriate skin flap transplantation or skin grafting was selected for repair based on the trauma situation.

2.3. Observation indicators

(1) Wound healing time: Record the time from the start of treatment to complete healing of the wound.

(2) Scar score: Use the Vancouver Scar Scale (VSS) to score the scars of the two groups of patients 3 months after surgery. The VSS scale evaluates scars from four dimensions: color, thickness, vascularity, and pliability. The total score ranges from 0–14, with higher scores indicating more pronounced scars.

(3) Patient satisfaction: Three months after surgery, a self-made satisfaction survey questionnaire will be used to investigate the satisfaction of the two groups of patients. The questionnaire includes evaluations of treatment effectiveness, facial appearance, functional recovery, etc., and is divided into three levels: very satisfied, satisfied, and dissatisfied. Satisfaction rate = (number of very satisfied cases + number of satisfied cases) / total number of cases × 100%.

(4) Occurrence of complications: Observe the occurrence of postoperative complications in the two groups of patients, including infection, hematoma, scar hyperplasia, etc.

2.4. Statistical methods

Data were analyzed using SPSS 22.0 statistical software. Measurement data were expressed as mean ± standard deviation (Mean ± SD) and analyzed using the t-test. Count data were expressed as rates (%) and analyzed using the x^2 test. A P-value < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of wound healing time

The average wound healing time in the observation group was 6.23 ± 1.05 days, while the average wound healing time in the control group was 8.76 ± 1.32 days. Comparing the two groups, the difference was statistically significant (t=11.256, *P*=0.000) (**Table 1**).

Table 1. Comparison of wound healing time between the two groups (Mean ± SD, days)

Group	Cases (n)	Wound healing time (days)
Observation Group	100	6.23 ± 1.05
Control Group	100	8.76 ± 1.32
t-value		11.256
P-value		<0.001

3.2. Comparison of scar scores

The average VSS score for patients in the observation group was 2.85 ± 0.76 points, while the average VSS score for patients in the control group was 5.12 ± 1.08 points. The difference between the two groups was statistically significant (t=15.324, *P*=0.000) (**Table 2**).

Table 2. Comparison of VSS scores between the two groups (Mean ± SD, points)

Group	Cases (n)	VSS score (mean ± SD)
Observation Group	100	2.85 ± 0.76
Control Group	100	5.12 ± 1.08
t-value		15.324
P-value		<0.001

3.3. Patient satisfaction survey

Patient satisfaction in the observation group was 90.00% compared to 72.00% in the control group. The difference between the two groups was statistically significant (x^2=12.830, *P*=0.000) (**Table 3**).

Table 3. Comparison of patient satisfaction between the two groups (n, %)

Group	Cases (n)	Very satisfied	Satisfied	Dissatisfied	Satisfaction rate
Observation Group	100	58 (58.00%)	32 (32.00%)	10 (10.00%)	90 (90.00%)
Control Group	100	32 (32.00%)	40 (40.00%)	28 (28.00%)	72 (72.00%)
x^2					12.830
P-value					<0.001

3.4. Analysis of complication rates

The incidence of complications in the observation group was 5.00% compared to 16.00% in the control group. The difference between the two groups was statistically significant (x^2=6.542, *P*=0.007) (**Table 4**).

Table 4. Comparison of complication occurrence between the two groups (cases, %)

Group	Cases (n)	Infection	Hematoma	Hypertrophic scar	Total incidence
Observation Group	100	2 (2.00%)	2 (2.00%)	1 (1.00%)	5 (5.00%)
Control Group	100	7 (7.00%)	5 (5.00%)	4 (4.00%)	16 (16.00%)
x^2					6.542
P-value					0.007

4. Discussion

The greatest advantage of cosmetic plastic surgery lies in its excellent aesthetic results. Through delicate debridement, accurate tissue reduction, and innovative suturing techniques, scar formation can be effectively reduced, allowing the appearance of facial trauma to closely approximate its pre-injury state. The rational application of methods such as skin flap transplantation and skin grafting has further improved the repair of tissue defects after large-area trauma, satisfying patients' pursuit of facial beauty [7]. While emphasizing aesthetic results, cosmetic plastic surgery does not neglect the restoration of facial function. Surgeons' precise handling of muscles, nerves, blood vessels, and other tissues during the surgical process ensures the normal recovery of facial functions such as chewing, speaking, and expressing emotions [8]. Compared with traditional repair techniques, cosmetic plastic surgery is more comprehensive and precise in functional recovery, thereby improving patients' quality of life [9]. The psychological impact of facial trauma on patients cannot be ignored. Cosmetic plastic surgery significantly reduces patients' psychological burden and helps them rebuild their confidence by improving their facial appearance [10]. Adequate communication and psychological support between doctors and patients during the treatment process also help alleviate patients' anxiety and fear, promoting their psychological recovery.

The application of cosmetic surgery repair techniques demands solid anatomical knowledge, superb surgical skills, and rich clinical experience from doctors. There are high requirements for wound assessment, tissue handling, flap design, and the precision of surgical operations, which increase doctors' learning and practical costs and limit the promotion and application of this technology in some primary medical institutions. Due to the need for special instruments and materials such as fine needles and sutures, microscopes, and complex surgical procedures like flap transplantation, the treatment cost of cosmetic surgery repair techniques is relatively high, which may become an obstacle for some patients with poor economic conditions to receive treatment [11]. Compared with traditional repair techniques, the surgical process of cosmetic surgery repair techniques is more complex and delicate, and the operation time is usually longer. Prolonged surgery not only increases the risk of anesthesia for patients but also places higher demands on equipment and staffing in the operating room.

The results of this study showed that the wound healing time in the observation group was 6.23 ± 1.05 days, shorter than that in the control group (8.76 ± 1.32 days) ($P < 0.05$). This is related to the fine debridement of cosmetic surgery repair techniques, which can completely remove foreign bodies and necrotic tissues, reduce the risk of infection, and provide a good environment for wound healing by layered suturing to disperse skin tension and ensure local blood circulation. Studies have shown that precise debridement and reasonable suturing methods can significantly accelerate the wound healing process, which is consistent with the results of this study.

The VSS score of the observation group was 2.85 ± 0.76, lower than that of the control group (5.12 ± 1.08) ($P < 0.05$). The reason is that cosmetic surgery repair techniques adopt minimally invasive suturing, using fine needles and sutures, and following the principles of tension-free and layered suturing, which can accurately align

skin edges and reduce scar formation. Traditional suturing techniques are rough and have poor tension control, which can easily lead to scar hyperplasia. This is consistent with the advantages of cosmetic surgery techniques described in relevant literature regarding scar improvement.

The satisfaction rate of the observation group was 90.00%, higher than that of the control group (72.00%) ($P < 0.05$), reflecting patients' emphasis on appearance recovery. Facial aesthetics directly affects psychology and social interaction, and cosmetic repair techniques balance function and aesthetics to meet patient needs. Traditional techniques often result in noticeable scars after surgery, which can easily reduce patient satisfaction.

The incidence of complications in the observation group was 5.00%, lower than that in the control group (16.00%) ($P < 0.05$). This is because the technique involves precise operation, causes less tissue damage, reduces the occurrence of infection and hematoma, and accurate reduction also lowers the risk of scar hyperplasia. Traditional techniques are relatively rough, cause more tissue damage, and increase the probability of complications.

This study has certain limitations. The sample size was only 200 cases, and it was a single-center study, which may introduce bias. Future research should include multi-center, large-sample studies to further validate the results. Additionally, the follow-up time was relatively short, and long-term effects were not adequately observed. Follow-up time should be extended in subsequent studies to improve research quality.

5. Conclusion

In summary, cosmetic repair techniques have significant advantages in the treatment of facial trauma. However, it is also necessary to consider the high technical requirements for doctors and the higher treatment costs. In clinical applications, a reasonable selection should be made based on patient conditions and the medical institution's capabilities to achieve the best treatment effect.

Disclosure statement

The authors declare no conflict of interest.

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