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Application of Botulinum Toxin Type A after Plastic Surgery Incision and Its Impact on Patients' Complication Risks

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Abstract: Objective: To investigate the application effect of Botulinum Toxin Type A after plastic surgery incision and its impact on patients' complication risks. Methods: 104 patients who underwent plastic surgery incision in our hospital from February 2023 to June 2025 were selected and randomly divided into a control group (n=52) and an observation group (n=52) using a random number table method. Both groups underwent plastic surgery incision, while the observation group received additional application of Botulinum Toxin Type A. The treatment effects, skin conditions, complication rates, and patient satisfaction were compared between the two groups. Results: After intervention, the indicators of both groups improved compared to before treatment. The observation group showed significant advantages in various indicator improvements: In terms of treatment effect, the total clinical effective rate of the observation group (94.23%) was better than that of the control group (76.92%) ($\chi2=6.310$, $P=0.000<0.001$); in terms of skin condition, the observation group showed more significant improvement ($P=0.000<0.001$ for all); in terms of adverse reaction rate, the observation group (1.92%) was lower than the control group (15.38%) ($\chi2=4.379$, $P=0.036<0.05$); in terms of patient satisfaction, the total satisfaction rate of the observation group (96.15%) was better than that of the control group (80.77%) ($\chi2=6.029$, $P=0.014<0.01$). Conclusion: The application of Botulinum Toxin Type A after plastic surgery incision can improve treatment effects, skin conditions, and patient satisfaction. Although the complication rate increases slightly, the overall safety is acceptable, making it worthy of clinical promotion.

Keywords: Botulinum Toxin Type A; Plastic Surgery Incision; Complications; Clinical Efficacy; Skin Condition

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1. Introduction

In recent years, the field of aesthetic and plastic surgery in China has undergone significant development and garnered increasing attention. Aesthetic incision surgery is a commonly used cosmetic surgical method that effectively improves local appearance through precise incision design and suture counting, ultimately achieving aesthetic goals [1]. However, wound healing after surgery often encounters issues such as excessive scar growth [2], uneven skin texture, abnormal skin color, etc., which not only detract from the aesthetic result but also increase the psychological burden on patients. Additionally, complications like incision non-healing and infection can affect patient recovery and satisfaction with

treatment. Botulinum toxin type A is a neurotoxin produced by Clostridium botulinum that exerts a muscle-relaxing effect by inhibiting the release of acetylcholine at the neuromuscular junction. In recent years, its application in aesthetic and plastic surgery has become increasingly widespread, including for face slimming, wrinkle removal, and improvement of masticatory muscle hypertrophy. Studies have found that botulinum toxin type A can reduce excessive muscle activity around the incision, lower incision tension, create a favorable environment for incision healing, and consequently minimize scar formation and improve skin appearance [3]. However, systematic research on its application after aesthetic incision surgery remains limited, and there is controversy regarding its impact on the risk of complications. Some studies suggest that botulinum toxin type A may affect local blood circulation and immune function at the incision site, increasing the risk of complications. Other studies indicate that the appropriate use of botulinum toxin type A does not significantly elevate the incidence of complications but can enhance overall treatment effectiveness by optimizing healing conditions [4]. Therefore, this study aims to conduct a prospective controlled investigation to explore the application effects of botulinum toxin type A after aesthetic incision surgery and its impact on the risk of complications. This will provide a scientific basis for clinical treatment plan selection, further improving the efficacy and safety of aesthetic and plastic surgeries and meeting patients' aesthetic needs.

2. Materials and Methods

2.1. General Information

This study is a prospective one, selecting 104 patients who underwent plastic surgery incision in our hospital from February 2023 to June 2025 as the research subjects. They were divided into a control group (n=52) and an observation group (n=52) using a random number table method.

Inclusion criteria: (1) Underwent plastic surgery incision on the face, neck, or trunk, with an incision length of ≥2cm; (2) No history of allergy to type A botulinum toxin; (3) Did not receive similar cosmetic treatment within 3 months before surgery; (4) Patients and their families were informed of the study and signed an informed consent form.

Exclusion criteria: (1) Suffering from severe diseases of important organs such as heart, liver, and kidney; (2) Presence of coagulation dysfunction or immunocompromise; (3) Presence of infection, ulcer, or other lesions at the incision site; (4) Being in pregnancy or lactation; Suffering from mental illness and unable to cooperate with treatment and follow-up.

2.2. Methods

Both groups of patients underwent plastic surgery incision. The surgeries were performed by the same experienced team of doctors. The surgical procedure strictly followed the principle of sterile operation. Appropriate incisions were designed based on the surgical site and cosmetic needs. The skin and subcutaneous tissue were cut layer by layer. After completing the corresponding plastic surgery operations, cosmetic suturing techniques were used to close the incisions. Antibiotics were routinely administered postoperatively to prevent infection, and patients were guided on incision care.

The observation group received Botulinum Toxin Type A on this basis. Within 24 to 48 hours after surgery, Botulinum Toxin Type A was administered through multi-point microinjection around the incision site within a 1cm range, based on the length and location of the incision. The injection dosage was controlled, and the spacing between each injection point was 0.5 to 1cm. During the injection process, the depth and angle of the needle were strictly controlled to avoid damaging blood vessels and nerves.

Both groups of patients were followed up for 6 months after surgery, and the incision healing and changes in related indicators were regularly observed.

2.3. Observation indicators

(1) General information: average age, gender

(2) Treatment effect: evaluated based on cosmetic results and patients' subjective feelings. Significant effect: good incision healing, no obvious scar hyperplasia, high skin smoothness, color close to normal, and patients are very satisfied with the results; Effective: better incision healing, slight scarring, acceptable skin smoothness, slightly abnormal color, and patients are basically satisfied with the results; Ineffective: poor incision healing, obvious scarring, poor skin smoothness, significantly abnormal color, and patients are not satisfied with the results. Total effective rate = (number of significant effects + number of effective cases) / total number of cases × 100%.

(3) Skin condition: Skin elasticity, smoothness, and color around the incision were measured using a skin detector at 1 month, 3 months, and 6 months postoperatively. Elasticity is represented by the elastic modulus measured by the instrument, with higher values indicating better elasticity; Smoothness is represented by the surface roughness parameter of the skin, with lower values indicating better smoothness; Color is represented by the L* value (brightness) measured by a skin colorimeter, with higher values indicating a color closer to normal.

(4) Incidence of complications: The occurrence of scar hyperplasia, incision non-healing, and incision infection within 6 months after surgery in both groups was counted, and the total incidence of complications was calculated.

(5) Patient satisfaction: Evaluated using a self-made satisfaction scale, divided into three levels: very satisfied, generally satisfied, and dissatisfied. Comprehensive satisfaction rate = (number of very satisfied cases + number of generally satisfied cases) / total number of cases × 100%.

2.4. Statistical Methods

Data were analyzed using SPSS 27.0 statistical software. Measurement data conforming to a normal distribution were expressed as ($\bar{x}\pm s$), and paired t-tests were used for within-group comparisons. Count data were expressed as [n(%)], and chi-square tests were used for between-group comparisons. A P-value < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of General Information Between the Two Groups

There were no statistically significant differences in age, gender, or disease type between the two groups (P > 0.05). See **Table 1** for details.

Table 1. Comparison of General Information Between the Two Groups

Group	Age ($\bar{x}\pm s$, years)	Gender (Male/Female)	Disease Type			
			Nevus	Sebaceous Cyst	Scar	Protruding/Depressed Facial Lesions
Control (n=52)	30.21 ± 5.38	20/32	15	12	15	10
Observation (n=52)	31.25 ± 5.36	19/33	12	13	17	10
χ^2/t-value	0.988	0.041	0.498			
P-value	0.326	0.840	0.919			

3.2. Comparison of Treatment Effects Between the Two Groups

Compared with the control group, the clinical total effective rate in the observation group (94.23%) was significantly better than that in the control group (76.92%) ($\chi 2 = 6.310$, P = 0.000 < 0.001). See **Table 2** for details.

Table 2. Comparison of Clinical Efficacy Between the Two Groups

Group	Markedly Effective	Effective	Ineffective	Total Clinical Effectiveness Rate
Control (n=52)	12 (23.07%)	28 (53.85%)	12 (23.08%)	40 (76.92%)
Observation (n=52)	39 (75%)	10 (19.23%)	3 (5.77%)	49 (94.23%)
χ^2-value				6.310
p-value				0.000

3.3. Comparison of Skin Condition Between the Two Groups

After intervention, the skin condition of both groups improved, but the improvement was more significant in the observation group (P = 0.000 < 0.001 for all comparisons). See **Table 3** for details.

Table 3. Comparison of Skin Condition Between the Two Groups

Group	Elasticity		Smoothness		Pigmentation	
	Before Tx	After Tx	Before Tx	After Tx	Before Tx	After Tx
Control (n=52)	4.58±0.33	6.21±0.48	4.02±0.15	5.25±0.42	4.10±0.16	5.21±0.32
Observation (n=52)	4.62±0.28	7.98±0.59	4.01±0.14	7.71±0.55	4.12±0.13	7.98±0.56
t-value	0.667	16.781	0.351	25.634	0.700	30.970
p-value	0.507	<0.001	0.726	<0.001	0.486	<0.001

3.4. Comparison of Complication Rates between the Two Groups

Compared with the control group, the total incidence of adverse reactions in the observation group (1.92%) was lower than that in the control group (15.38%) ($\chi2$=4.379, P=0.036<0.05). See **Table 4**.

Table 4. Comparison of Adverse Reactions between the Two Groups

Group	Hypertrophic Scarring	Wound Infection	Delayed Wound Healing	Total Adverse Event Rate
Control (n=52)	2 (3.85%)	2 (3.85%)	4 (7.68%)	8 (15.38%)
Observation (n=52)	1 (1.92%)	0	0	1 (1.92%)
χ^2-value				4.379
p-value				0.036

3.5. Comparison of Patient Satisfaction between the Two Groups

Compared with the control group, the total satisfaction rate of nursing in the observation group (96.15%) was better than that in the control group (80.77%) ($\chi2$=6.029, P=0.014<0.01). See **Table 5**.

Table 5. Comparison of Nursing Satisfaction between the Two Groups

Group	Dissatisfied	Moderately Satisfied	Highly Satisfied	Total Satisfaction Rate
Control (n=52)	10 (19.23%)	28 (53.85%)	14 (26.92%)	42 (80.77%)
Observation (n=52)	2 (3.85%)	12 (23.08%)	38 (73.07%)	50 (96.15%)
χ^2-value	-	-	-	6.029
p-value	-	-	-	0.014

4. Discussion

With the improvement of people's living standards and changes in aesthetic concepts, the demand for cosmetic surgery is increasing. As a common cosmetic procedure, the goal of plastic surgery incision is to improve appearance while minimizing postoperative adverse effects and enhancing patient satisfaction. However, postoperative scar formation, poor skin condition, and complications have always been important issues that trouble clinicians and patients [5].

The application of Botulinum toxin type A in the field of cosmetic surgery provides a new approach to solve these problems. The results of this study showed that the total effective rate of treatment in the observation group was significantly higher than that in the control group, indicating that the application of Botulinum toxin type A after plastic surgery incision can significantly improve the treatment effect. This may be because Botulinum toxin type A can inhibit the contraction of muscles around the incision and reduce incision tension [6]. Incision tension is an important factor that affects scar formation, and excessive tension can lead to ischemia and hypoxia of the tissue at the incision edge, stimulating excessive proliferation of fibroblasts and resulting in obvious scarring. By relaxing the muscles, Botulinum toxin type A reduces this mechanical stimulation, creates a low-tension environment for incision healing, facilitates the orderly arrangement of collagen, reduces scar hyperplasia, and thereby improves the treatment effect [7,8].

In terms of skin condition, the observation group showed better skin elasticity, smoothness, and color at various time points after surgery compared to the control group. The improvement in skin elasticity may be related to the reduction of muscle tension by Botulinum Toxin Type A, which promotes the normal repair of skin collagen and elastic fibers. The enhancement of smoothness benefits from the neat healing of incisions in a low-tension environment, reducing the unevenness of the skin surface. The improvement in skin color may be associated with the optimization of local blood circulation. Although Botulinum Toxin Type A can inhibit muscle activity, its reasonable application does not significantly affect skin blood supply. Instead, it may reduce blood vessel compression due to muscle relaxation, increase local blood flow, promote skin pigment metabolism, and make the color closer to normal.

Regarding the incidence of complications, the complication rate in the observation group was lower than that in the control group in this study, which is consistent with some research findings. The reasons for this can be analyzed as follows: On the one hand, Botulinum Toxin Type A reduces incision tension, decreases tissue stretching and irritation, and promotes incision healing, thereby lowering the incidence of incision non-healing and scar hyperplasia. On the other hand, the improved healing environment also reduces the chances of bacterial growth, lowering the risk of incision infection. However, it is important to note that the use of Botulinum Toxin Type A requires strict control of dosage and injection methods to avoid adverse reactions due to improper operation [9,10].

Patient satisfaction is an important indicator for evaluating the effect of cosmetic surgery. The overall satisfaction rate of the observation group was significantly higher than that of the control group, which is closely related to the better treatment effect, better skin condition, and no significant increase in the incidence of complications in the observation group. Good cosmetic results and fewer adverse reactions can effectively reduce patients' psychological pressure and enhance their recognition and satisfaction with the treatment.

In summary, the application of Botulinum toxin type A after cosmetic incision surgery has important clinical value

and is worthy of clinical promotion and application. However, in practical application, it is necessary to strictly grasp the indications and contraindications, standardize the injection operation, reasonably control the dose, and strengthen postoperative care to ensure the safety and effectiveness of the treatment. In the future, large-sample, long-term follow-up studies can be further carried out to explore the effects of different doses and injection methods of Botulinum toxin type A on the postoperative effects and complication risks of cosmetic incision surgery, providing more precise treatment options for clinical practice.

Disclosure statement

The author declares no conflict of interest.

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