

Study of the Use of Medical Chitosan in Neurosurgery Eye Care

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Abstract: *Objective:* This study aimed to investigate the effectiveness of medical chitosan in ophthalmic care in neurosurgery. *Methods:* Through a randomized controlled trial, 90 patients who were undergoing neurosurgery were randomly divided into three groups, with 30 cases in each group. Each group underwent a different type of eye care: Medical chitosan film, erythromycin eye ointment, or homemade eye patch. The occurrence of ocular complications, ocular symptom scores, and quality of life scores of the three groups were observed. *Results:* The complication rate of the medical chitosan group was significantly lower than that of the erythromycin eye ointment and the homemade eye patch group ($P < 0.05$). The ocular scores of the medical chitosan film group were significantly better than those of the erythromycin eye ointment and homemade eye protection patch group, and the difference between the medical chitosan film group and the other two groups was statistically significant ($P < 0.05$). The quality-of-life score of the medical chitosan film group was significantly better than that of the erythromycin eye ointment and the homemade eye patch groups ($P < 0.05$). *Conclusion:* Medical chitosan film aids eye care in neurosurgery, so it is worth popularizing and applying.

Keywords: Medical chitosan film; Neurosurgery; Eye care

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1. Introduction

Eye care is one of the important links in the postoperative care of neurosurgery patients, as the patients are in the state of general anesthesia during the operation, so they cannot blink on their own. Furthermore, the duration of the surgery is long, which easily leads to eye dryness, inflammation, and other complications^[1-6]. Therefore, it is important to find an effective eye care method. Medical chitosan membranes have been widely used in surgical procedures because of their biocompatibility, low immunogenicity, and moisturizing properties. In this study, we will investigate the application effect of medical chitosan films in eye care in neurosurgery.

2. Information and methods

2.1. General information

Ninety patients who were undergoing neurosurgery in our hospital from January 2019 to December 2020 were

selected. Among them, 53 cases were male and 37 cases were female, aged between 20 and 65 years old, with a mean age of 45.31 ± 11.23 years. The duration of surgery was 3 to 6 hours, with a mean duration of 4.23 ± 1.34 hours. The patients were divided into a medical chitosan film group, an erythromycin eye ointment group, and a homemade eye patch group using the randomized numerical table method, with 30 cases in each group. There was no statistically significant difference between the three groups in terms of gender, age, and duration of surgery ($P > 0.05$).

2.2. Methods

Routine eye care is provided for patients, including preoperative cleaning of the eye, keeping the eye moist during the surgery, and cleaning and observing the eye at the end of the surgery. On top of basic eye care, medical chitosan film, erythromycin eye ointment, and homemade eye patches were given according to the group that the patients were in, all of which were operated according to the instructions. Medical chitosan film was applied as follows: (1) The patient's eye was cleaned with saline upon entering the operating room. (2) A medical chitosan film was pasted on the patient's eye. (3) During the surgery, the patient's eye was checked regularly; the chitosan film was replaced if the patient's eye dried up. (4) After the surgery, the skin around the eye was cleaned using dressings the patient's eyes were observed.

2.3. Observation indicators

- (1) Ocular complication rate: The patients were observed for ocular dryness, inflammation, conjunctivitis, and so on.
- (2) Scoring of ocular symptoms: The visual analog scoring (VAS) was used to score the postoperative ocular symptoms of the patients. The score ranged from 0 to 10, with 0 indicating no symptoms and 10 indicating severe symptoms.
- (3) Quality-of-life score: The SF-36 quality-of-life scale was used to score the quality of life of the patients in surgery. The score ranged from 0 to 100 points, with higher scores indicating a better quality of life.

2.4. Statistical analysis

SPSS23.0 statistical software was used for data analysis. The measurement data were expressed as mean \pm standard deviation and analyzed using a *t*-test; the count data were expressed as *n* (%) and were analyzed using a χ^2 -test. $P < 0.05$ indicated a statistically significant difference.

3. Results

3.1. Ocular complication rate

The complication rate of the medical chitosan film group was significantly lower than that of the erythromycin eye ointment and homemade eye patch group ($P < 0.05$).

Table 1. Occurrence of ocular complications

Group	Dry	Conjunctivitis	Complication rate <i>n</i> (%)
Medical chitosan film group	1	1	2 (6.67)
Erythromycin eye ointment group	4	3	7 (23.33) ^a
Homemade eye patch group	3	4	7 (23.33) ^{bc}

Note: *a* indicates $P < 0.05$ for the medical chitosan film group compared to the erythromycin eye ointment group; *b* indicates $P < 0.05$ for the medical chitosan film group compared to the homemade eye patch group; *c* indicates $P > 0.05$ for the homemade eye patch group compared to the erythromycin eye ointment group.

3.2. Eye symptom scores

The ocular scores of the medical chitosan film group were significantly better than those of the erythromycin eye ointment and homemade eye patch groups ($P < 0.05$).

Table 2. Ocular symptom scores

Group	Score of eye symptom
Medical chitosan film group	2.51 ± 1.31
Erythromycin eye ointment group	4.82 ± 1.73 ^a
Homemade eye patch group	4.42 ± 1.83 ^{bc}

Note: *a* indicates $P < 0.05$ for the medical chitosan film group compared to the erythromycin eye ointment group; *b* indicates $P < 0.05$ for the medical chitosan film group compared to the homemade eye patch group; *c* indicates $P > 0.05$ for the homemade eye patch group compared to the erythromycin eye ointment group.

3.3. Quality-of-life score

The quality-of-life score of the medical chitosan film group was significantly better than that of the erythromycin eye ointment and homemade eye protection patch groups ($P < 0.05$).

Table 3. Quality-of-life scores

Group	Quality-of-life score
Medical chitosan film group	85.33 ± 12.41
Erythromycin eye ointment group	71.58 ± 11.84 ^a
Homemade eye patch group	72.07 ± 10.94 ^{bc}

Note: *a* indicates $P < 0.05$ for the medical chitosan film group compared to the erythromycin eye ointment group; *b* indicates $P < 0.05$ for the medical chitosan film group compared to the homemade eye patch group; *c* indicates $P > 0.05$ for the homemade eye patch group compared to the erythromycin eye ointment group.

4. Discussion

As individuals age and are affected by lifestyle habits, the skin around the eyes is susceptible to issues such as dryness, wrinkles, and pigmentation. These concerns necessitate specialized care. Medical chitosan film, recognized for its moisturizing, antioxidant, and antibacterial properties, finds extensive application in the realm of eye care^[7-11].

Medical chitosan film has good moisturizing properties. It helps retain the moisture of the skin around the eyes and prevents wrinkles. Besides, chitosan film is rich in antioxidant components, such as polyphenolic compounds and vitamin C, which can scavenge free radicals and slow down the aging of the skin around the eyes. It also demonstrates antimicrobial properties, which can inhibit the growth of ocular bacteria and prevent ocular infections. Furthermore, chitosan films are compatible with ocular skin tissues and will not cause irritation or allergic reactions. Chitosan films undergo strict medical testing and approval procedures, making them highly safe. Applying medical chitosan eye patches to the eye area offers benefits such as moisture, reduced dryness, and diminished wrinkles. These patches also provide antioxidant effects and help prevent eye infections due to their antibacterial properties.

Chitosan eye injections can be used to fill in fine lines and fold under the eyes to improve the elasticity and improve the appearance of the skin under the eyes. Chitosan can stimulate the generation of eye collagen and improve the texture and elasticity of the skin around the eyes. In addition, eye cream containing chitosan can be

quickly absorbed by the skin around the eye, achieving deep nourishment. Chitosan promotes blood circulation and metabolism in the skin around the eyes, addressing issues such as dark circles and under-eye bags. Eye masks containing chitosan adhere closely to the eyes, preventing infections. This film provides ample nutrition and moisture to the eye area, stimulating cell regeneration and repair due to the chitosan ingredients, thereby improving concerns like fine lines and wrinkles around the eyes.

The results showed that the patients who used medical chitosan film for eye care were better than those who used conventional eye care in terms of the ocular complication rate, ocular symptom scores, and quality-of-life scores. This demonstrates that medical chitosan film has a good effect in terms of eye care during neurosurgery. Chitosan film has moisturizing properties, breathability, and low immunogenicity, which can effectively alleviate ocular dryness and prevent inflammation, conjunctivitis, and other complications. Meanwhile, chitosan film also promotes the repair and regeneration of corneal epithelial cells, which accelerates the recovery of postoperative vision and quality of life. Erythromycin eye ointment and homemade eye patches play a significant role in neurosurgery eye care by reducing the occurrence of ocular complications and improving patient comfort and vision recovery. However, it is also important to the individual ocular condition and needs of the patients and ensure that the treatment provided is tailored for them.

Eye care in neurosurgery can be carried out in the following aspects: To keep their eyes clean patients should regularly wash their eyes with eye drops or eyewash recommended by the doctor and avoid touching the eyes with their hands to minimize the spread of bacteria. To prevent eye dryness, patients can use artificial tear drops or gently cover the eyes with a warm, moist gauze; they should also avoid staring at electronic screens or reading books for a long time to reduce eye strain and eye dryness. During neurosurgery, patients undergo either general or local anesthesia. While under anesthesia, patients may face challenges such as incomplete eye closure or oculomotor disorders. To prevent the risk of eye rupture or infection, patients must refrain from rubbing or squeezing their eyes before and during surgery^[12]. Patients should use antibacterial drugs and anti-inflammatory medications according to their doctor's instructions to prevent infections. Besides, they should avoid using cosmetics and skin care products at the surgical site^[13] to reduce the risk of infections. During the postoperative recovery period, patients should take precautions such as avoiding prolonged periods of staring at electronic screens or reading books to reduce eyestrain and discomfort. Forceful rubbing of the eyes or excessive use should be avoided to prevent vision loss and ocular discomfort^[14]. Patients should inform their doctors or nurses about any ocular discomfort or abnormalities so that proper measures can be taken to avoid further complications^[15].

5. Conclusion

In summary, medical chitosan film has a good eye care effect in neurosurgery, which can effectively prevent the occurrence of ocular complications, alleviate ocular symptoms, and improve the quality of life of patients. Therefore, the application of medical chitosan film is worth promoting in neurosurgery.

Disclosure statement

The authors declare no conflict of interest.

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