Therapeutic effects investigation of physical therapy and pharmacotherapy in the treatment of persistent allergic rhinitis

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Abstract: To investigate the therapeutic effects of physical therapy and pharmacotherapy in the treatment of persistent allergic rhinitis. Methods:192 patients were randomly divided into 3groups, A group 72 cases, B group 70 cases. A and B group were treated with focused ultrasound and radiofrequency ablation respectively under the endoscope and using spraying Mometasone Furoate Nasal Spray for 1month after the operation. Patients of C group use the Mometasone Furoate Nasal Spray and Cetirizine Hydro- chloride Tablets for 1 month. Follow up for 6 months after treatment and evaluate the curative effect with soring method. Results: Total effectiveness was as fllowed:1st months: A group 97.2%, B group 97.1%C group 96.0%;6 months: A group 90.3%, B group 87.1%, C group 64.0%. The curative effect score of three group after the treatment for 1month have no significant difference (P>0.05). Comparing the efficiency of patients in three groups after treatment for 6 months, there was significant difference of stat is tactically significance. The efficiency of A and B group were higher than group C(P<0.05).A group was better than B group with the score of sneezing after the treatment ,the difference was significant(P<0.05).But B group was better than A group with the score of nasal congestion ,the difference was significant(P<0.05).Conclusion: The curative effect of treatment with two physical therapy methods combined with mometasone furoate for persistent allergic rhinitis, the former is better than the latter for sneezing ,but the improvement of nasal congestion is less than the latter. Long-erm therapeutic effect of drug with AR is less than physical therapy in combination with drug. The treatment with focused ultrasound combined with mometasone furoate for persistent AR is worth promoting, especially suitable for medium and severe persistent AR patients.

Keywords: Rhinitis, Allergic, Persistent, Physical therapy, Pharmacotherapy

1. Introduction

Allergic rhinitis (AR), also known as allergic rhinitis, is a common allergic disease in the field of otorhinolaryngology. The incidence of this disease is high and closely related to living environment [1], severely affecting the quality of life of patients. Since January 2012, our department has joined hands with the Otorhinolaryngology Department of the Fifth People's Hospital of Nanchong City to use the CZB-type ultrasonic rhinitis treatment device. Under nasal endoscopy, 192 patients with persistent AR were randomly divided into three groups and treated with focused ultrasound combined with mometasone furoate nasal spray, plasma radiofrequency ablation combined with mometasone furoate nasal spray, and mometasone furoate nasal spray combined with cetirizine. The treatment results were compared and analyzed. The report is as follows.

2. Materials and Methods

2.1. General Information

A total of 192 patients with moderate to severe persistent AR were randomly selected from the outpatient departments of the Otorhinolaryngology Clinic at the Fifth People's Hospital of Nanchong City and the Central Hospital of Nanchong City. The diagnostic criteria were based on the AR diagnosis and

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treatment guidelines from 2004 and 2009 [2-3]. Patients were randomly divided into three groups, with 98 males and 94 females; ages ranging from 18 to 67 years old, with an average age of (39.8±7.6) years, and an average disease course of (6.5±3.2) years. There were no significant differences in gender, age, and disease course among the three groups of patients. Inclusion criteria: patients with a clear diagnosis who were willing to accept the following treatment methods, all patients signed written informed consent; exclusion criteria: patients with deviated nasal septum affecting treatment, acute and chronic rhino-sinusitis, nasal polyps, and severe systemic diseases were excluded, as well as patients allergic to cetirizine. Before treatment, there were no significant differences in symptoms of nasal obstruction, sneezing, clear nasal discharge, and nasal itching among the three groups of patients (P>0.05) (Table 1), making them suitable for later efficacy observation and analysis.

Table 1: Comparison of Symptom Scores Before Treatment Between Groups (One-Way ANOVA)

Symptoms	Group A	Group B	Group C	F-value	P-value
Nasal Congestion	2.31±0.71	2.30±0.73	2.26±0.69	0.068	0.934
Sneezing	2.25±0.71	2.26±0.65	3.24±0.66	0.009	0.991
Runny Nose	2.18±0.70	2.31±0.67	2.22±0.65	0.723	0.486
Nasal Itching	2.01±0.62	2.03±0.64	1.94±0.62	0.322	0.752

2.2. Treatment Methods

2.2.1. Group A underwent treatment with focused ultrasound combined with mometasone furoate nasal spray.

The CZB-type ultrasonic rhinitis treatment device (Chongqing Hai fu Company) was used. Patients were placed in a supine position, and after satisfactory local anesthesia of the nasal mucosa, under nasal endoscopy, the treatment head's ultrasonic emission window was closely applied to the nasal mucosa for scanning. The scanning gear was set to level Ⅲ, with a speed of 2–6mm/s, a scanning interval of approximately 4mm, and each scanning line was repeated once. The mucosa of the anterior ethmoidal nerve distribution area of the nasal septum, the posterior inferior nasal nerve and anterior ethmoidal nerve distribution area of the inferior turbinates, and the mucous membrane of the nasal dome (anterior ethmoidal nerve distribution area) on both sides were scanned, with a scanning time of 300–600 seconds, adjusting the scanning time according to the severity of the condition. Postoperatively, mometasone furoate nasal spray (Schering-Plough Company) was used for one month, once a day, with two sprays in each nostril every morning. Postoperative nasal endoscopy was conducted for follow-up. In three cases, the effect was not satisfactory half a month after the operation, and the surgery was performed again.

2.2.2. Group B underwent treatment with plasma radiofrequency ablation combined with mometasone furoate nasal spray.

Group B was treated using a low temperature plasma radiofrequency ablation system (American Analysis Company). Patients were placed in a supine position, and after successful surface anesthesia of the nasal mucosa, under nasal endoscopy, the blade tip moistened with saline solution was inserted into the submucosal layer from the front to the back of the inferior turbinate without penetration, adjusting the ablation channels and time according to the specific degree of swelling and hypertrophy of the inferior turbinate. Submucosal ablation was also performed at the mucous membrane of the nasal dome on both sides. Gelatin sponges were applied to the wound surface postoperatively. Postoperatively, mometasone furoate nasal spray was used for one month, once a day, with two sprays in each nostril every morning. Postoperative nasal endoscopic re-examination was conducted.

2.2.3. Group C was treated with a combination of mometasone furoate nasal spray and cetirizine.

Mometasone furoate nasal spray (Inner Rhino) was used for one month, once a day, with two sprays in each nostril every morning; oral administration of cetirizine hydrochloride tablets (Belgian United

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Chemical Group Pharmaceutical Department), 10mg each time, once a day. Patients who are not satisfied with the therapeutic effect may continue to use it at a reduced dose for an additional 1 to 2 months. Postoperative nasal endoscopic re-examination was conducted.

2.3. Criteria for Efficacy Evaluation

In accordance with the diagnostic and treatment principles and recommended plans from the "Lanzhou Conference" in 2004, the visual analog scale was applied, and the scoring method was used to evaluate the efficacy at 1 month and 6 months postoperatively. The total scores for symptoms and signs before and after treatment were calculated, and the improvement percentage was determined as (Total before treatment Total after treatment) / Total before treatment×100%. Efficacy evaluation criteria: An improvement percentage of ⩾66% is considered marked effect, 25% to 65% is effective, and⩽25% is ineffective. The total effective rate is the sum of the marked effect rate and the effective rate.

2.4. Statistical Analysis

All data processing was completed using the SPSS 16.0 software package. Pre- and post-treatment symptom scores for the three groups were analyzed using one-way ANOVA (Analysis of Variance), and the comparison of efficacy rates among Groups A, B, and C was performed using the chi-square test. A P-value of less than 0.05 was considered to indicate a statistically significant difference.

3. Results

After treatment, all three groups were followed up for six months, and symptoms such as nasal congestion, sneezing, nasal itching, and watery rhinorrhea were significantly relieved, with no adverse reactions or complications such as nasal adhesion, septal perforation, or atrophic changes in the nasal mucosa. In Group A, the nasal mucosa turned to a light red color, the edema of the inferior turbinates decreased or disappeared, sneezing symptoms were significantly relieved, and ventilation improved or returned to normal; In Group B, there was no significant change in the appearance of the nasal mucosa, the inferior turbinates were noticeably reduced, nasal congestion symptoms were significantly alleviated, and symptoms such as nasal itching, watery rhinorrhea, and sneezing were somewhat relieved; In Group C, after treatment, the nasal mucosa turned to a light red color, the edema of the inferior turbinates decreased or disappeared, and ventilation improved or returned to normal.

3.1. Comparison of Efficacy Rates Among Groups A, B, and C

The total efficacy rates for the three groups of patients after treatment were as follows: at 1 month: Group A 97.2%, Group B 97.1%, Group C 96.0%; at 6 months: Group A 90.3%, Group B 87.1%, Group C 64.0%. The comparison of efficacy rates among the three groups at 1month post-treatment showed no statistical significance (χ^2=0.97, P=0.62); the comparison of efficacy rates at 6 months post-treatment revealed significant statistical differences (χ^2=15.76, P=0.00). When comparing the efficacy rates of the three groups two by two at 6 months post-treatment, there was no statistical significance between Group A and Group B (χ^2=0.35, P=0.56), but there was statistical significance between Group A and Group C (χ^2=12.51, P=0.00), and between Group B and Group C (χ^2=8.96, P=0.00), with both Group A and Group B having higher efficacy rates than Group C. See Table 2.

Table 2 Comparison of Treatment Efficacy for Persistent AR Between Group A and Group B (%)

Time (months)	Group A		Group B		Group C		Chi-square (x^2) value	P-value
	Effective	Ineffective	Effective	Ineffective	Effective	Ineffective		
1	70(97.2)	2(2.8)	68(97.1)	2(2.9)	47(94.0)	3(6.0)	0.97	0.62
6	65(90.3)	7(9.7)	61(87.1)	9(12.9)	32(64.0)	18(36.0)	15.76	0.00

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3.2. Comparison of Post-Treatment Symptom Scores Among Groups A, B, and C

After treatment, the comparison of nasal congestion symptom scores at 6 months showed statistical significance, with a significant difference between Groups A and B (P=0.01), with Group B showing better improvement in nasal congestion symptoms than Group A; comparisons between Group A and C, and Group B and C showed no statistical significance (P=0.99, 0.06). The comparison of sneezing symptom scores at 6 months post-treatment was statistically significant among the three groups, with a significant difference between Groups A and B (P=0.00), with Group A showing better improvement in sneezing symptoms than Group B; comparisons between Group A and C, and Group B and C showed no statistical significance (P=0.13, 0.32). The comparison of rhinorrhea and nasal itching symptom scores at 6 months post-treatment showed no significant differences among the three groups (Table 3).

Table 3 Comparison of Symptom Scores After Treatment Among Groups A, B, and C (Mean ± Standard Deviation)

Symptoms	Group A	Group B	Group C	F-value	P-value
Nasal Congestion	1.61±0.66	1.31±0.55	1.58±0.64	5.12	0.01
Sneezing	1.26±0.44	1.63±0.59	1.46±0.58	8.77	0
Runny Nose	1.42±0.50	1.63±0.54	1.54±0.50	3.02	0.05
Nasal Itching	1.40±0.49	1.66±0.51	1.52±0.54	4.38	0.14

4. Discussion

AR is a type I allergic disease of the nasal mucosa mediated by I g E, characterized primarily by nasal congestion, watery rhinorrhea, sneezing, and nasal itching. The fundamental pathological changes involve the release of inflammatory mediators and cytokines, and the infiltration of inflammatory cells, leading to the dilation of capillaries, increased permeability, and increased glandular secretion. The sites requiring treatment in AR are the over-reactive blood vessels, nerves, glands, and locally infiltrated immune cells in the nasal mucosa. Current treatments for AR include allergen avoidance (environmental control), drug therapy [4], immunotherapy [5], surgical treatment [6], physical therapy [7], and traditional Chinese medicine treatment, etc. [8]. However, each treatment has its limitations: environmental control is simple and effective but difficult to achieve; drug control, such as with intranasal corticosteroids and antihistamines, can alleviate clinical symptoms in most patients, but some patients still have poor efficacy, drug resistance, and symptoms are prone to recurrence after stopping medication, along with certain drug toxic side effects. Mild AR is mainly treated with drugs; immunotherapy can only cure a portion of AR patients, and it requires a long treatment time, high cost, and high treatment operation requirements, making it hard to widely apply; traditional Chinese medicine, acupuncture, and other methods have been used clinically for many years but lack evidence-based medical evidence; surgery is often used for patients with AR accompanied by deviated nasal septum, chronic rhino-sinusitis, or nasal polyps. Therefore, personalized and comprehensive treatment should be considered for AR.

Focused ultrasound directs extracorporeal ultrasonic waves to the lesion within the body, achieving the purpose of treating diseases through the mechanical, thermal, and cavitation effects of ultrasound. Focused ultrasound can penetrate the nasal mucosa and act on the over-reactive blood vessels, nerves, glands, and locally infiltrated immune cells in the nasal mucosa, forming coagulative necrotic spots in a targeted manner, and achieving the purpose of treatment through precise local destruction, but the energy penetrating non-treatment areas is not sufficient to cause local damage [9-10]. Because it acts on the submucosal layer, it has no effect on the mucociliary transport function of the nasal mucosa.

The basic principle of the low-temperature plasma surgical system is to break the molecular bonds of the target tissue cells at low temperatures and decompose them into carbohydrates and oxides to achieve the purpose of cutting and ablation. Due to its convenient use and minimal damage to surrounding tissues, it has been widely used in otolaryngology in recent years, especially in the treatment of inferior turbinates,

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and has a significant advantage in the treatment of patients with hypertrophic inferior turbinates [11]. Because it causes low-temperature damage to the mucosa of the inferior turbinate, it has no obvious effect on the mucociliary transport function of the nasal mucosa [12].

Mometasone furoate nasal spray, as a corticosteroid commonly used in clinical practice, can exert anti-inflammatory and antiallergic effects within 24 hours of use. It reduces the production and release of inflammatory mediators, inhibits the generation of cytokines, and suppresses the chemotaxis and migration of inflammatory cells to the nasal mucosa [13], making it one of the effective drugs for the treatment of AR currently. Nasal corticosteroids and oral second-generation antihistamines (such as cetirizine) are widely recommended as first-line treatment options for AR. The latter is more effective in relieving nasal itching and sneezing symptoms and is safer and has fewer side effects compared to first-generation antihistamines. However, for patients with moderate to severe persistent AR, drug therapy is often less effective, and there are concerns about the adverse reactions associated with long-term use, making it difficult to adhere to long-term medication.

The results show that the three methods for treating persistent AR all achieved satisfactory efficacy one month after treatment, with no significant differences in efficacy comparison. However, the efficacy of the first two treatment methods was better than that of the drug treatment group (Group C) six months after treatment, indicating that both of the first two treatment plans are effective for persistent AR, but physical therapy combined with drug therapy has a better long-term effect than drug therapy alone. Patients treated with focused ultrasound had significantly lower symptom scores for sneezing after treatment compared to the plasma treatment control group, indicating that it is more effective in improving sneezing symptoms than plasma treatment. After the two treatments, the nasal congestion scores were significantly higher in Group A than in Group B, while there was no difference in nasal itching and rhinorrhea symptoms among the three groups, indicating that plasma treatment is better than focused ultrasound treatment in improving nasal congestion symptoms. It is considered that the tissue ablation effect of focused ultrasound is not as good as that of plasma radiofrequency ablation, but its destructive effect on blood vessels, nerves, and glands in the nasal mucosa is stronger than that of plasma radiofrequency ablation. For patients with moderate to severe persistent AR with obvious sneezing symptoms, focused ultrasound combined with drug therapy can be considered. For patients with moderate to severe persistent AR with obvious nasal congestion, plasma radiofrequency ablation for inferior turbinate reduction combined with drug therapy can be considered [14]. For patients with mild intermittent or seasonal AR, drug therapy is still recommended. Therefore, the author believes that the treatment of AR should be based on a comprehensive analysis and treatment of its clinical symptoms, duration, and drug tolerance, and should not be limited to a single treatment plan.

5. Conclusion

In summary, the treatment of AR with a combination of focused ultrasound and corticosteroid nasal sprays, integrating physical therapy with drug therapy, is minimally invasive, highly safe, and has reliable short-term efficacy [15], making it worth promoting in clinical practice [16-17], especially suitable for patients with moderate to severe persistent AR. Whether the combined use of corticosteroids after focused ultrasound treatment in persistent AR patients can improve their long-term efficacy warrants further observation and analysis [18]. In treating AR, a globally prevalent condition, the current focus remains on managing symptoms effectively rather than curing the disease, indicating that there is still a long way to go.

6. References

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