Original Article

Clinical efficacy of combined treatment with trichloroacetic acid chemical cautery and steroid spray in allergic rhinitis with inferior turbinate hypertrophy

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ABSTRACT

Objectives: Comparison between efficacy of combined treatment with trichloroacetic acid (TCA) chemical cautery and steroid nasal spray in the treatment of allergic rhinitis (AR) with inferior turbinate hypertrophy (ITH).

Patients and Methods: A total of 132 patients with ITH due to AR were included in the study. Forty-four patients each were treated with TCA chemical cauterization of inferior turbinate (Group A), steroid nasal spray (Group B), or combined treatment with TCA cautery and steroid nasal spray (Group C). The Symptom Severity Grade (SSG) 1-5 based on a validated Questionnaire Sheet (QS) as well as Visual Analog Scale were documented before and after treatment.

Results: Before treatment, the SSG was 3-5 in 37 (84%), 36 (81.8%), and 40 (90.9%) patients in groups A, B, and C, respectively. At six months post-treatment, SSG 1-2 was achieved in 20 patients (45.4%) in Group A, 18 patients (40.9%) in group B and 31 patients (70.4%) in Group C. Statistically significant improvement was found in patients who received the combined treatment.

Conclusion: Combined treatment with TCA chemical cauterization of inferior turbinate and steroid nasal spray can be effective therapy for amelioration of symptoms of AR and ITH.

Keywords: Inferior turbinate hypertrophy; questionnaire; steroid nasal spray; symptom severity grade; trichloroacetic acid chemical cautery.

Allergic rhinitis (AR) characterized by sneezing, nasal obstruction, nasal itching, and rhinorrhea[1] is one of the most common causes of inferior turbinate hypertrophy (ITH).[2] In turn, ITH is the most common cause of nasal obstruction in patients with AR. It may affect the airway and/or olfaction, and causes significant morbidity, including impairments in craniofacial development, alteration in speech and language.[2] Hypertrophy usually results from AR, vasomotor rhinitis or chronic rhinosinusitis. It is caused by deposition of collagen beneath the basement membrane of sinonasal mucosa, along with hypertrophy and hypersecretion of mucosal glands.[2]

Different methods to treat nasal obstruction due to ITH include medical therapy (systemic or local antihistamines, decongestants, corticosteroids, mast cell stabilizers, and immunotherapy) or surgical treatment (surface or submucosal cautery, different forms of laser cautery, cryosurgery, and partial or

Received: September 14, 2017 **Accepted:** February 26, 2018

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Doi: http://dx.doi.org/10.5606/Tr-ENT.2018.81370

Citation:
Nemade S, Sampate P, Shinde K. Clinical efficacy of combined treatment with trichloroacetic acid chemical cautery and steroid spray in allergic rhinitis with inferior turbinate hypertrophy. Tr-ENT 2018;28(2):85-92

total surgical trimming of inferior turbinate). Chemicals used for surface cautery are 10% trichloroacetic acid (TCA) or 25% silver nitrate. The former, also known as trichloroethanoic acid, is an analog of acetic acid. It is considered safe by carcinogenic potency database (CPDB) and is widely used on the skin or mucosa by various medical specialties.[3]

In this study, we compare the efficacy of combined treatment with TCA chemical cautery and steroid nasal spray (Fluticasone furoate) on inferior turbinate hypertrophy in allergic rhinitis, based on Symptom Severity Grade (SSG 1-5) and Visual Analog Scale (VAS).

PATIENTS AND METHODS

With Institutional Review Board approval, this prospective, randomized, single blinded, comparative, parallel group study with three intervention groups was performed at Smt Kashibai Navale Medical College and General Hospital between January 2015 and September 2017. The study was performed according to the guidelines and ethical standards of the Helsinki Declaration. A total of 132 participants (84 males, 48 females; median age 38 year; range, 15 to 65 years) with AR and nasal obstruction due to ITH were included in the study. Smokers, pregnant women, people with life threatening/ chronic asthma, chronic respiratory illnesses like bronchiectasis, pulmonary tuberculosis and other obstructive airway diseases were excluded. Other exclusion criteria were recent nasal surgery or anatomic defects of the nose, two recent courses of parenteral steroids within three months of screening and presence of any comorbid systemic illness which may affect the assessment directly or indirectly. Oral and nasal decongestants were stopped one week prior to treatment.

Group A (n=44) patients were treated with TCA chemical cautery of hypertrophied inferior turbinate. The nasal mucosa was anesthetized with a cotton wick soaked in 4% lignocaine solution. After 10 minutes, a cotton tipped applicator dipped in 10% TCA solution was kept in contact with anterior and middle part of the hypertrophied inferior turbinate for one minute. A nasal speculum was used for visualization of the inferior turbinate. Four sessions of this procedure were carried out at weekly intervals. Group B (n=44) patients were treated with steroid nasal sprays containing 27.5 ug fluticasone furoate per dose (0.015% w/w), twice a day for three months. Use of the steroid spray was demonstrated to all the patients. Group C (n=44) patients were treated with four sessions of combined treatment with TCA cautery of the inferior turbinate and steroid nasal sprays for three months. Symptom Severity Grade based on Questionnaire sheet (Figure 1, Table, 1) and VAS was documented before treatment, and at three, and six months post-treatment. The VAS score was documented from 0-10 (in terms of nasal obstruction, sneezing and rhinorrhea); a 0 score indicated no symptoms and 10 score indicated catastrophic symptoms (Figure 2).

Based on improvement in the SSG and VAS score, the clinical efficacy of treatment was analyzed. Statistical analysis was carried out using IBM SPSS Statistics version 25.0 (SAS Institute, Cary, NC, USA) software package. Univariate analysis, Pearson chi-square test, and Fisher's exact probability test were used for statistical evaluation of SSG before and after treatment. Comparisons of VAS scores were performed using the Mann-Whitney U test. A p value <.05 was considered to be significant. The odds ratios (OR) and 95% confidence intervals (CI) were added if p values were less than .05. Correlation between SSG and VAS was done through Spearman coefficient correlation.

RESULTS

The SSG in Group A (Table 2), Group B (Table 3) and Group C (Table 4) were documented (Figure 3).

Before treatment, statistical analysis between groups A and C showed a chi-square value of 0.416 (two tailed p value .519 with 1 degree of freedom and 95% confidence interval). Fisher exact probability test (cross validated) showed a p value of .521. No statistically significant difference was found. Statistical analysis between groups B and C showed a chi-square value of 0.868 (two tailed p value .351, 1 degree of freedom, 95% confidence interval). Fisher exact probability test (cross validated) showed a p value of .352. No statistically significant difference was found.

Patient's name:

Age/Gender:

No	Question	Yes (A)	Sometimes (B)	No (C)
1	Do you get nasal obstruction			
2	Do you get sneezing			
3	Do you get watery or mucoid nasal secretions			
4	Do you have nasal pain			
5	Do you get redness, itching of eyes and epiphora			
6	Do you get post nasal drip			
7	Do you get nasal bleeding			
8	Do you get headache			
9	Do you smoke			
10	Does your symptoms make you angry			
11	Do your allergic symptoms interfere sleep			
12	Because of your nasal symptoms, do you feel desperate			
13	Because of nasal symptoms, do you find that you are often irritable			
14	Because of rhinorrhea, is it difficult for you to read			
15	Do your allergy symptoms interfere with ability to work at your job or go to school			
16	Do you feel that allergic rhinitis problem has placed stress on your relationships with members of your family and friends			
17	Do you feel that you have no control over your allergy			
18	Does your symptoms get worse when you are under stress			
19	Does your allergy make you feel insecure			
20	Because of your allergic symptoms, do you often feel tired			
21	Does your allergy make you feel anxious			
22	Does your nasal symptoms make it difficult to relax			
23	Does allergy causes you to avoid travelling			
24	Does the symptoms contributes to a feeling of general ill health			
25	Does your symptoms makes you panicky			

Total	A	B	C
	x 4	x 2	x 0

Total score= (Ax4) + (Bx2) + (Cx0)

Figure 1. *Questionnaire.*

Six months following treatment, SSG was documented (Figure 4). Statistical comparison between groups A with C and groups B with C showed significant differences. For Groups A with C, chi-square value was 4.663 (two tailed *p* value .0308 with 1 degree of freedom and 95% confidence interval. Fisher exact probability test (cross validated) showed *p* value .0302. For groups B and C, chi square value was 6.631 (two tailed *p* value .010 with 1 degree of freedom and 95% confidence interval). Fisher exact probability test (cross validated) showed *p* value .0096.

The graded VAS in the three groups is illustrated in Figure 5, 6 and 7. At six months

Table 1. Symptom severity grade

Grade	Score	Severity of allergic rhinitis with ITH
1	0-16	Slight
2	18-36	Mild
3	38-56	Moderate
4	58-76	Severe
5	78-100	Catastrophic

ITH: Inferior turbinate hypertrophy.

follow-up, statistically significant improvement of VAS score was observed in the patients receiving combined treatment (p=.0004 and p=.0001) (Table 5, 6). Based on Spearman correlation coefficient, there was a significant correlation between questionnaire score (QS) and VAS (rs=.548; p=.0001; n=132). Thus, the higher the VAS, the higher is SSG.

Overall adverse effect incidence was 15.1%. The most common adverse effect was pharyngitis. There were no reports of dryness of the nose or epistaxis during this study. None of the patients refused cauterization on the contralateral nostril and the nasal pain did not persist for more than a few minutes after the procedure.

DISCUSSION

Allergic rhinitis is a significant public health concern affecting an estimated 500 million people globally.[4] In patients with AR, current treatments of nasal obstruction due to inferior turbinate hypertrophy range from behavioral changes (i.e. avoiding exposure to inciting factors that cause AR) to invasive surgery. Avoidance of irritants in the environment is a key factor in treatment, but is practically almost impossible. Treatment can thus be medical or surgical.[2,4] Medical treatment provides relief of nasal obstruction initially, but the symptoms are recurrent in most treated individuals. Nasal decongestants are effective in the treatment of nasal obstruction due to ITH. Topical decongestants can only be used short-term, as long-term use leads to rhinitis medicamentosa (rebound nasal congestion).[2-4]

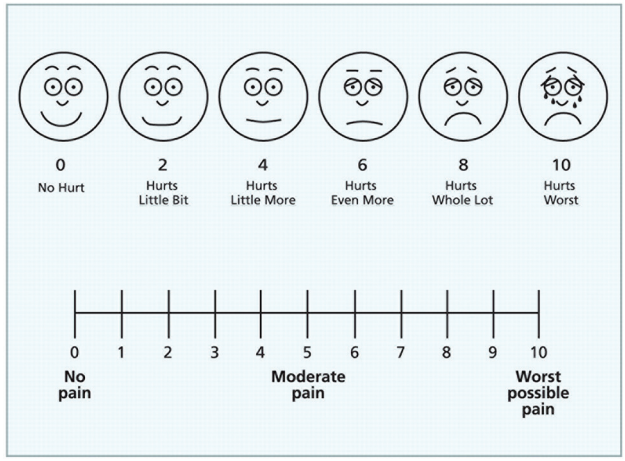

Figure 2. Model of Visual Analogue Scale used.

Intranasal glucocorticosteroids (INSs) are regarded as the most effective pharmacologic treatment for AR and are recommended by Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines as first-line treatment. Although long-term use of steroid nasal sprays is often

Table 2. Symptom severity grade based on questionnaire score in Group A

Symptom Severity Grade (SSG)	Questionnaire score (QS)	Before treatment (Number of patients) (n=44)	After treatment at 3 months follow-up (Number of patients) (n=44)	After treatment at 6 months follow-up (Number of patients) (n=44)
1. Slight	0-16	4	10	11
2. Mild	18-36	3	12	9
3. Moderate	38-56	21	14	15
4. Severe	58-76	11	5	6
5. Catastrophic	78-100	5	3	3
Total		44	44	44

Table 3. Symptom severity grade based on questionnaire score in Group B

Symptom Severity Grade (SSG)	Questionnaire score (QS)	Before treatment (Number of patients) (n=44)	After treatment at 3 months follow-up (Number of patients) (n=44)	After treatment at 6 months follow-up (Number of patients) (n=44)
1. Slight	0-16	6	9	10
2. Mild	18-36	2	12	8
3. Moderate	38-56	22	13	13
4. Severe	58-76	12	8	11
5. Catastrophic	78-100	2	2	2
Total		44	44	44

Table 4. Symptom severity grade based on questionnaire score in Group C

Symptom Severity Grade (SSG)	Questionnaire score (QS)	Before treatment (Number of patients) (n=44)	After treatment at 3 months follow-up (Number of patients) (n=44)	After treatment at 6 months follow-up (Number of patients) (n=44)
1. Slight	0-16	3	25	22
2. Mild	18-36	1	8	9
3. Moderate	38-56	24	9	8
4. Severe	58-76	12	2	5
5. Catastrophic	78-100	4	0	0
Total		44	44	44

associated with side effects like bleeding, drying, and crusting,[4,5] intranasal glucocorticosteroids have a good safety profile. This is especially true for newer INSs (such as ciclesonide, mometasone furoate, and fluticasone furoate) which have systemic bioavailability lower than 1%.[4] Sozen et al.[5] compared the positive effects of nasal steroid spray and radiofrequency ablation for ITH and concluded that nasal steroids may be used to treat this condition.[5] Surgical treatment

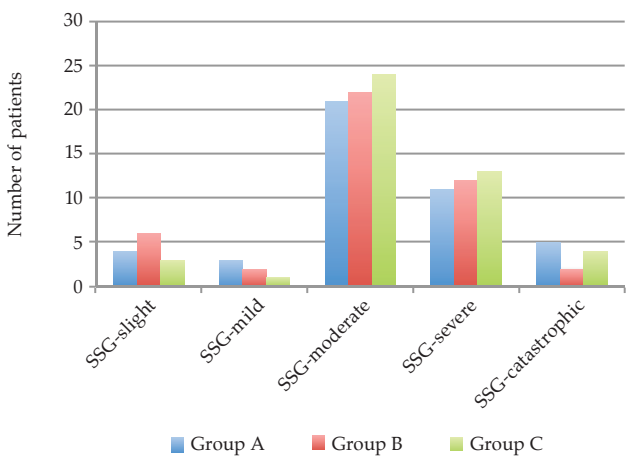

Figure 3. Symptom Severity Grade in three groups before treatment.

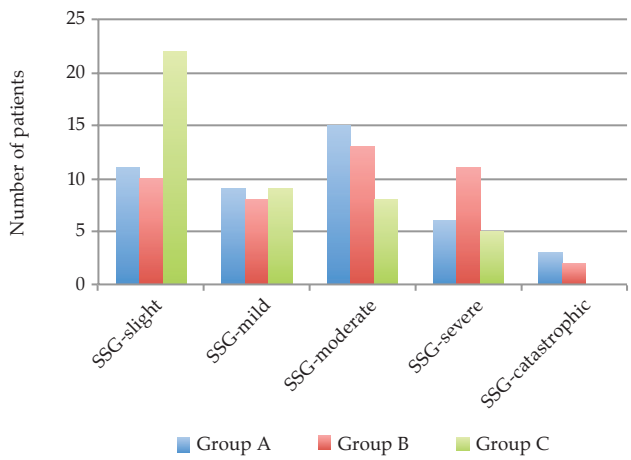

Figure 4. Symptom Severity Grade in three groups at six months post treatment.

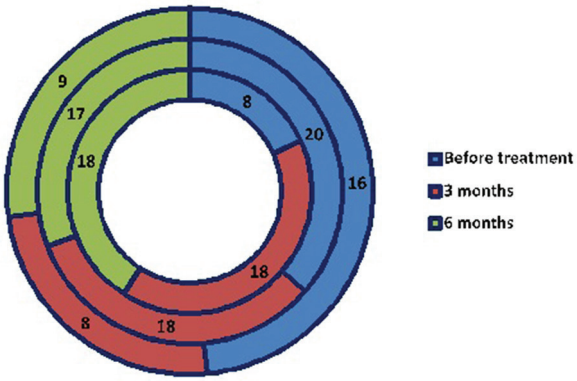

Figure 5. *Graded Visual Analog Scale (VAS) score in Group A (n=44).* *Inner circle (VAS score 0-3); Middle circle (VAS score 4-7); Outer circle (VAS score 8-10).*

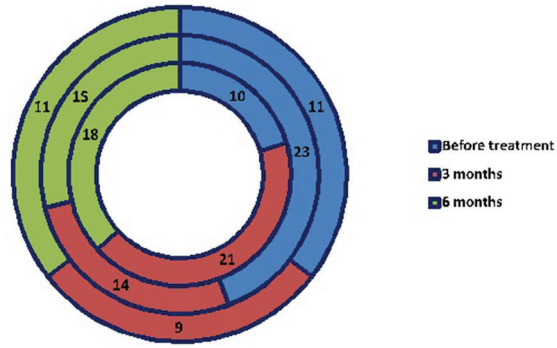

Figure 6. *Graded Visual Analog Scale (VAS) score in Group B (n=44).* *Inner circle (VAS score 0-3); Middle circle (VAS score 4-7); Outer circle (VAS score 8-10).*

of ITH in the form of surface cautery is done with electrosurgical probe, laser, or cryoprobe. Electrosurgery or laser can be performed submucosally also. Surgical resection of turbinates can be partial or total. After surgery, the nose is usually packed with gauze containing antibiotic ointment for several days. Over-resection of turbinates can cause irreversible drying (atrophic rhinitis). Moreover, resection and surface cautery can all be associated with prolonged crusting and healing, which occurs over a four-to six-week period.[2,6]

Chemical cauterization of inferior turbinates is a very simple method that is easy to adopt without need of any anesthesia, and that can be done in the outpatient department. It prevents complications like crusting, bleeding and pain that are associated with surgery and electrocautey.[2,6] The middle part of the inferior turbinate and the adjacent area of the septum appear to be the "trigger area," stimulation of which leads to rhinorrhoea, sneezing and nasal obstruction.[6] Ten percent TCA produces a local astringent action by coagulating albumin. The sensitivity and excitability of mucous membranes of the nose seem to be reduced after treatment with TCA in the trigger area, especially in those involving nasal obstruction and watery rhinorrhea. Nasal airflow resistance also improves after treatment. Nasal provocation testing reveals a significant decrease in post-treatment responses.[6] Yao et al.[7] observed improvement of other symptoms of AR, such as rhinorrhea and sneezing, after topical TCA application, and also demonstrated that TCA causes reduction in mucosal infiltration of T cells (Th2 type), which is responsible for symptoms of AR. This suggests that migration of these cells was inhibited by the local action of the acid.[7]

Nasal obstruction can be evaluated by subjective and objective methods. Objective assessment is by acoustic rhinometry and rhinomanometry. For subjective evaluation, Total Nasal Symptom Score, VAS and the Nasal Obstruction Symptom Evaluation (NOSE) scale can be used.[8] In our study, we modified the NOSE scale in the form of a validated Questionnaire sheet (Figure 1) and we evaluated the severity of nasal obstruction and other symptoms of AR with SSG (Table 2). We found that maximum

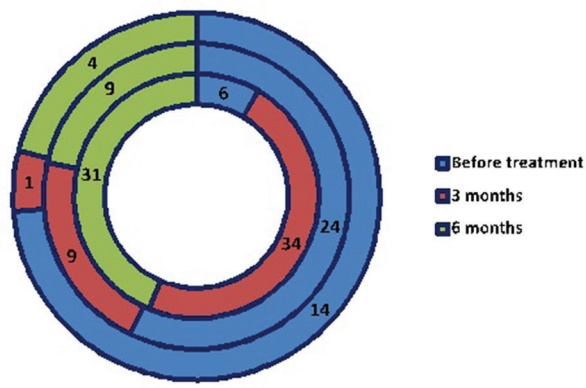

Figure 7. *Graded Visual Analog Scale (VAS) score in Group C (n=44).* *Inner circle (VAS score 0-3); Middle circle (VAS score 4-7); Outer circle (VAS score 8-10).*

Table 5. Average Visual Analog Scale

	Group A (TCA)	Group B (Steroid spray)	Group C (Combined treatment)
Before treatment	6.7±2.1	7.2±3.2	6.8±3.6
Three months after treatment	5.4±2.2	5.9±3.1	3.2±2.6
Six months after treatment	4.8±2.5	5.1±2.2	2.1±1.8

TCA: Trichloroacetic acid.

Table 6. Statistical comparison between groups according to Visual Analog Scale

	Mann-Whitney U value			Z score			p value		
	Groups A&B	Groups A&C	Groups B&C	Groups A&B	Groups A&C	Groups B&C	Groups A&B	Groups A&C	Groups B&C
Before treatment	26.5	30.5	23.5	-0.525	-0.105	0.840	0.5961	0.9124	0.4009
Three months after treatment	28.5	7.5	0.00	-0.315	2.520	3.308	0.7489	0.1174	0.0009
Six months after treatment	28	3	0.00	-1.625	3.515	3.741	0.1031	0.0004	0.0001

benefit to the patients was achieved by combined treatment with TCA chemical cauterization of the inferior turbinate and steroid nasal spray. At six months follow-up, 70.4% of patients who received the combined treatment could achieve SSG 1-2. It showed significantly better results compared to patients who received treatment with chemical cauterization of inferior turbinate only (45.4%) or steroid spray alone (40.9%). Patients receiving combined treatment showed statistically significant improvement of VAS score at six months follow-up (p=.0004, p=.0001) (Table 5, 6). Another advantage of this combined treatment is that it avoids the side effects due to prolonged use of steroid nasal spray, and avoids surgical management and its related complications.

Conclusion

Nasal obstruction due to ITH is one of the most common symptoms of AR. Combined treatment with TCA chemical cauterization of inferior turbinate and steroid spray can be effective for amelioration of symptoms of AR and ITH. In particular, patients with high SSG benefit most from combined treatment, which will help them reach the lower levels of severity grade.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

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