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Prospective randomized trial of sclerotherapy vs standard treatment for epistaxis due to hereditary hemorrhagic telangiectasia

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Abstract

Background—Our previous studies have demonstrated the tolerability and low side-effect profile of office-based sclerotherapy with sodium tetradecyl sulfate (STS) for treating recurrent epistaxis due to hereditary hemorrhagic telangiectasia (HHT). The objective of this study was to use a prospective randomized trial to determine the effectiveness of sclerotherapy with STS vs standard treatment.

Methods—This prospective randomized trial (conducted from November 1, 2011, through January 31, 2014) involved 17 patients with recurrent epistaxis due to HHT. We defined standard treatment as continuation of any treatment that the patient had previously undergone, such as moisturization, packing, and cautery. We used a crossover design, so study participants were randomized to either sclerotherapy or standard treatment during the first time period, and then to the other during the second period. The primary outcome measure was frequency and severity of epistaxis, as measured by the epistaxis severity score (ESS). The ESS is a 10-point scale, with higher scores corresponding to more bleeding.

Results—After controlling for treatment order, bleeding was substantially better controlled after sclerotherapy; the ESS after sclerotherapy was nearly one point lower than after standard treatment (-0.95 , 1-sided $p = 0.027$). Treatment order, baseline ESS, the number of lesions, moisturization practices, and a history of previous blood transfusions did not significantly affect the results.

Conclusion—This trial demonstrated that sclerotherapy with STS (vs standard treatment) significantly reduced epistaxis due to HHT.

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Office-sclerotherapy for Epistaxis Due to Hereditary Hemorrhagic Telangiectasia

Keywords

hemorrhagic disorders; epistaxis; sclerotherapy; sodium tetradecyl sulfate; Osler-Weber-Rendu syndrome

Recurrent epistaxis is often the presenting symptom in patients with hereditary hemorrhagic telangiectasia (HHT); in fact, 90% of patients with HHT experience recurrent epistaxis.¹ HHT has an overall frequency of 1:5000. It affects all ethnicities, and males and females equally.² An autosomal dominant disease with variable penetrance and expression, it acts on genes that produce elastic fibers of blood vessels. Affected individuals exhibit vascular malformations, primarily in the nose, gastrointestinal (GI) tract, brain, liver, and lung. Lesions demonstrate markedly dilated, convoluted venules with abnormal smooth muscles, often directly connected to abnormally dilated arterioles.³ In the nasal epithelium, thin-walled telangiectasias are exposed to dryness and nasal crusting, leading to frequent damage to these vessels. When damage causes bleeding, the lack of effective elastic fibers prevents constriction, and difficult-to-control hemorrhage ensues. The severity of epistaxis usually worsens with advancing age; major life-threatening bleeding can result in frequent transfusions, invasive procedures, and hospitalizations.⁴

A stepwise approach to treatment is recommended, based on the severity of symptoms.^{5,6} The Epistaxis Severity Score (ESS) is a standardized scoring system assessing epistaxis severity and frequency, and is an accurate, reproducible, validated objective measure of epistaxis severity.⁷ The ESS is measured on a 10-point scale, with higher scores reflecting more severe and frequent bleeding.

Current standard treatment for mild recurrent bleeding relies on careful and diligent moisturization of the nasal passages. Many patients require iron supplementation to treat anemia. Various topical and oral regimens are also used, such as hormones, antifibrinolytics, and antiangiogenic agents.⁸ Recurrent or severe epistaxis may necessitate blood transfusions and referral to an otolaryngologist.

For moderately severe recurrent epistaxis, otolaryngologists use various forms of laser photocoagulation (CO₂, argon, neodymium-doped yttrium aluminum garnet [Nd-YAG], flashlamp-pulsed dye, and potassium titanyl phosphate [KTP]), electrical cautery, or surgical microdebridement. More aggressive surgical options include septodermoplasty and complete nasal closure (Young's procedure). Arterial embolization is used for emergent severe bleeding.⁸ Yet none of these modalities provide complete relief from bleeding and can be associated with significant side effects, such as nasal crusting, foul odor, and septal perforation. Their limitations have motivated the search for alternative treatment options.

One alternative is sclerotherapy, by injecting vascular lesions with an agent that causes thickening of the vessel wall, obstruction of blood flow, clot formation, and collapse of the lesion. An established treatment modality for vascular malformations in the skin, GI tract, and genitourinary tract, sclerotherapy has been adopted for lesions in various sites in the head and neck,⁹⁻¹³ but not for HHT. Case reports and one large series in the literature have

described sclerotherapy for epistaxis due to HHT, but have not been followed by prospective studies.^{14–17}

In our previously published retrospective analysis of our pilot study, we described the results of sclerotherapy with sodium tetradecyl sulfate (STS) in 7 patients. All 7 described the procedure as tolerable, and all reported a reduction in the severity and frequency of bleeding. All 7 were willing to undergo sclerotherapy with STS again.⁸ In our subsequent analysis of outcomes in 36 patients undergoing repeated sclerotherapy, we found no reports of adverse sequelae such as septal perforation, increased bleeding, or foul smell; some patients described minimal transient procedural symptoms, but no serious complications.¹⁸

The purpose of the current prospective randomized trial was to determine the effectiveness of sclerotherapy with STS, vs standard treatment, for recurrent epistaxis due to HHT. We hypothesized a priori that the severity and frequency of epistaxis would be *reduced* with sclerotherapy compared to standard treatment.

Patients and methods

For our prospective randomized trial (conducted from November 1, 2011, through January 31, 2014), we invited patients to join if they were at least 18 years old and presented to the University of Minnesota Otolaryngology Clinic with a diagnosis of recurrent epistaxis due to HHT based on presence of at least 3 of 4 Curaçao criteria: recurrent epistaxis, telangiectasias, visceral lesions, or family history.¹⁹ Patients who had undergone previous sclerotherapy for epistaxis were excluded. The University of Minnesota institutional review board approved our trial, which was registered at [ClinicalTrials.gov](https://clinicaltrials.gov) (Unique identifier: NCT01408732).

We chose a crossover design, so that each participant received both treatments. A crossover design allowed us to maximize statistical power, and because we anticipated that patients who were referred to our center for treatment would not have accepted randomization had one possibility been treatment without sclerotherapy. Therefore, study participants were randomized to either sclerotherapy or standard treatment during the first time period (period 1), and then to the other during the second period (period 2). Each period was 6 weeks (Fig. 1). We did not include a typical washout period as that would have required a period of no treatment for epistaxis.

Data collection

The primary outcome measure was the frequency and severity of epistaxis, as measured by the ESS. At the time of sclerotherapy treatment, the types of lesions, number of lesions treated, and total dose of sclerosant were recorded. Additionally, questionnaires were used to assess tolerability, procedure-related nasal symptoms, satisfaction with the treatment, or likelihood to continue that treatment after each treatment period. Quality of life information was collected by administering the 12-Item Short Form Health Survey (SF-12) at baseline and after each period.

Sclerotherapy technique

Topical anesthetic was applied to the nasal mucosa. Injected local anesthetic was offered, all patients declined. Endoscopic visualization of the lesions was performed, along with removal of crusting if necessary. An assistant prepared the STS solution for injection by foaming the solution with air at a 4:1 ratio using a 3-way stopcock (Fig. 2). A 25G butterfly needle was inserted into the lesion in a submucosal fashion, penetrating about 1 to 2 mm and using minimal pressure; then, small quantities of STS were injected into the lesion. Individual injection amounts varied between lesions, patients, and treatment sessions. However, a maximum total of 3 mL of solution was used in each session. Injection ceased when the mixture exuded from the lesion or when blanching of the lesion was seen. Lesions were treated bilaterally, each with a separate injection. Procedure-related bleeding was treated with light packing or with pressure applied to the lesion. Participants were offered standard treatment for any breakthrough bleeding during that period.

Standard treatment

We defined standard treatment as continuation of any treatment that the patient had previously undergone, such as moisturization, packing, and cautery.

Statistical analysis

The crossover analysis was based on “difference scores” as depicted in Figure 2. Group 1 patients underwent sclerotherapy (“treatment A”) first (“period 1”), and their postsclerotherapy ESS score is denoted A1. They then underwent standard treatment (“treatment B”) second (“period 2”), and their final ESS score is denoted B2. Group 2 patients had treatment order reversed, and their ESS scores are denoted B1 and A2, respectively. The difference between A1 and B2 and the difference between A2 and B1 were calculated by subtraction.

These subtractions canceled the within-sequence effects of all patient-specific factors, leaving only 2 that were modeled and analyzed: the treatment (sclerotherapy vs standard) and the period or order effect (period 1 vs period 2), representing longitudinal variation. In other words, each set of comparisons had its own matched control, except for treatment and treatment order. We assumed that the within-subject differences were normally distributed. The “treatment effect” and “treatment order” effect were assessed by F-tests (squares of the t statistics), using both PROC MIXED and PROC GLM (SAS version 9.3; SAS Institute Inc., Cary, NC). We used a 1-tailed test because we hypothesized a priori that ESS scores would be reduced, and assumed the standard $p < 0.05$ as our statistical threshold of significance. For post hoc verification, we expanded the model to include 4 other potential confounders: baseline ESS, number of lesions, moisturization, and previous blood transfusions.

Results

Of 18 patients identified during our study period, 17 completed the trial. One of the originally enrolled 18 patients declined to be randomized after enrollment. Nine (9) patients were randomized to receive sclerotherapy first (group 1) and 8 to the opposite sequence (group 2).

Treatment with sclerotherapy led to improved ESS scores (0.95 difference, 1-sided $p = 0.027$), after adjustment for treatment order. Post hoc verification of potential confounders such as baseline ESS score, number of lesions, moisturization, or previous blood transfusions demonstrated that none of the variables were significant.

The standard deviation of the difference scores was 1.82. Based on Cohen's effect size guidelines (small difference is 0.2 of the standard deviation, medium difference is 0.5 of the standard deviation, and large difference is 0.8 of the standard deviation),²⁰ a small clinical improvement would be 0.36, and a medium clinical improvement would be 0.91. Therefore, our observed clinical improvement of 0.95 is not just statistically significant, but also clinically meaningful.

Treatment order was not statistically significant. In other words, although sclerotherapy was more effective than standard treatment regardless of whether patients received sclerotherapy first (group 1) or second (group 2). There was a small suggestion that treatment in general was slightly more effective overall in treatment period 2, but again, the order effect was not statistically significant (2-sided $p = 0.298$).

The crossover design of the trial necessarily matches all patient-specific factors except for treatment order (and treatment), thus we did not need to adjust the results for standard demographic characteristics. However, for external comparisons, descriptive statistics of our cohort are described in Table 1, as well as previous treatments that they had undergone prior to the study. Study participants included 8 males and 9 females over 18 years old. All 3 types of telangiectasia, punctate, diffuse interconnecting, and large solitary arteriovenous malformations,²¹ were seen and treated; the number of lesions ranged from 3 to 12 (mean, 7). One patient presented with a nasal perforation. Six patients had received blood transfusions and 1 iron transfusions. The STS dose per session ranged from 0.5 to 2.0 mL (mean, 1.24 mL).

No adverse events were reported after either sclerotherapy or standard treatment, and no patients needed to undergo packing for bleeding during sclerotherapy.

Of the patients who reported pain related to either sclerotherapy or standard treatment, we found no statistically significant differences in the pain rating. Two patients reported new nasal crusting after sclerotherapy, and 4 noted some increase in nasal odor. Nearly all patients were only somewhat or not at all satisfied with the previous treatments that they had received for recurrent epistaxis. Of our 17 patients, 16 were probable ($n = 1$) or very likely ($n = 15$) to consider further sclerotherapy; all 16 of them preferred office-based sclerotherapy (vs the operating room). Only 1 patient was unsure about seeking further sclerotherapy and preferred laser treatment. These results and the individual ESS scores after treatments are depicted in Table 2. Results from the SF-12 appeared to show no meaningful changes related to either treatment.

Discussion

This prospective randomized trial demonstrated that sclerotherapy with STS significantly reduced recurrent epistaxis due to HHT, in comparison to standard treatment. The difference

was not only statistically significant (1-sided $p = 0.0273$), but also clinically meaningful with a difference of nearly a point (0.95) on the ESS, because a change of 0.36 represents a small clinical improvement. This effect was also shown to be independent of treatment order.

Besides the positive clinical outcomes demonstrated in our trial, other potential advantages to sclerotherapy with STS exist. Sclerotherapy can be performed safely and effectively in an office-based setting, as our patients preferred. Otolaryngologists are adept at performing in-office procedures to treat patients' head and neck ailments. An additional advantage of sclerotherapy is its immediate effect on the vascular lesion, thereby reducing procedure-related bleeding by blocking or treating the nearby vessels around the visible lesion. None of our 17 trial patients experienced any significant procedure-related bleeding requiring packing or any other treatment before leaving the office.

An anionic surfactant, STS is commonly used to treat varicose veins and other vascular lesions. It is a detergent-based chemical that acts on the lipid molecules in the vein wall, causing destruction of the internal lining of the vein and leading to sclerosis. One study in the literature reported immediate pathologic effects, demonstrating damage of the vascular endothelium within 2 minutes—with increasing edema, vascular damage, and thrombus formation at 15 and 30 minutes.²²

Foam sclerotherapy is a variation of the method. With foam, air bubbles displace blood, allowing the agent to have more direct contact with the lesion's endothelium and exerting a greater effect than liquid alone (which is diluted in blood).²³ Subsequently, a lesser amount of active drug is necessary to treat the lesion successfully.

These results confirm the findings from our previously published retrospective analyses, which demonstrated substantial improvement without perforation, crusting, or foul smell in the near-term⁸ and at longer-term follow-up of 36 patients.¹⁸ However, it should be emphasized that potential complications related to the sclerosant traveling to unintended sites must be thoroughly considered. When various agents are injected into the nose, complications such as visual loss are well described in the literature.²⁴ Although complications are not completely preventable, we consider our foaming technique, our direct visualization for intralesional injection, and our small-volume, low-pressure injection to be essential, in order to mitigate potential complications (such as STS reaching collateral vessels, including the ophthalmic artery).

Few prospective randomized trials comparing treatments for recurrent epistaxis due to HHT have been reported. A recent trial comparing KTP laser treatment and electrosurgical plasma coagulation in 11 patients demonstrated equivalent 1-year epistaxis control.²⁵ Results of the North American Study of Epistaxis (NOSE Study)—comparing the safety and efficacy of 3 topical agents and nasal saline spray in 140 randomized patients—are highly anticipated.

Our study does have some limitations. First, the sample size ($n = 17$) was smaller than what we had originally planned (nearly 40 patients). We found that many patients were unwilling to be randomized, because they had been referred for treatment with sclerotherapy. However, we believe that our findings are perhaps even more meaningful because our

observed effect reached statistical significance, even in enrolling one-half the anticipated number of patients. We believe that this supports our assertion that the observed impact was strongly clinically significant.

We recognize that some may criticize our definition of standard therapy. We chose to define standard therapy as it is largely used in the community, with a potpourri of treatments. We felt that patients had been managed as best as possible by referring otolaryngologists, and we therefore kept standard therapy to what had been optimized prior to their referral. We also recognize that the treatment periods could have been lengthened, and we could not offer a true washout period because that would require no treatment for their epistaxis, which would not be reasonable. However, we had to balance study optimization with study enrollment. Patients were not willing to wait more than 2 months for sclerotherapy.

Conclusion

This trial demonstrated that sclerotherapy with STS significantly reduced the severity and frequency of epistaxis due to HHT, as measured by the ESS. An effective treatment option associated with a paucity of complications, sclerotherapy with STS is well tolerated in an office-based setting. The authors would like to reinforce that when considering this treatment option for recurrent epistaxis due to HHT, adherence to proper technique is essential to minimize ocular complications associated with collateral circulation.

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References

1. Guttmaier AE, Marchuk DA, White RI Jr. Hereditary hemorrhagic telangiectasia. *N Engl J Med*. 1995; 333:918–924. [PubMed: 7666879]
2. Kjeldsen AD, Vase P, Green A. Hereditary haemorrhagic telangiectasia: a population-based study of prevalence and mortality in Danish patients. *J Intern Med*. 1999; 245:31–39. [PubMed: 10095814]
3. Braverman IM, Keh A, Jacobson BS. Ultrastructure and three-dimensional organization of telangiectasias of hereditary hemorrhagic telangiectasia. *J Invest Dermatol*. 1990; 95:422–427. [PubMed: 2212727]
4. Aassar OS, Friedman CM, White RI. The natural history of epistaxis in hereditary hemorrhagic telangiectasia. *Laryngoscope*. 1991; 101:977–980. [PubMed: 1886446]
5. Geisthoff UW, Fiorella ML, Fiorella R. Treatment of recurrent epistaxis in HHT. *Curr Pharm Des*. 2006; 12:1237–1242. [PubMed: 16611115]
6. Lund VJ, Howard DJ. A treatment algorithm for the management of epistaxis in hereditary hemorrhagic telangiectasia. *Am J Rhinol*. 1999; 13:319–322. [PubMed: 10485021]
7. Hoag JB, Terry P, Mitchell S, Reh D, Merlo CA. An epistaxis severity score for hereditary hemorrhagic telangiectasia. *Laryngoscope*. 2010; 120:838–843. [PubMed: 20087969]
8. Boyer H, Fernandes P, Duran O, Hunter D, Goding G. Office-based sclerotherapy for recurrent epistaxis due to hereditary hemorrhagic telangiectasia: a pilot study. *Int Forum Allergy Rhinol*. 2011; 1:319–323. [PubMed: 22287439]

9. Rehman K, Sitampalam G, McCafferty I, Monaghan A. The use of foam sclerotherapy for treatment of head and neck vascular malformations. *Br J Oral Maxillofac Surg*. 2009; 47:631–632. [PubMed: 19375203]
10. Shiels W, Kang D, Murakami J, Hogan M, Wiet G. Percutaneous treatment of lymphatic malformations. *Otolaryngol Head Neck Surg*. 2009; 141:219–224. [PubMed: 19643255]
11. Goldman MP, Weiss RA, Brody HJ, Colman WP, Fitzpatrick RE. Treatment of facial telangiectasia with sclerotherapy, laser surgery, and/or electrodesiccation: a review. *J Dermatol Surg Oncol*. 1993; 19:899–906. [PubMed: 8408908]
12. Berenguer B, Burrows PE, Zurakowski D, Mulliken JB. Sclerotherapy of craniofacial venous malformations: complications and results. *Plast Reconstr Surg*. 1999; 104:1–11. [PubMed: 10597669]
13. Morais D, Millás T, Zarrabeitia R, Botella LM, Almaraz A. Local sclerotherapy with Polydocanol (Aethoxysklerol®) for the treatment of epistaxis in Rendu-Osler-Weber or hereditary hemorrhagic telangiectasia (HHT): 15 years of experience. *Rhinology*. 2012; 50:80–86. [PubMed: 22469609]
14. Ramirez B, Morais D, Condado MA, et al. A new sclerosant for the treatment of Rendu-Osler-Weber disease. *Acta Otorrinolaringol Esp*. 2000; 51:36–39. [Spanish]. [PubMed: 10799930]
15. Morais D, Ramirez B, Santos J. Local sclerosing treatment with etoxiesclerol in ORL disease: Rendu-Osler disease, granulomas, angiomas. *Acta Otorrinolaringol Esp*. 2002; 53:658–661. [Spanish]. [PubMed: 12584880]
16. Roux-Vaillard S, Pasco-Papon A, Laccourreye L, Dubin J. Treatment of epistaxis in Rendu-Osler-Weber disease by in situ Ethibloc injections. *J Neuroradiol*. 2004; 31:110–115. [PubMed: 15094648]
17. Duncan IC, VanDer Nest L. Intralesional bleomycin injections for the palliation of epistaxis in hereditary hemorrhagic telangiectasia. *AJNR Am J Neuroradiol*. 2004; 25:1144–1146. [PubMed: 15313698]
18. Hanks JE, Hunter D, Goding GS, Boyer HC. Complications from office sclerotherapy for epistaxis due to hereditary hemorrhagic telangiectasia (HHT or Osler-Weber-Rendu). *Int Forum Allergy Rhinol*. 2014; 4:422–427. [PubMed: 24431220]
19. Shovlin CL, Guttmacher AE, Buscarini E, et al. Diagnostic criteria for hereditary hemorrhagic telangiectasia (Rendu-Osler-Weber Syndrome). *Am J Med Genet*. 2000; 91:66–67. [PubMed: 10751092]
20. Cohen, J. *Statistical Power Analysis for the Behavioral Sciences*. 2nd. Hillsdale, NJ: Lawrence Earlbaum Associates; 1988.
21. Mahoney E, Shapshay S. New classification of nasal vasculature patterns in hereditary hemorrhagic telangiectasia. *Am J Rhinol*. 2006; 20:87–90. [PubMed: 16539301]
22. Orsini C, Brotto M. Immediate pathologic effects on the vein wall of foam sclerotherapy. *Dermatol Surg*. 2007; 33:1250–1254. [PubMed: 17903159]
23. Bunke N, Brown K, Bergan J. Foam sclerotherapy: techniques and uses. *Perspect Vasc Surg Endovasc Ther*. 2009; 21:91–93. [PubMed: 19767405]
24. McCleve DE, Goldstein JC. Blindness secondary to injections in the nose, mouth, and face: cause and prevention. *Ear Nose Throat J*. 1995; 74:182–189. [PubMed: 7729344]
25. Luk L, Mace JC, Bhandarkar ND, Sautter NB. Comparison of electrosurgical plasma coagulation and potassium titanyl-phosphate laser photocoagulation for treatment of hereditary hemorrhagic telangiectasia-related epistaxis. *Int Forum Allergy Rhinol*. 2014; 4:640–645. [PubMed: 24719397]

*The capital letter denotes which treatment (A =sclerotherapy, B = standard); the number denotes which of the 2 time periods.

FIGURE 1.

Randomization and crossover scheme and labeling of time periods for data analysis.

FIGURE 2.
Sclerotherapy setup.

TABLE 1

General and disease-specific characteristics

Characteristic	Patients (n)
Gender	
Male	8
Female	9
Age, years	
Range 31–70	
Mean 51.8	
Curaçao criteria (Shovlin et al. ¹⁹)	
3	9
4	8
Number of telangiectasia	
Range 3–12	
Mean 7	
Telangiectasia type (Mahoney and Shapshay ²¹)	
Type 1	3
Type 2	13
Type 3	1
Prior treatment	
Moisturization	11
Packing	9
Cautery	8
Laser treatment	4
Embolization	1
Septodermoplasty	1

TABLE 2

Individual satisfaction and treatment results

Group 1 ^a						
Subject	Baseline ESS	ESS after sclerotherapy	ESS after standard therapy	Previous standard therapy	Satisfaction with previous standard therapy	Likelihood to consider future sclerotherapy
1	4.4	4.1	3.6	M, P	Satisfied	Not sure
2	5.4	3.6	3.9	P	Satisfied	Very likely
3	3.9	2.0	1.4	None		Very likely
4	5.8	4.4	3.5	M, P, L	Somewhat	Probably
5	3.5	1.0	2.5	P	Somewhat	Very likely
6	7.1	1.7	3.6	M, P, C	Somewhat	Very likely
7	5.9	2.5	4.1	M, C	Not at all	Very likely
8	8.1	5.9	3.6	M	Not at all	Very likely
9	3.6	0.5	3.6	M, C	Not at all	Very likely
Group 2 ^b						
Subject	Baseline ESS	ESS after standard therapy	ESS after sclerotherapy	Previous standard therapy	Satisfaction with previous standard therapy	Likelihood to consider future sclerotherapy
1	3.6	3.1	3.7	M, P, C	Somewhat	Very likely
2	2.5	3.0	2.6	None		Very likely
3	6.3	6.3	4.8	M, C, L	Somewhat	Very likely
4	7.2	5.4	5.4	L	Not at all	Very likely
5	7.6	3.1	2.7	M, C	Not at all	Very likely
6	8.2	8.8	2.9	M, P, C	Not at all	Very likely
7	6.4	6.4	5.0	L	Not at all	Very likely
8	4.2	3.6	1.0	M, P, C	Very satisfied	Very likely

^aTreatment order: sclerotherapy 1st, standard therapy 2nd.^bTreatment order: standard therapy 1st, sclerotherapy 2nd.

C = cautery; ESS = epistaxis severity score; L = laser; M = moisture; P = packing.