



Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijporl



Bilateral simultaneous nasal septal cauterization in children with recurrent epistaxis

Sevim Aslan Felek^{*}, Hatice Celik, Ahmet Islam, Munir Demirci

Ministry of Health Ankara Training and Research Hospital, 2nd E.N.T. Department, Talatpasa Bulvarı, Cebeci, Dordyol Postcode 06591 Ankara, Turkey

ARTICLE INFO

Article history:

Received 14 April 2009

Received in revised form 26 June 2009

Accepted 30 June 2009

Available online xxx

Keywords:

Bilateral epistaxis
Septal perforation
Silver nitrate
Little's area
Children

ABSTRACT

Objective: To investigate the feasibility, effectiveness and complications of bilateral simultaneous silver nitrate cauterization for anterior nasal septal epistaxis in otherwise healthy children.

Methods: Prospective study in a tertiary referral otorhinolaryngology department.

Thirty-seven children with anterior epistaxis between the ages of 5–16 years were included in the study. The patients who had varicose vessels or network of small vessels in the Little's area had simultaneous bilateral silver nitrate cauterization.

Results: Complete or near-complete epistaxis control was obtained in 76% of the patients after the first cauterization, and in 86% of the patients after the second cauterization in a mean follow-up period of 8 months. Partial success was obtained in five patients. The crusting in the cauterization area was healed late in six patients. Septal perforation, tattooing, or mucocutaneous/allergic reactions were not observed in any of the patients.

Conclusions: Bilateral silver nitrate cauterization is an effective, feasible, low-cost and preferable treatment method in childhood epistaxis when it is applied in an appropriate concentration and at an appropriate duration in a healthy mucosal environment.

© 2009 Elsevier Ireland Ltd. All rights reserved.

1. Introduction

Epistaxis is one of the most common problems in childhood. It affects 30% of children between the ages of 0 and 5 years, 56% of the children between 6 and 10 years and 64% of children between 11 and 15 years [1]. The bleeding point is the vessels of Little's area, also known as Kiesselbach's plexus, in the majority of the children; and this area is situated at the anterior one-thirds of the nasal septum [2]. In childhood, local factors such as infectious disorders (sinus and nasopharyngeal), inflammatory disorders (allergic rhinitis), trauma (nose picking, nose rubbing, external blow, foreign body), anatomic abnormalities (nasal septal deviation), medications (topical decongestants, cocaine) and environmental factors such as cold-hot and dry air play important roles in the etiology [2,3]. These factors have direct or indirect effects on Little's region mucosa or the vessel walls, and cause recurrent bleeding. Hematologic disorders or benign/malignant tumors are rare causes of recurrent epistaxis [1,2,4].

In cases of persistent epistaxis, where first-aid measures have failed and providing a bleeding vessel is visible, cautery with a

silver nitrate tipped stick is the treatment of choice [5]. This treatment method can be practiced using commercially available silver nitrate at 75% or 95% concentrations, and aims to destroy the telangiectatic blood vessels and replace them with scar tissue [6,7].

Usually, unilateral septal cauterization is preferred and bilateral simultaneous cauterization is avoided because of fear of septal perforation [3,7]. There are only a few clinical studies concerning simultaneous bilateral cauterization of the nasal septum in children [8].

In this study, we investigated feasibility, effectiveness and complications of bilateral simultaneous silver nitrate cauterization in anterior nasal septal epistaxis in otherwise healthy children.

2. Materials and methods

Thirty-eight children between the ages of 5 and 16 years who admitted to the outpatient clinic with bilateral epistaxis between December 2007 and February 2009 were included in this prospective study. The approval of the Ethics Board was obtained (The date and the number of the Ethics Board report: 2007 - 0259). The patient and his/her family were informed on the context of the study in detail. If they agreed with the conditions, an informed consent was obtained.

^{*} Corresponding author at: 337 Sokak 8/19 Karakusunlar, Postcode 06530, Ankara, Turkey. Tel.: +90 505 718 66 48; fax: +90 312 363 33 96.

E-mail address: saslanfelek@yahoo.com (S.A. Felek).



Fig. 1. The typical appearance of a varicose vessel in the Little's area.

The patients included in the study fulfilled all of the following criteria:

- (1) Patients at or below 16 years of age.
- (2) Patients who were bleeding simultaneously or alternately from both nostrils since one year or longer.
- (3) Patients who had bilateral apparently visible vessels in the Little's area at the nasal septum [varicose vessel(s); a clearly visible vessel of varying thickness and length], usually lying superficially in the septal mucosa (Fig. 1) or network of small vessels; very thin visible vessels arranged in a network covering a large part of the anterior nasal mucosa [9].
- (4) The patients who had non-surgical treatment of epistaxis previously (nasal saline spray, antiseptic ointment, oral antibiotics, or silver nitrate cauterization), however recurred.
- (5) In order to evaluate the effectiveness of the treatment, the patients with a follow-up period of 2 months or longer after the cauterization.

Exclusion criteria were as follows: the patients with previous septal or sinus surgery, any systemic disease (liver or kidney disorders, acquired/hereditary coagulopathies, etc.), the patients who were on medications such as steroids, non-steroid anti-inflammatory agents or anticoagulants, bleeding due to cocaine abuse or due to a tumor (angiofibroma, etc.), and the ones who had silver nitrate cauterization within the previous 2 months in our center or in another one. Our standard epistaxis form contains questions for the use of medications and any previous treatment for epistaxis.

Although fulfilling the inclusion criteria, the patients with an acute infection (acute sinusitis, vestibulitis), or the ones who had crusting and/or exfoliation of the nasal mucosa (rhinitis anterior sicca) were administered oral antibiotics and/or antiseptic ointments for 10 days, and were included in the study if they still had epistaxis after this treatment.

The effectiveness of the treatment was evaluated as follows: complete recovery, partial recovery (50% reduction in the number of nosebleeds) or unsuccessful (less than 50% reduction in the number of nosebleeds).

The standard epistaxis forms were filled according to the data obtained from the patient or his/her family. Personal and family history, the duration and the frequency of the bleeding, other nasal symptoms (obstruction, mouth breathing), nose picking, history of frequent upper respiratory tract infections, use of medications (steroid/non-steroid anti-inflammatory agents, anticoagulants, cocaine, etc.), environmental factors (temperature, humidity), and previous treatments for epistaxis were questioned. The findings of physical examination, the results of the laboratory

tests, and the follow-up information after the cauterization were also recorded into these forms.

All patients had a detailed nasal examination including anterior rhinoscopy and nasal endoscopy as well as complete otorhinolaryngologic and head–neck examination. Complete blood count, blood chemistry (liver and kidney function tests), bleeding time, prothrombin time, and activated partial thromboplastin time were obtained. Patients with abnormal test results were excluded from the study and referred to pediatricians.

Topical anesthesia was achieved by applying cotton pads impregnated in 1:1 pantocaine (4%)/oxymetazoline (0.05%) to the nasal septum for 5 min. The cauterization was performed with silver nitrate tipped sticks (HemoStop®; 75% silver nitrate, 25% potassium). We first started cauterization in the neighborhood of the clearly visible vessels in the Little's area, and cauterized 5 or 6 foci in a circular fashion, and lastly cauterized the center. The duration of the cauterization was 5 s for each focus. The same procedure was applied in the opposite Little's area using another silver nitrate tipped stick. Excess silver nitrate particles were removed from the mucosa after the procedure. All patients used an epithelizing 5% dexpanthenol ointment twice a day for 1 week after the cauterization. Following cauterization, only the patients who had long-lasting crusting in their nasal mucosa used the ointment for 2–3 weeks, until the epithelization was complete. The patients did not use any other treatment for epistaxis after the use of the ointment.

The patients were followed up at 1st, 2nd and 4th weeks after the cauterization. They were examined every 4 weeks in the first 6 months, and every 8 weeks in the second 6 months following the procedure. The frequency and severity of the bleeding were recorded, and the presence of septal perforation, crusting or mucocutaneous color change in the cauterized area were explored in the follow-up visits. Re-cauterization for complete control of the epistaxis was performed at least 2 months after the first cauterization, if needed.

3. Results

Bilateral simultaneous septal cauterization was performed in 38 patients with recurrent epistaxis. One patient was excluded due to loss of follow-up before 2 months. There were 26 boys (70%), 11 girls (30%) and overall 37 patients who fulfilled the inclusion criteria. The mean age was 10.9 years (range 5–16) and the mean follow-up period was 8 months (range 2–14 months).

Twenty-four patients (65%) had epistaxis between 1 and 5 years while 13 patients (35%) had it for more than 5 years.

The frequency of bleeding was quite variable relating to the underlying factors. At least one epistaxis episode occurred daily in nine patients (24%), weekly in six patients (16%), and monthly in eight patients (22%). Fourteen patients (38%) who reported variable frequency of epistaxis episodes had more than 15 episodes per year.

Sixty per cent of the patients ($n = 22$) reported that they had epistaxis episodes due to more than one reasons (upper respiratory tract infections, temperature and seasonal variations, digital trauma, minor trauma such as rubbing or wiping the nose). Some of these patients had epistaxis after coughing or sneezing, the factors that increase intra-abdominal pressure. Thirteen per cent of the patients (35%) had spontaneous epistaxis during sleep at night.

Four patients (11%) had a history of unilateral septal silver nitrate cauterization.

Nineteen per cent ($n = 7$) of the patients had varicose vessels at the Little's area of their nasal septum while the rest had the appearance of network of small vessels.

Twenty-eight of 37 patients had complete control of their epistaxis after the first cauterization. Additional cauterization was

performed in nine patients who had ongoing episodes of epistaxis and persistence or recurrence of visible vessels in the Little's area. Complete or near-complete control of epistaxis was achieved in 32 patients (86%) in the follow-up period of the study. There was partial recovery in five patients. The patients with partial recovery reported that the frequency of epistaxis episodes decreased or disappeared, especially after minor trauma.

Minor complications were as follows: in six patients, the crusting at the area of cauterization recovered later (at the end of 3rd week) when compared to other patients. Four patients had epistaxis that was controlled with simple measures during the cauterization. We completed cauterization after controlling the epistaxis in these patients. We did not encounter septal perforation in any of the patients after cauterization.

4. Discussion

Most episodes of childhood epistaxis are recurrent, mild and self-limiting. The focus of bleeding is in the anterior septum in 85–90% of the cases. In this area, the Little's area has a dense and dual blood flow, its vessels are superficial and just under the mucosa, and they are unprotected against the external factors. Predisposing factors such as cold-hot and dry air, upper respiratory tract infections, allergic rhinitis and trauma (nose picking or nose rubbing) disturb the mucosa and the vessels of this region directly or secondarily, and cause recurrent epistaxis. Sometimes nosebleeds can occur after a severe Valsalva maneuver and are due to rupture of the superficial vessels [2–4].

A remarkable characteristic in our study was the presence of two or more factors that triggered epistaxis in more than half of the children. These epistaxis episodes were controlled with simple measures most of the time. Digital trauma, temperature and seasonal variations and upper respiratory tract infections were found as important triggering factors. However, some patients reported spontaneous nosebleeds during wiping or rubbing their nose, during sneezing and even during sleeping at night. The epistaxis episodes that are not known when or where to start and especially the ones that occur during sleep were observed to cause major anxiety in the child and in witnessing parents.

Antibiotic ointments, epithelizing creams and moisturizing the nose are the first-line treatment options in epistaxis treatment. Silver nitrate cauterization is a second-line treatment option in cases that cannot be controlled with the aforementioned measures and when bleeding occurs due to abnormal vascularization in the anterior nasal septum [3,10].

Although unilateral nosebleeds are more common, the clinician may encounter patients with bilateral epistaxis due to significant vascularization at both sides of the nasal septum. The clinician who decides to cauterize faces off another decision: a single stage bilateral cauterization or unilateral cauterization necessitating a second stage. Up to date, bilateral simultaneous septal cauterization was avoided due to fear of septal perforation [3,7,11]. However, this avoidance is not supported by clinical studies but declared according to the personal experiences of the clinicians. There is only one study in English literature concerning bilateral septal cauterization and its complications in children. Link et al. reported 93% complete or near-complete control of epistaxis with bilateral simultaneous anterior septal silver nitrate cauterization in 43 otherwise healthy or unhealthy children with bilateral epistaxis. They did not observe septal perforation in any of their patients [8]. Silver nitrate cauterization was performed in otherwise healthy children in our study. Complete or near-complete epistaxis control was obtained in 76% of the patients after the first cauterization and in 86% of the patients after the second cauterization. Partial recovery was obtained in 5 patients. Although we re-performed bilateral cauterization in 9 patients due

to recurrence of epistaxis in the follow-up period, we did not observe septal perforation in any of our patients.

Perichondrial blood flow is known as the key physiologic component for the maintenance of a healthy cartilaginous structure in nasal septum and other cartilaginous regions [8]. There is no consensus on the ideal (optimal) silver nitrate concentration and the duration of its contact with the tissue to obtain hemostasis without risking the blood flow. There are only a few clinical and experimental studies on this issue. Hanif et al. investigated the tissue penetration depth of silver nitrate in relation to varying contact times in order to determine the optimal duration of application. They reported that the depth did not increase with increased duration, and concluded that a contact duration of 5 s was sufficient to obtain an effective treatment [12]. Amin et al. investigated histologic effects of two different concentrations on mucosal tissue to determine the optimal silver nitrate concentration. In their study, they observed that the tissue penetration depth with 95% concentration was approximately twice of the one obtained with 75%, and stated that application of high concentrations of silver nitrate could increase the risk of septal perforation [6].

Lloyd et al. studied on excised septal cartilage specimens without any mucosa in the laboratory, and reported that the relation between the contact time of silver nitrate and the depth of penetration was not significant. Those authors stated that destruction of perichondrium which is an important structure for nourishment of the cartilage, and the presence of several local factors (such as atherosclerosis) could be important for development of septal perforation [13].

We applied silver nitrate in 75% concentration for 5 s on each focus in our study. In patients who needed a second cauterization, we cauterized the areas with visible vascularization or vessels that became visible again, and avoided cauterization of sclerozed areas. The presence of diseased nasal mucosa was taken into consideration since this condition could negatively affect local tissue nourishment or aggravate bleeding. Cauterization was not performed in the presence of infected, fragile, desquamated or crusting mucosa. Performing cauterization in otherwise healthy children, i.e. absence of the conditions that negatively affect the systemic tissue nourishment, could have contributed to the absence of the septal complications in our study.

The real sense of bilateral septal cauterization is to reduce the anxiety of the child and the family due to repeating procedures, and to decrease the cost of the treatment. Although bilateral cauterization is performed in a single stage, some patients may need an additional cauterization when the vascular region in Little's area is large. Unilateral staged cauterization procedure in patients with bilateral epistaxis requires additional patient-doctor appointments and a higher patient compliance. Obtaining this compliance is really hard especially in children.

The absence of any septal perforation in our study group may be due to our small sample size. The advantages of bilateral simultaneous septal cauterization have to be weighed against the possibility of septal perforation development, although the risk is small. However, larger studies are needed to determine the actual safety of this procedure.

5. Conclusion

Simultaneous bilateral silver nitrate cauterization is an effective, feasible, low-cost and preferable treatment method in recurrent childhood epistaxis that originate from the anterior septum. Although we did not encounter any septal perforations in our study, it is hard to state that simultaneous bilateral cauterization is an entirely safe procedure. However, we can consider that bilateral simultaneous silver nitrate cauterization carries quite low risk for nasal septal perforation when applied in

an appropriate concentration and at an appropriate duration in a healthy mucosal environment.

References

- [1] H. Kubba, Childhood epistaxis, *Clin. Otolaryngol.* 31 (3) (2006) 212–213.
- [2] J.L. Guarisco, H.D. Graham 3rd., Epistaxis in children: causes, diagnosis, and treatment, *Ear Nose Throat J.* 68 (7) (1989) 528–530, 522, 532.
- [3] M.J. Burton, C.J. Doree, Intervention for idiopathic epistaxis(nosebleeds) in children, *Cochrane Database Syst. Rev.* (1) (2004) CD004461.
- [4] L.E. Pope, C.G. Hobbs, Epistaxis: an update on current management, *Postgrad. Med. J.* 81 (955) (2005) 309–314.
- [5] G.D. Barr, Silver nitrate cautery and epistaxis, *Arch. Emerg. Med.* 6 (3) (1989) 233.
- [6] M. Amin, F. Glynn, S. Phelan, P. Sheahan, P. Crotty, D. McShane, Silver nitrate cauterisation, does concentration matter? *Clin. Otolaryngol.* 32 (3) (2007) 197–199.
- [7] P. Murthy, Nilssen EI, S. Rao, L.G. McClymont, A randomised clinical trial of antiseptic nasal carrier cream and silver nitrate cautery in the treatment of recurrent anterior epistaxis, *Clin. Otolaryngol. Allied Sci.* 24 (3) (1999) 228–231.
- [8] T.R. Link, S.F. Conley, V. Flanary, J.E. Kerschner, Bilateral epistaxis in children: efficacy of bilateral septal cauterization with silver nitrate, *Int. J. Pediatr. Otorhinolaryngol.* 70 (8) (2006) 1439–1442.
- [9] M. Beran, B. Petruson, Changes in the nasal mucosa of habitual nose-bleeders, *Acta Otolaryngol.* 102 (3-4) (1986) 308–314.
- [10] J. Ruddy, D.W. Proops, K. Pearman, H. Ruddy, Management of epistaxis in children, *Int. J. Pediatr. Otorhinolaryngol.* 21 (2) (1991) 139–142.
- [11] P.M. Middleton, Epistaxis, *Emerg. Med. Australas.* 16 (5–6) (2004) 428–440.
- [12] J. Hanif, R.A. Tasca, A. Frosh, K. Ghufloor, R. Stirling, Silver nitrate: histological effects of cautery on epithelial surfaces with varying contact times, *Clin. Otolaryngol. Allied Sci.* 28 (4) (2003) 368–370.
- [13] S. Lloyd, J. Almeyda, R. Di Cuffa, K. Shah, The effect of silver nitrate on nasal septal cartilage, *Ear Nose Throat J.* 84 (1) (2005) 41–44.