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Endoscopic Sphenopalatine Artery Ligation in Posterior Epistaxis: Retrospective Analysis of 30 Patients

Original Investigation

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Abstract

Objective: Although posterior epistaxis is rarely seen, it is an important medical problem that both decreases the quality of life of the patient and causes difficulties in the management for otorhinolaryngologists. In this study, we aimed to present the results of 30 patients who underwent transnasal endoscopic sphenopalatine artery ligation (TESPAL) for posterior epistaxis in our department.

Methods: The records of 30 patients who underwent TESPAL from January 2014 to April 2016 were analyzed retrospectively, and the relationship between perioperative factors and need for revision surgery was assessed.

Results: The success rate of TESPAL in posterior epistaxis was 90%. There was no relationship between surgical failure and antiaggregant use (p=0.224), anticoagulant use (p=0.534), hypertension (p=0.564), previous nasal surgery (p=0.279), and bilateral TESPAL application (p=0.279). TESPAL was seen to be effective in cases with Osler–Weber–Rendu disease, pregnancy, and uncontrollable epistaxis after rhinoplasty surgery. Mortality was seen in one of our patients not related to endoscopic ligation in the follow-up period.

Conclusion: TESPAL is an effective method in the treatment of posterior epistaxis. Hypertension, antiaggregant or anticoagulant use, bilateral sphenopalatine artery ligation, and previous nasal surgery do not seem to be factors leading to surgical failure.

Keywords: Epistaxis, endoscopic hemostasis, ligation, sphenopalatine artery

Introduction

The lifetime incidence of epistaxis is about 60% and it is the most common emergency otolaryngologists' encounter (1, 2). It shows bimodal progress according to the age range. It peaks before the age of ten and between 45 and 65 years of age (3). In addition to digital trauma, nasal septum deviation, neoplasms and chemical irritants, systemic factors such as coagulopathies, kidney failure, alcoholism, and vascular anomalies can also be causes (1, 2). Seasonal changes, allergic rhinitis, exogenous or endogenous estrogens, environmental humidity, and upper respiratory tract infections increase its incidence (1-3). Most patients with epistaxis can be treated with chemical cauterization, hemostatic agent application and short-term application of anterior nasal packing, which are first-line treatment methods. However, though the rate is low (5%–10%), there is a group of patients with posterior epistaxis whose bleeding does not stop with these methods. Although posterior nasal packing can be applied in patients with posterior epistaxis, both the morbidity and duration of hospitalization of these patients have been reduced through the transnasal endoscopic sphenopalatine artery ligation (TESPAL) and arterial embolization methods in recent years (4). In this study, the data of 30 patients who did not respond to the application of anterior nasal packing and in whom the TESPAL method was applied in our clinic are presented with the current literature.

Methods

Approval from the local ethics committee and written informed consent by the patients have been obtained for our study. Thirty patients who applied to the emergency department due to epistaxis between January 2014 and February 2016 and whose bleeding did not stop despite the application of anterior nasal packing and TESPAL applied under general anesthesia were included in the study. Hemogram, blood chemistry, aPTT, and INR tests for all the patients with epistaxis were requested and those with bleeding diathesis were consulted with the Hematology department. The patients using antiaggregant or anticoagulant drugs were consulted with the departments of Cardiology or Cardiovascular surgery. In the retrospective review of the patients, demographic data, comorbid diseases, medical treatment condition, whether or not other surgical procedures were applied in addition to the implementation of TESPAL and the status

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of response to the TESPAL implementation were determined and analyzed. The patients with a follow-up duration shorter than six months were excluded from the study.

Surgical Technique

All surgical procedures were performed with the aid of a 0° endoscope. After cottons impregnated with topical vasoconstrictor and decongestant were fixed, vasoconstrictor agent injection containing lidocaine + epinephrine (Jetokain ampoule® Adeka, İstanbul, Turkey) –20 mg/mL Lidocaine (+0.0125 mg/mL Epinephrine) was done in the middle meatus. Then, the flap was elevated towards the posteroinferior by making a vertical incision in the superior of the maxillary sinus posterior fontanelle in order to reach the sphenopalatine foramen (SPF) and crista ethmoidalis (CE) (Figure 1a). By making a maxillary antrostomy, the posterior wall of the maxillary sinus was used as an anatomical marker for CE in patients when the posterior fontanelle could not be fully evaluated or CE could not be found due to the intensity of bleeding. CE was taken with the help of a curette or Kerrison punch in order to see all the branches of the sphenopalatine artery (SPA) (Figure 1b). The SPA was clipped with the help of two or three hemoclips in the most proximal location where it came out of the foramen (Figure 1c). In the patients that it was uncertain whether the SPA was fully clipped with hemoclips, bipolar electrocoagulation was applied to the most proximal part of the artery and packing was placed on the operation site (Figure 1d).

Table 1. The demographics and clinical characteristics of the patients undergoing transendoscopic sphenopalatine artery ligation

Characteristics	Number of patients-percentage
Gender (M/F)	20/10-66.6%/33.3%
Side of TESPAL application (right/left)	20/13-60.6%/39.3%
Bilateral TESPAL	3-10%
Hypertension	17-56.6%
Newly diagnosed hypertension	2-6.6%
Use of antiaggregant drugs	15-50%
Use of anticoagulant drugs	9-30%
Previous nasal surgery	3-10%
Idiopathic (except hypertension)	3-10%
Septoplasty during TESPAL	6-20%
Maxillary antrostomy during TESPAL	4-13.3%
Revision surgery	3-10%
Pregnancy	1-3.3%
Osler-Weber-Rendu syndrome	1-3.3%
Death	1-3.3%

M: male; F: female; TESPAL: transnasal endoscopic sphenopalatine artery ligation

Statistical Analysis

Statistical analysis was performed using the SPSS program (version 16, Chicago, IL, USA). The Fisher exact test was used to determine the relationships between re-bleeding (revision surgery) and perioperative variables (hypertension, antiaggregant drug use, anticoagulant drug use, previous nasal surgery, and implementation of bilateral TESPAL), in which $p<0.05$ was considered statistically significant.

Results

The mean follow-up period of the patients who underwent TESPAL was 15 months (6–30 months). The demographics and clinical characteristics of the patients are shown in Table 1. Additional diseases and clinical findings of the patients were as follows:

Hypertension (HT): HT was the most common (56.6%) additional health problem encountered in patients. Although two (6.6%) patients had no earlier story of HT, this diagnosis was made in the period when they were hospitalized in our clinic due to posterior epistaxis.

Osler–Weber–Rendu syndrome: One patient applied with bleeding from bilateral nasal cavities due to OWRS. Owing to the fact that bleeding did not stop despite the implementation of bilateral anterior nasal packing, bipolar cauterization was applied to the telangiectasias on the lateral wall of the nasal cavity during the endoscopic examination and thus, bleeding was reduced. Bilateral TESPAL was applied to reduce the congestion of the posterior and lateral nasal wall. The patient had no bleeding in six-month postoperative controls.

Figure 1. a-d. The surgical steps of endoscopic sphenopalatine artery ligation. (a) Flap elevation on the lateral nasal wall (Arrow shows crista ethmoidalis). (b) Exposure of the sphenopalatine artery (black arrow) is shown after the crista ethmoidalis is removed with a curette or Kerrison punch (star shows the posterior fontanelle). (c) Sphenopalatine artery is clipped with hemoclips. (d) The flap elevated on the lateral nasal wall is laid in its place (black arrow)

Pregnancy: A 32 week pregnant woman applied due to a nosebleed originating from the nasal cavity. The patient had no symptoms of pre-eclampsia or additional diseases. The blood count, aPTT, and INR values and blood chemistry of the patient were normal. When the bleeding originating from the nasal cavity was not able to be stopped despite the anterior nasal packing, after the fetus was determined to be healthy through the consultation of the Obstetrics and Gynecology department, right TESPAL was first tried to be performed under local anesthesia. However, repeat right TESPAL was performed under general anesthesia because the bleeding did not allow local intervention. No additional problem was found in the postoperative follow-up of the patient.

After Rhinoplasty: A 27 year old male patient who underwent rhinoplasty seven days before was referred to our clinic due to postoperative recurrent epistaxis that could not be controlled through treatment. There was posterior epistaxis in the left nasal cavity. In the examination made under general anesthesia, an arterial bleeding from the lateral nasal wall was seen in the posterior nasal cavity. It was thought that the bleeding originated from the lateral osteotomy. Since the bleeding did not stop with bipolar cauterization, left TESPAL was performed. The patient did not have postoperative bleeding.

Previous Septoplasty: A 54-year-old female patient had a history of septoplasty, which was performed 15 years ago. The blood count, blood chemistry, aPTT, and INR values and blood pressure of the patient were normal. There was bleeding from the left nasal cavity. When the bleeding did not stop with the anterior nasal packing, left TESPAL was performed. Due to the re-bleeding of the patient on the fifth postoperative day, arterial bleeding between the upper half of the left middle concha and the septum was stopped with bipolar cauterization. Also, because of the past surgical history, angiography was performed together with computed tomography in order to exclude aneurysms. No pathology was found in the angiography. After removing the anterior nasal packing, the patient, who had no bleeding, was discharged with recommendations.

Cirrhosis, renal failure, impaired general condition: A patient with a history of Hepatitis C, cirrhosis, and dialysis due to renal failure applied with the complaint of massive bilateral bleeding. Since the bleeding did not stop despite the anterior nasal packing, bilateral TESPAL was performed under general anesthesia. Upon the continuation of bleeding in the right nasal cavity, anterior, and posterior packing was applied. Due to the ongoing bleeding in spite of this, right external carotid artery ligation was performed. It was seen that the bleeding decreased. The patient was taken to the reanimation unit of the Department of Anesthesiology in the postoperative period. The patient died during the follow-up due to additional diseases.

Bilateral TESPAL: Bilateral TESPAL was performed in three (10%) patients. A 42-year-old male patient applied with the complaint of a bilateral nosebleed. Upon the continuation of the bleeding despite the anterior nasal packing, bilateral TESPAL was performed. In the postoperative period, the patient did not have bleeding. No ischemia or necrosis in the posterior nasal cavity was observed in any of the patients in whom bilateral TESPAL was administered.

Revision surgery: Due to the recurrent bleeding in three (10%) patients despite the application of TESPAL, a revision surgery was required. All revision surgeries were performed within the first five days postoperatively and no bleeding was seen after surgical revascularization. The patient with previous septoplasty history and the patient with impaired general condition were presented above. A seventy-seven-year-old female patient who had advanced Alzheimer's disease and no hypertension history applied due to nose bleeding in the left nasal cavity. When the patient applied, her blood pressure was 170/100 mm Hg. The patient underwent left TESPAL. Due to re-bleeding on the postoperative second day, the patient was examined under general anesthesia. The bleeding between the left middle concha and nasal septum was stopped with bipolar cauterization. The patient was diagnosed with hypertension from the results of a Cardiology consultation.

The relationship between the need for revision surgery (surgical failure) and perioperative variables: There was no statistically significant relationship between the revision surgery requirement due to re-bleeding and the use of antiaggregant drugs (p=0.224), use of anticoagulant (p=0.534), HT (p=0.564), previous nasal surgery (p=0.279) or the implementation of bilateral TESPAL (p=0.279).

Discussion

Posterior epistaxis often arises from the posterior septum and the posterior lateral nasal wall, which constitutes 5 to 10% of patients (4). Due to the difficulties in spotting the location of bleeding, its treatment is more difficult than anterior epistaxis (4).

After being introduced to ENT practice, endoscopes were first presented as an effective treatment method by Budrovich et al. in 1992 (5) for posterior epistaxis that cannot be stopped through TESPAL. However, anatomical variations related to the SPA may be the cause of surgical failure. SPA arises from SPF as a single artery at a rate of 60 to 80% and then comes off the branches of the posterior septal and posterior lateral nasal branches. However, SPA may arise from SPF in the form of more than a single artery in 20 to 30% of patients (4, 6). During SPA ligation, the artery should be clipped at the proximal portion as much as possible in order to clip all accessory arteries, if there are any. Crista ethmoidalis is located in the anterior to the foramen in 98% of patients and overlies the SPF. Crista ethmoidalis is a reliable marker to find the SPF and allows the unveiling of the SPF during TESPAL (4). Although there is usually only one SPF, there may be accessory foramina at the level of CE in 10% of patients and the artery may be passing through these foramina. Removal of the CE will allow the accessory foramina to be seen and the SPA to be reliably clipped at the most proximal portion (4, 6). Therefore, if it cannot be ensured that the whole artery wall has been clipped with hemo-

clips after removing the CE in our clinic, bipolar electrocautery is additionally performed at the most proximal part to the SPF. Besides accessory foramina, high settlement of the SPF is another cause of surgical failure. In order to avoid this, Midilli et al. (6) suggested cauterizing the posterior septal and posterior lateral nasal arteries separately through a two-step cauterisation technique. Although the use of hemoclips during TESPAL seems to be a cost-increasing method in comparison to bipolar cauterization, insufficient coagulation time during cauterization can cause re-bleeding and the vascular lumen to remain patent (7). The data regarding cauterization reducing the possibility of bleeding in comparison to the clipping method are not clear (7, 8). Many authors use both methods (8-10). In reference to our clinical experience, cauterizing the environmental mucosa of the SPA only through bipolar cauterisation makes it difficult to assess the exact location of the artery in the postoperative period because of discoloration of the mucosa. In the presence of hemoclips, observation of the clip may be used for determining the location of the artery.

Performing antrostomy during the application of TESPAL and enlarging the maxillary sinus ostium up to the posterior wall of the sinus were routinely performed to find the localization of the SPF in the years when the TESPAL technique was first popularized. The SPF is located 1–2 mm posterior and inferior to the posterior wall of the maxillary sinus (7). Today, although there are still authors proposing that antrostomy should mostly be performed during TESPAL, antrostomy is not necessary for every patient. It may be required in patients in whom the localization of the SPF cannot be found (7, 9). In the current studies, maxillary antrostomy was required in four patients (13.3%) in whom SPF could not be found.

When the literature is reviewed, it is seen that the success rate of TESPAL is greater than 85% (4). Failure to clip the posterior septal branch of the SPA, dislocation of the hemoclips, bleeding diathesis, accompanying anterior ethmoid artery bleedings that were not noticed during the first surgery and bleeding from the collateral vascular structures can be considered among the causes of recurrent bleeding (3). In the current study, revision surgery was required in three cases and the success rate of TESPAL was found to be 90%. Dislocation of the clips was not observed in any patient as the reason of surgical failure. It was seen that there was bleeding diathesis in one (3.3%) patient and arterial bleeding between the middle concha and nasal septum in the two other patients (6.6%). Failure to fully clip the posterior septal artery was considered to be the cause of bleeding in these two patients.

There are various applications among the authors regarding the approaches to patients with posterior epistaxis. If it can be seen, cauterizing the bleeding site primarily can reduce the possibility of re-bleeding in patients with epistaxis (11). If the bleeding site cannot be seen in the endoscopic examination, anterior nasal packing can be applied. However, the application of anterior nasal packing without endoscopic examination may increase the bleeding, especially in patients with nasal septum deviation because it may damage the mucosa (12). TESPAL is recommended in bleedings that cannot be stopped despite anterior nasal packing or in patients with posterior epistaxis after the removal of the packing in 48-72 hours (11, 13). On the other hand, the application of TESPAL without anterior nasal packing is another method in patients with posterior epistaxis (14). In the application of posterior nasal packing in posterior epistaxis, the probability of recurrent bleeding is between 26% and 52% and the rate of success is lower than TESPAL (10). In comparison to posterior packing, TESPAL emerges as a method that shortens the length of hospitalization, lowers cost and increases the quality of life (9, 15, 16). The requirement of anterior nasal packing after the application of TESPAL is another matter of discussion. After finding and clipping the artery that causes bleeding, the need to place nasal packing again is eliminated (7). Therefore, there are authors who do not recommend anterior nasal packing application after TESPAL and who argue that placing the nasal packing does not reduce the likelihood of re-bleeding (9). On the other hand, a flap elevation on the lateral wall during surgery can cause postoperative mucosal bleeding. Therefore, anterior nasal packing can be applied after TESPAL (12). In our study, we applied anterior nasal packing in all patients after TESPAL. The posterior epistaxis algorithm that we applied in our clinic and used in our study is given in Figure 2.

The relationship between HT and epistaxis has not been fully clarified. It is not clear whether epistaxis is a result of HT or it is the reason for HT because it causes anxiety (17, 18). The incidence of concomitant HT in patients undergoing TESPAL ranges from 30 to 60% (8, 9, 11, 12). In current studies, the fact that 56.6% of patients have a history of HT preoperatively and the diagnosis of HT has been made along with an epistaxis episode in 6.6% of them suggest that high blood pressure is a risk factor for posterior epistaxis. However, as seen in our study and in many other studies, the presence of hypertension in patients does not increase surgical failure in TESPAL (8, 11).

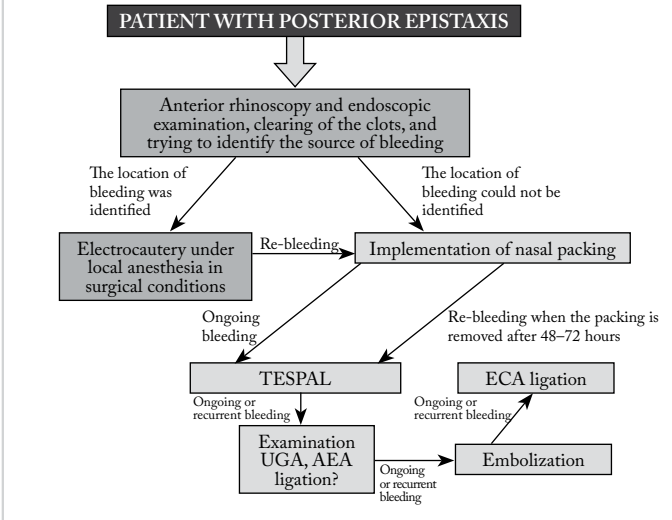

Figure 2. The approach algorithm that we applied to the patient with posterior epistaxis in our clinic.
TESPAL: transnasal endoscopic sphenopalatine artery ligation; UGA: under general anesthesia; AEA: anterior ethmoid artery; ECA: external carotid artery

Congestion increases in the vascular bed with the cholinergic effect of estrogen in the nasal mucosa during pregnancy and this increases the tendency for epistaxis (19). General anesthesia can trigger preterm labor in the first two trimesters of pregnancy and the effect of inhaled or intravenous anesthetics on the fetus has not been fully clarified. Therefore, if possible, local anesthesia is preferable for nasal surgical intervention during pregnancy, however considering the possible side effects and receiving the patient's informed consent, TESPAL can be applied under general anesthesia in cases in which the bleeding does not allow local surgical intervention (20). In our study, posterior epistaxis that could not be stopped despite anterior nasal packing was treated successfully with TESPAL in one patient under general anesthesia.

The Osler-Weber syndrome is an autosomal dominant familial inherited genetic syndrome that is characterized by nasal telangiectasias leading to spontaneous and recurrent serious epistaxis episodes and is accompanied by visceral lesions. In the treatment of epistaxis in OWRS, septodermoplasty and Young's operation are effective, however because they are aggressive surgical methods, they should be the last choice (21). The cauterization of the telangiectasias through bipolar cautery is also accepted as an effective method, such as the laser method (22). In our study, the bipolar cauterization of telangiectasias and application of bilateral TESPAL prevented epistaxis episodes in one (3.3%) patient with OWRS. However, the follow-up period of our patient was six-month and it should be noted that epistaxis in OWRS may repeat in long-term follow-up (23). The patient with OWRS in our study may be indicative of the fact that bilateral TESPAL can be applied effectively before more aggressive surgeries, such as septodermoplasty and Young's operation, in this group of patients.

The implementation of TESPAL in both sides is an effective method in unstoppable bilateral posterior epistaxis, but this may also lead to perforation and partial necrosis in the middle concha by causing bilateral ischemia in the posterior septum (24). There are authors that report no complications depending on the application of bilateral TESPAL and some that report temporary intranasal scaling, dryness, and reduction in tear (9, 10, 12, 25). Since one of the three patients undergoing bilateral TESPAL died during the follow-up, he could not be evaluated in terms of late complications in our study. No complications were found in the other two patients in postoperative six-month controls.

Since it is difficult to determine the direction of bleeding in posterior epistaxis, traditionally, bilateral packing is applied especially in cases with excess bleeding. George et al. (25) observed that bilateral TESPAL was needed only in one of the 15 patients who were undergone preoperative bilateral anterior nasal packing. Similarly, preoperative bilateral anterior nasal packing was applied in all 30 patients in our study, but it was seen that bilateral TESPAL was applied in three (10%) of them. Therefore, the determination of the preoperative bleeding direction in posterior epistaxis will save patients from the application of unnecessary bilateral nasal packing.

Although the TESPAL application has few local side effects, patients with posterior epistaxis are mostly elderly patients with additional diseases. Since the postoperative mortality rate is not that low to be neglected, close monitoring of the overall health conditions of these patients is required. It was reported in the study of Abdelkader et al. (10) that mortality occurred in the follow-up of two of 43 patients who underwent TESPAL. In our study, independent of the surgical technique, the death of one (3.3%) patient in the postoperative period reveals the importance of close monitoring of the general health status and comorbidities of patients with posterior epistaxis.

Nosebleed is one of the most common complications of rhinoplasty. Bleeding frequently arises from the suture lines or damaged mucosa. Most of the epistaxis after rhinoplasty are treated with conservative therapies such as topical vasoconstrictor sprays and anterior nasal packing application. However, nosebleeds that do not stop with these methods and require additional initiatives, such as TESPAL application and arterial embolization, can be seen (26). In our study, the bleeding that could not be stopped with anterior nasal packing after rhinoplasty was controlled successfully with TESPAL in one (3.3%) patient.

In our study, the use of antiaggregant or anticoagulant drugs is not seen as a risk factor for surgical failure in TESPAL. This result is similar to that in many studies (9, 11, 25). Differently, Nouraei et al. (8) determined the use of anticoagulants for re-bleeding in the early period after TESPAL as a risk factor.

Conclusion

As a result, TESPAL emerges as an effective method with a success rate of 90% in posterior epistaxis. The use of antiaggregant or anticoagulant drugs, hypertension, previous nasal surgery and bilateral sphenopalatine artery ligation do not appear as factors for surgical failure. In rare cases, the first symptom of systemic hypertension may be posterior epistaxis.

Ethics Committee Approval: Ethics committee approval was received for this study from the local ethical committee.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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