Surgical versus non-surgical treatment of posterior epistaxis

J. Vergara Hernández1, L. E. Ordóñez Ordóñez2

Abstract: The aim of the study was to compare the efficacy of surgical versus non-surgical treatment of patients hospitalized with epistaxis, considering the significance of the source of bleeding and identifying failure-predicting factors related to specific treatments. 62 patients were included in the study, 36 (58%) of whom suffered from posterior epistaxis and 26 (42%) of whom had anterior bleeding. The only factor associated with the failure of non-surgical treatment was a posterior source of the bleeding (p=0.001). These patients were also hospitalized for a longer period (8.17 days) than those with anterior epistaxis (4.62 days) (p = 0.001). The success rate for the initial non-surgical treatment of patients with posterior epistaxis was 45% (14/31), significantly lower (p = 0.0001) than the 87% attained with the primary surgical procedure, (13/15) - endoscopic cauterization of the sphenopalatine artery. These results support endoscopic cauterization of the sphenopalatine artery as the most effective primary treatment for posterior epistaxis.

Keywords: Epistaxis. Posterior epistaxis. Treatment. Surgery.

INTRODUCTION

Epistaxis is a condition that causes anxiety, not only in the patient, but also in the doctor responsible for the patient's treatment. Nosebleeds are more common in men; frequency increases with age and with conditions such as high blood pressure1-3.

Depending on the site of origin, epistaxis is classified as either anterior or posterior; if the site of bleeding is visible in the anterior rhinoscopy it is classified as anterior epistaxis.

The cause of epistaxis is multifactorial and it results from the interaction of a series of factors that affect the nasal mucosa and the blood vessels; these include environmental, local and systemic factors4. The blood supply to the nasal cavity comes from both the external and internal carotid systems. The anterior and posterior ethmoidal arteries originate in the ophthalmic artery, a branch of the internal carotid, and the circulation of which goes to the superior and middle turbinates and the upper part of the nasal septum. The irrigation that comes from the external carotid is carried by the columellar arteries, the internal maxillary and the ascending pharyngeal arteries. The branches of the internal maxillary artery (IMA) that carry the irrigation to the nasal fossa include the descending palatine artery and the sphenopalatine artery (SPA). The SPA irrigates, through the posterior-lateral nasal artery, the larger part of the lateral nasal wall and, through the nasopalatine artery (NPA), the superior turbinate and the nasal septum5,6. Two areas of vascular anastomosis, Kiesselbach's plexus and Woodruff's nasopharyngeal plexus, have been described as common bleeding sites in patients with anterior and posterior epistaxis respectively.

Within the Otorhinolaryngology, many procedures have been described to control nasal bleeding, which, in general, can be classified as surgical or non-surgical. Surgical procedures have historically been used as an alternative when non-surgical management has failed2-7,8. However, treatment for posterior epistaxis has been under discussion over the last few years. The initial step for a long time was to carry out a posterior packing with a success rate of around 60%.9 If the bleeding re-occurred, ligation of the IMA was performed, with a re-bleeding rate of around 15%10. There have been various publications over the last few years that have suggested the initial step for these patients should be the surgical control of the SPA or of its branches under endoscopic vision. Related studies have shown that both ligation and arterial cauterization have a quite acceptable level of efficacy and an
acceptable cost-effectiveness profile.\textsuperscript{8,11-13} Another alternative for primary treatment or for when the initial management fails reported by some authors is selective embolization of the IMA and/or of its branches, with a reported efficacy of between 75\% and 83\%.\textsuperscript{14,15}

Due to the fact that various schools in our area, including our own, resort to posterior packing as the initial step for posterior epistaxis, we would like to verify whether, as some authors have reported, it is no longer the best alternative for these patients.

This is a descriptive, retrospective study that was conducted to compare the efficacy of the surgical treatment versus the non-surgical treatment which hospitalized patients received for epistaxis in two Bogota institutions, emphasizing in the comparison, the site of origin of the bleeding (anterior or posterior), as well as the identification of possible failure-predicting factors for any of these treatments.

**MATERIAL AND METHODS**

We reviewed the medical histories of patients admitted with epistaxis to the Hospital Militar Central (HMC) between January 1995 and December 2003 and the Hospital Universitario Clínica San Rafael (HUCSR) between January 2000 and December 2003. Patients who sought advice regarding epistaxis or were hospitalized because of it, as well as those who had been admitted because of other causes, (for example coagulopathy), but who also had epistaxis and the management of which required them to stay longer in hospital were included in the study. Patients who developed epistaxis while in hospital but whose nosebleeds alone did not require their hospitalization were excluded from the study. Patients were also excluded if their medical records did not contain the information required.

The following data was recorded: demographic characteristics, local alterations: nasal trauma, septal perforation, septal deviation, rhinosinusial inflammatory processes, foreign bodies and nose tumors; and systemic alterations: high blood pressure, coagulopathy, the taking of medication that alters the coagulation process, and smoking, which, apart from being associated with nosebleeds, can be associated with the complications recorded. The site of bleeding was classified as posterior when it was not possible to see it in the anterior rhinoscopy; it was otherwise classified as anterior. Management of the epistaxis was divided into surgical and non-surgical, the latter including arterial embolization. The primary treatment was considered a success when the patient did not require additional procedures to control the epistaxis; if secondary treatment was necessary, the same criteria was used to define success and failure of the second measure of treatment. Furthermore, the need for a blood component transfusion was recorded, the type of department in which the patient had been hospitalized (general ward or ICU) and the duration of the stay in hospital in days. When complications occurred, they were classified as being associated with the treatment or derived from the underlying illness. Among the former, the following were looked for, nasal alae and/or columellar necrosis, septal perforation, local infection, sepsis, cardiovascular, cerebrovascular and other vascular occlusive events. In regard to complications attributable to the underlying disease, cardiovascular and cerebrovascular events or other complications were looked for.

Endoscopic cauterization of the bleeding site and/or of the sphenopalatine artery was the initial surgical procedure performed on patients who underwent this therapeutic method. Monopolar cauterization was used in every case and was applied by means of the tip of a suction cannula; the cannula was protected with a plastic cap (nasogastric probe). The procedure was performed under general anesthetic and after removing the plug, an endoscopy was performed in order to identify points of bleeding and if found, electric cauterization was performed. Later, the middle meatus and the tail of the middle turbinate were identified, a vertical incision was made 1 cm anterior to the end of the middle turbinate and the mucoperiosteum flap was raised and cut in the cranial and dorsal directions until finding the sphenopalatine foramen (SPF) with the branches of the SPA. An alternative for the placing of the SPF consists of performing a middle antrostomy using the posterior wall of the maxillary antrum as a guide to locate this orifice. Then, the branches of the artery in question are cauterized, the flap repositioned and the absorbent sponge (Gelfoam\textsuperscript{®}) inserted and the procedure is over. In some patients, finding the foramen with the emerging vessels was not possible (various patients initially treated with posterior packing using the Foley\textsuperscript{®} or Epistat\textsuperscript{®} probe had large areas of mucosa necrosis with anatomical distortion). In these patients the area corresponding to the initial distribution of the SPA (the tail of the middle turbinate, posterior portion of the superior and middle meatuses and the roof of the choana) was cauterized. A septrhaphy was performed on the patients who presented a septal deviation that did not enable adequate access to the surgical area.

The success rate of the different types of treatment was compared, as was their connection to the characteristics of the patient and the bleeding site. Non-parametric, statistical tests (Chi squared) or parametric ones (Student's t test) were used, depending on the nature of the variable studied; a value greater than p<0.05 was considered to be significant. The SPSS program version 10.0 was used for the statistical analysis.
RESULTS

In total there were 62 patients who fulfilled the inclusion criteria; 34 were attended to in the HMC and 28 in the HUCSR. The average age was 53 years (6 to 83 years) and the male/female relationship was almost 1 (32/30). The anomalies found in the subjects studied are given in Table 1; septal deviation (36%), nasal trauma (21%), high blood pressure (47%) and coagulopathy (21%) are the most common etiological factors of nosebleeds; it is important to emphasize the high frequency of high-risk cardiovascular/coronary disease (45%).

The bleeding site was posterior in 36 patients (58%) and anterior in 26 (42%). The types of initial treatment the patients received are given in Table 2 according to the site of bleeding; in general, the majority of patients were initially treated with non-surgical measures. The general success rate of initial non-surgical treatment was 67% (38/57) and surgical was 100% (5/5 patients).

The efficacy rates of the initial treatment by site of bleeding are given in Table 3. It can be seen how non-surgical management was successful in 14 out of 31 cases (45%) of posterior epistaxis. There is a statistically significant association between the failure of non-surgical management and the presence of bleeding of posterior origin, Chi square test (p=0.001), and therefore the need for additional treatment.

No significant relationship was found using the Chi squared test (Fisher’s exact test for septal perforation) between the failure of the initial non-surgical treatment with nasal trauma (p=0.99), septal deviation (p=0.61), septal perforation (p=0.69), high blood pressure (p=0.54), high cardiovascular risk/coronary disease (p=0.50), nor coagulopathy (p=0.99). An association on the edge of statistical significance was found between smoking cigarettes and failure of the initial treatment with Fisher’s exact test (p=0.05). However, in the analysis stratified by the other variable, the site of bleeding, which was associated with the failure of non-surgical management, the relationship -as analyzed using Fisher’s exact test (p=0.14) - was not significant. This means that smoking cigarettes is probably a factor of confusion and that the association is not real.

In regard to the bleeding site, no significant relationship was found (Chi squared test, p>0.05) with the institution in which the patient was hospitalized (HMC or HUCSR), the presence of septal deviation, nasal trauma, septal perforation, high blood pressure, smoking cigarettes or coagulopathy. A difference on the edge of statistical significance was found using Student’s t test for age (p= 0.05), with patients with posterior epistaxis being older on average (56.1 years; 47.6 years for the group of anterior bleeding).

| Table 1: Clinical findings in 62 patients hospitalized because of epistaxis in two tertiary-care institutions in the city of Bogota |
|-----------------|---------|
| Entity          | No. of patients (%) |
| Septal deviation| 22 (36%) |
| Septal perforation| 8 (13%) |
| Nasal trauma*   | 13 (21%) |
| Inflammatory rhinosinus alterations**| 4 (6%) |
| Foreign body    | 1 (2%) |
| Nasal cavity    | 1 (2%) |
| Hemangiopericytoma|                  |
| High blood pressure| 29 (47%) |
| High cardiovascular risk/coronary disease| 28 (45%) |
| Cigarettes***   | 13 (21%) |
| Coagulopathies***| 13 (21%) |

*Includes iatrogenic trauma (nasosinusal surgery). **Allergic rhinitis, acute or chronic rhinosinusitis of any etiology. ***Smokes more than 5 cigarettes a day. ****Includes taking medication that alters coagulation (aspirin, NSAIDs, oral anticoagulants).

| Table 2: Initial treatment of 62 subjects under study by the site of bleeding |
|--------------------------|-----------------|-----------------|
| Type of treatment               | Origin of bleeding |
| Non-surgical n=57 | Chemical cauterization | Anterior n=26 |
|                           | Anterior packing with gauze | Anterior n=36 |
|                           | Anterior packing with antiseptic sponge |    |
|                           | PA packing with a gauze roll |    |
| Surgical n=5 | Endoscopic cauterization of the bleeding site and/or the SPA |    |

*Selective embolization of the sphenopalatine artery.

| Table 3: Success rate of the initial management in the subjects under study by the site of bleeding |
|-------------|-----------------|-----------------|
| Site of bleeding | Type of initial treatment |
|               | Non-surgical n=57 (% success) | Surgical n=5 (% success) |
| Anterior (n=26) | 92 | 0 |
| Posterior (n=36) | 45 | 100 |
Of the 19 patients who required secondary treatment, the site of bleeding was posterior in 17 and anterior in 2. 10 patients received consistent surgical treatment in endoscopic cauterization with or without septoplasty, of whom 2 needed management with a third measure (80% success rate of the second surgical management) that consisted of the ligation of the external carotid artery. In 9 patients, the secondary management was not surgical, failing in 3 cases that were subsequently treated with endoscopic cauterization (a 67% success rate for the non-surgical secondary management).

18 patients in total received hemoderivatives, 16 were transfused with hematite concentrate, one with platelet concentrate and one with fresh plasma. Of the 16 patients who received hematite concentrate, 12 had posterior bleeding and 4 anterior; a non-significant difference on conducting a Chi squared test (p=0.11). Only 2 patients spent part of their hospital stay in the ICU, the rest remained on the ENT ward.

The overall success rate for the first surgical intervention on patients with posterior epistaxis was 87% (13/15). This was the initial measure taken for 5 of the patients, and on the remaining 10 surgery was performed following the failure of non-surgical treatment. A rate higher than 45% was found for the initial non-surgical treatment of posterior epistaxis (14/31), this difference was statistically significant (Chi squared test (p=0.001)).

In regard to the time spent in hospital, the average was 6.68 days (from 2 to 23 days), 8.17 days for the patients with posterior bleeding and 4.62 days for those with anterior epistaxis, a statistically significant difference (p=0.001) when analyzed using Student’s t test (Fig. 1). If we only consider the patients with posterior epistaxis who were treated surgically, (n=15), we find that the average hospital stay for those who underwent the procedure as their primary treatment lasted 5.2 days, less than that of patients who underwent surgery as a secondary treatment (n=10) which lasted 12 days. However, this difference was not statistically significant ((p=0.061), Student’s t test).

In regard to the complications that occurred in the 10 patients, 4 were attributable to the treatment, (6%) and 6 were recorded as being secondary to the underlying disease 10%. Cardiovascular events were the most frequent, found in 5 patients attributable to underlying disease (2 patients had a hypertensive emergency, 1 hypotension-arrhythmia, 1 stable angina and 1 unstable angina, all had previously been diagnosed with a high cardiovascular risk). One man with gastric carcinoma and thrombocytopenia died aged 31; the cause was attributed to a severe hemorrhage of the upper digestive tracts. The complications attributable to treatment consisted of 3 patients with nasal alae and/or columnellar necrosis who were managed with posterior packing, and one patient with a cerebrovascular accident which was managed with arterial embolization.

**DISCUSSION**

The patients who needed to be hospitalized to manage their nosebleeds were generally elderly and had associated pathologies such as high blood pressure and a high risk of coronary events; the preponderance of the male sex reported by other authors was not found. It is striking that patients with posterior epistaxis tended to be elderly, an independent effect of the presence or absence of high blood pressure.

The frequency of patients with posterior bleeding was greater than that of those with anterior bleeding; other studies on the subject reported similar results, this is related to the greater difficulty that managing these cases entails.

The initial treatment for the majority of patients (92%) was non-surgical, independently of the site of origin of the bleeding; this is similar to the conduct of other ENT departments. Some years ago, a change in the primary treatment for posterior epistaxis started to be reported in the worldwide literature on the subject, advocating surgical procedures. The five patients treated in this way (all after the year 2001) reflect the influence of this information on our department.

Numerous results from this study made us think that non-surgical management is not the best alternative for posterior epistaxis: 1. Those patients managed in this way required secondary treatment which cannot be explained by chance (p=0.001). 2. The success rate of the initial surgical intervention is greater than that of initial non-surgical management, a statistically significant difference (p=0.001). 3. There are aspects that could indicate that the severity of the posterior bleeding is
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greater and morbidity higher: these patients were in hospital for longer (p=0.001) and required a greater number of transfusions.

Of the possible different surgical methods, endoscopic cauterization was the most common; it was performed on 18 of 20 patients who underwent some type of surgical procedure and the success rate of 87%, when conducted as the primary intervention, concurs with figures reported in the literature.

Numerous publications have suggested over the last few years that posterior epistaxis should be managed surgically. Although a randomized clinical trial that compared surgical and non-surgical treatments was not found in the review carried out, the results from the descriptive studies are constant.

A study of 203 patients by Klotz et al, in which surgical treatment (arterial ligation of the internal maxillary or sphenopalatine with or without additional ligation of the ethmoidals, external carotid; septoplasty, endoscopic cauterization) was compared with non-surgical treatment (anteroposterior packing, embolization), gave a 90% success rate for surgical procedures, a 75% success rate for embolization and a 62% success rate for anteroposterior packing. In regard to the cost in (US) dollars, on average $5,697 per embolized patient was spent, (embolization after failed packing, without including the cost of the packing), $5,136 per packed patient (in whom this management was successful) and $3,851 per patient admitted for surgery (when it was initial treatment had failed or after the failure of medical treatment without including the cost of the latter). The fact that only 6% (13) of the patients in the study received surgical treatment as the initial treatment is noteworthy. The hospital stay of the patients treated medically was longer (5.29 days) than that of the patients treated surgically (2.1 days). The authors of this study recommend surgical management as the first course of treatment for posterior epistaxis, not only because of the high success rate, but also because of the lower costs, the shorter hospital stay and the greater comfort for the patient.

Another important point to be discussed is the complications derived from the type of protocol established. For a long time, significant morbidity was associated with posterior packing, including hypoxemia, cardiovascular events and septicemia, amongst others. In this regard, Loftus et al. conducted a study in order to determine the clinical relevance of the nasopulmonary reflex. In this study, they mention that although experimental and clinical studies conducted in the sixties and seventies show a decrease in the partial arterial pressure of oxygen (paO_2) and/or an increase in partial arterial pressure of carbon dioxide (paCO_2) related to posterior packing, in their continuous monitoring study with pulse oximetry of 19 patients, for a total of 1200 hours of monitoring, only 2 cases of desaturation below 90% were detected; as well as complications in these patients (delirium tremens, heart failure, cardiac ischemia, heart failure, broncho-aspiration) which were related more to underlying diseases (high blood pressure, EPOC, auricular fibrillation, mellitus diabetes, high cardiovascular risk) than with episodes of oxygen desaturation. They concluded that the drop in arterial oxygen content in these patients does not represent a primary problem in the way that the underlying pathology does. Another study designed to determine the cost-effectiveness of hospitalizing patients with bilateral posterior packing in the intensive care unit versus hospitalization in the general ward did not find significant differences in regard to complications, but did find them in regard to cost. The authors concluded that the majority of patients with posterior epistaxis could be managed in a general ward, monitored with permanent pulse oximetry, without increasing the number of complications, and reducing the costs. The results of this study are in line with previous data that found that cardiovascular complications were attributable to the underlying pathology more than to the posterior packing (and which were recorded in this way in the corresponding medical histories).

In regard to the success rate and complications of arterial embolization, there was not a sufficient number to be able to comment; the scarce use of this resource in the two institutions studied reflects the little experience of the corresponding surgical radiology departments. However, there are studies that say that, despite the significant associated morbidity (blindness, facial paralysis, cerebrovascular events, soft tissue necrosis), it is comparable to or less than that caused by ligation of the internal maxillary artery (18% versus 28%) or posterior packing, and remains an effective alternative in the management of posterior epistaxis with a reported efficacy of between 75-85%.

To finish we would like to emphasize some anatomical details that are relevant when performing procedures on the SPA using transnasal endoscopy (cauterization or ligation), knowledge of which, without doubt, helps to improve the results of these procedures. This terminal branch of the IMA enters the nasal cavity through the SPF. In a study of 110 craniums, (220 lateral nasal walls), it was found that this orifice was above the ethmoidal crest (superior and posterior to the tail of the middle turbinate) in the superior meatus in 35% of cases; the lower edge of the SPF was below the ethmoidal crest and therefore located partly in the superior meatus and partly in the middle meatus in 56% of cases; and there were two separate orifices, one in the superior meatus and the other in the middle one in 9%. In regard to the branching pattern of the SPA, the initial anatomical descriptions refer to the exit of a single trunk. However, in a recent study, the authors found
the most common occurrence to be the branching of this artery in the pterygopalatine fossa and the entrance into the nasal cavity of 2 (76%), 3 (22%) or 4 (2%) branches. The nasopalatine branch and the posterior lateral nasal artery were identified in all of them, and the latter was of greater caliber (1.89±0.23 mm) than the former (1.58 ±0.5 mm). In another study, the division was only present in the nasal cavity in 2 out of 20 cases. In conclusion, when identifying the SPA in the SPF, one should bear in mind that it is most common to find at least 2 branches exiting from both the superior meatus and the middle meatus and that the procedure should not end before these vessels are found.

The findings of this study support the proposal of some authors to consider posterior epistaxis as a different entity to anterior bleeding and for the primary treatment of these patients to be surgical, specifically endoscopic cauterization of the bleeding site and/or of the sphenopalatine artery. In this way, the need for secondary treatment, the length of the hospital stay, and, consequently, the cost as well, are all reduced. The morbidity associated with posterior packing is also avoided7,9,11,12.

Among other factors that restrict the interpretation of the studies on the subject (including this one) is the absence of protocols for conducting the procedures. Anteroposterior packing for example can be done in three different ways (gauze, Foley probe® or Epistat®); furthermore, most studies include patients with anterior bleeding in the study group (some are catalogued as difficult-to-manage epistaxis).

Additional studies, controlled clinical trials in particular, could help to clarify some of the doubts regarding which should be the initial measure taken in the management of posterior epistaxis. These studies should only include patients with posterior epistaxis and compare the efficacy and cost of anteroposterior packing, selective arterial embolization and endoscopic cauterization of the SPA, (given its low morbidity and high efficacy, endoscopic cauterization of the SPA is, without doubt, the surgical procedure of choice). Experienced staff, surgeons and surgical radiology departments should be involved to avoid the learning curve figuring as a confusion factor when interpreting the results.

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