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SAFETY AND EFFICACY OF TRANSARTERIAL EMBOLIZATION THERAPY IN PATIENTS WITH UNCONTROLLED EPISTAXIS: A SINGLE-CENTER RETROSPECTIVE OBSERVATIONAL STUDY

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Abstract

Aim: This study aimed to present technical details and outcomes of endovascular treatment of patients who underwent endovascular embolization due to resistant and recurrent epistaxis in our center.

Methods: In this study, between January 2014 and January 2020, the patients who underwent endovascular treatment due to epistaxis in the interventional radiology unit at our hospital were evaluated retrospectively.

Results: In this study, 4 (25%) female and 12 (75%) male patients were included in 16 patients. The mean age of the patients was 56.6 ± 17.8 years. The etiologies of epistaxis of the patients were as follows; 4 (25%) patients had nasal angiofibroma, 1 (6.2%) patient had larynx carcinoma, 1 (6.2%) patient had nasopharynx carcinoma, 1 (6.2%) patient had aneurysm rupture, 1 (6.2%) patient had epistaxis due to anticoagulant use, 8 (50%) patients had idiopathic epistaxis. In total, endovascular embolization was performed in all 18 procedures performed. In all 16 patients who underwent embolization, 100% technical success was achieved during the procedure, and no complications developed in the follow-up. However, in 2 (12.5%) procedures, embolization therapy was performed for the second time due to recurrent epistaxis after embolization.

Conclusions: In resistance and recurrent epistaxis cases, endovascular embolization is an alternative to surgical methods, a treatment method with a low risk of complications and a high success rate.

Keywords: *Resistant Epistaxis, endovascular treatment, embolization, interventional radiology*

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Introduction

Epistaxis occurs once in a lifetime in 60% of the population. It is one of the most common reasons for applying to the emergency department[1]. However, it stops spontaneously in most patients or can be treated with simple medical intervention[2]. In a group of patients, resistant and recurrent bleeding may occur. As a result, hypotension, aspiration, hypoxia, and life-threatening complications may be observed [3].

Epistaxis can be seen in all age groups, but its frequency has increased significantly in people under the age of 20 and over 50 [4,5]. The factors involved in the etiology can be classified into local and systemic factors. Although these are mostly not detectable, local factors include trauma, foreign body, nasal surgical procedures, malignancies, nasal septum anatomical deformities, vascular aneurysms, nasal papilloma, and adenocarcinomas. Systemic factors are hypertension, coagulopathy, and hereditary hemorrhagic telangiectasia[6-8].

The anatomical region where epistaxis occurs most often is the anterior nasal septum, the Kisselbach's plexus, or the Little area [9]. The Kisselbach's plexus consists of the major palatine artery, the sphenopalatine artery, the anterior ethmoidal artery (AEA), and the superior labial arteries. The second most common area is in the Woodruff plexus. It is located at the posterior end of the meatus media, where the sphenopalatine artery enters the nasal cavity and consists of anastomoses between the branches of the internal maxillary artery (IMA)[9,10]. According to the etiology, the place of epistaxis varies; for example, in systemic diseases, it most often occurs in the posterior nasal cavity. Anterior epistaxis management is easier and has a better prognosis than posterior hemorrhages[10].

Epistaxis treatment is divided into non-surgical and surgical methods. Non-surgical methods of treatment are the application of direct pressure or local vasoconstrictor agents and tampons with gauze. Surgical methods include cryosurgery, artery ligation, or septoplasty[11]. Endovascular embolization therapy may be an alternative to surgical treatment methods in patients with resistant and recurrent epistaxis. In the literature, there are few studies on the use of this method of treatment[12,13].

This study aimed to present technical details and outcomes of endovascular treatment of patients who underwent endovascular embolization due to resistant and recurrent epistaxis in our center.

Materials and Methods

In this study, between January 2014 and January 2020, the patients who underwent endovascular treatment due to epistaxis in the interventional radiology unit at our hospital were evaluated retrospectively. Prior to the study, approval was obtained by the Clinical Research Ethics Committee in accordance with the Helsinki declaration (102/2020). Written consent was obtained from all patients before the interventional procedure.

Patients Population

Patients treated for epistaxis resistant to medical treatment in our hospital or an external center were included in the study. Patients with a high risk of developing contrast nephropathy and, therefore, unable to perform catheter angiography or who are not hemodynamically stable were excluded from the study. The hospital information system was scanned retrospectively. The demographic and clinical characteristics of the patients, the technical details of the endovascular treatment, the success rate, and the complications were examined.

The Endovascular Treatment

Endovascular treatments were performed in the interventional radiology department. All procedures were performed with local anesthesia. After the patient was taken to the angiography table, the inguinal region was sterilized in the standard way. A 5Fr short

introducer sheath was inserted into the right main femoral artery using the Seldinger technique. 5 French (Fr) pig-tail catheter was used to perform angiography of the arcus aorta. Then, diagnostic catheters suitable for the patient's arcus aorta were selected. Standard two directions (anterior-posterior and lateral) angiography images for external and internal carotid arteries were obtained. Pathologies that may lead to epistaxis were tried to be detected. The internal or external carotid artery was selectively catheterized with a 5 or 6-Fr-long introducer sheath or guide catheters for embolization. To prevent the risk of catheter-related thromboembolism, the lumen of these catheters was infused with pressurized serum. If there were no contraindications in the patient, bolus-low doses of intravenous heparin were administered.

The microcatheter for super-selective catheterization was selected in accordance with the embolizing material to be used. Microcatheters with an internal diameter of 1.7 to 2.3 Fr were used together with a 0.014-18-inch hydrophilic guidewire. The embolizing material was selected depending on the dimension of the artery to be embolized, the presence of intracranial anastomosis, and the vascular lesion that caused bleeding. In addition, when no lesion was causing epistaxis, the patient's nasal tampons and balloon were removed to determine the target vein, and imaging was performed. The first segment, the exit of the middle meningeal artery and accessory meningeal arteries, was passed during embolization from the internal maxillary artery. The presence of anastomoses between the sphenopalatine artery and the ophthalmic artery was checked to prevent complications. To avoid embolization-related cranial nerve damage, particles larger than 100 microns were selected for embolization.

After embolization, the tampons were removed while the patient was still at the table to control bleeding. Two-direction angiographs were performed to check whether the bleeding was continuing; the procedure should be terminated by conducting a visual assessment of the bleeding site and a basal neurological examination.

Statistical Analysis

The patient's demographic data and clinical characteristics were analyzed using the SPSS 13.0 package program. Descriptive statistical data were expressed as mean ± standard deviation and frequency (%).

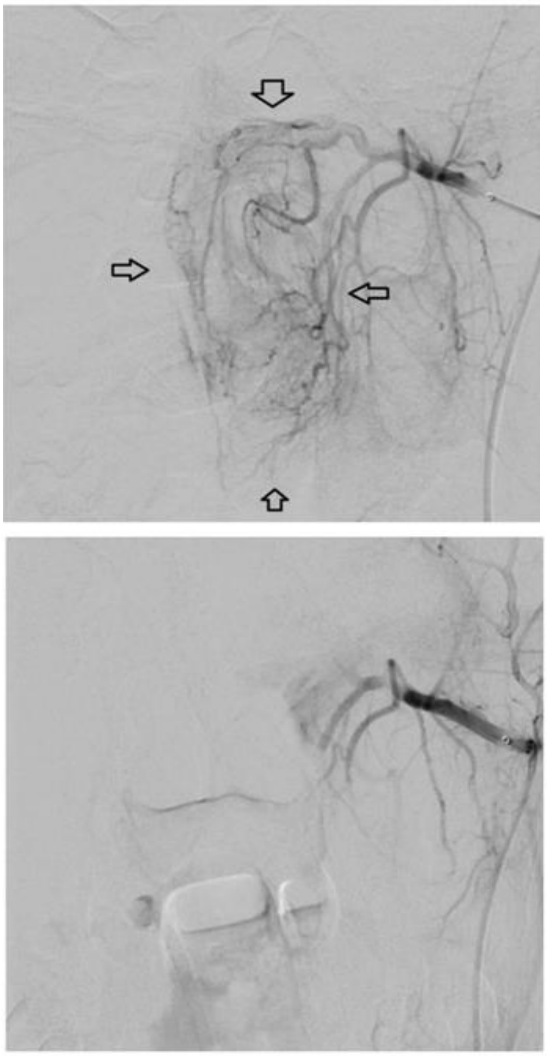

Figure 1. Embolization procedures

Results

In this study, 4 (25%) women and 12 (75%) men, 16 patients, and 18 endovascular embolization treatments were performed. The mean age of the patients was 56.6 ± 17.8 years. At the time of admission, 6 (17.5%)

patients had headaches, 2 (12.5%) patients had tinnitus, 1 (6.2%) patient had dizziness, and 2 (6.2%) patients had a sero-hemorrhagic discharge. Eight (66.7%) patients had no complaints other than epistaxis.

The etiologies of epistaxis of the patients were as follows; 4 (25%) patients had nasal angiofibroma, 1 (6.2%) patient had larynx carcinoma, 1 (6.2%) patient had nasopharynx carcinoma, 1 (6.2%) patient had aneurysm rupture, 1 (6.2%) patient had epistaxis due to anticoagulant use, 8 (50%) patients had idiopathic epistaxis. All 18 embolization procedures were achieved with 100% technical success (Figure 1); when nasal tampons were removed, no signs of active extravasation were observed in the images taken. No complications were observed in clinical follow-ups. However, due to recurrent epistaxis within the firstone1 week after treatment, two patients had to undergo endovascular treatment for the second time. The first of these patients was a 65-year-old male patient. The cause of epistaxis was idiopathic. The first endovascular treatment applied embolization to the left internal maxillary artery with 500-micron microspheres. He was treated for the second time due to a recurrence of epistaxis. Second embolization was performed bilaterally to the internal maxillary arteries with a microsphere of 200-micron.

The other patient was a 72-year-old male patient. The cause of epistaxis was idiopathic. In the first endovascular treatment, embolization was applied bilaterally to the internal maxillary arteries with 400 microns-sized microspheres. The patient was admitted three days after the treatment due to recurrent epistaxis. In the second endovascular treatment, endovascular therapy was applied to the left internal maxillary artery with 500-micron-sized microspheres.

For embolization with endovascular therapy, polyvinyl alcohol in 6 (33.3%) procedures, microspheres in 11 (61.1%) procedures, and a coil in 1 (5.5%) procedure were used. The vascular structures that underwent endovascular embolization due to epistaxis are presented in Table 1.

Table 1. The vascular structures that underwent endovascular embolization due to epistaxis.

Vessels	n (%)
Bilateral internal maxillary artery	8 (50%)
Facial artery and ipsilateral internal maxillary	3 (16.7%)
Left internal maxillary artery	2 (12.5%)
Sphenopalatine branch of the internal maxillary artery	1 (6.2%)
Petrous segment of the right internal carotid artery	1 (6.2%)
External carotid artery	2 (12.5%)

Discussion

Epistaxis is an acute health problem often encountered, especially in daily clinical practice[1,2]. In some patients, epistaxis is resistant to treatment and recurs frequently. In such cases, epistaxis may be life-threatening, and surgical treatment methods may be required[14,15]. In recent years, studies have shown that embolization with endovascular therapy can be an alternative to surgical artery ligation[15,16]. This study presents technical details and outcomes of endovascular treatment of patients who underwent endovascular embolization due to resistant and recurrent epistaxis in our center.

Tampon therapy is the most used method as a first-line treatment in epistaxis. Bleeding control can be achieved by placing a tampon with adrenaline, lidocaine, epinephrine, and lidocaine in the nasal passage[17]. This study determined that tampon was performed most often in patients as the first treatment in accordance with the literature data. However, in patients with a tumor that caused bleeding, endovascular embolization therapy was first performed, considering that bleeding may be resistant.

It is noted that only in 10-15% of patients with epistaxis the etiological cause can be determined, while others are called idiopathic epistaxis[16-18]. In this study, most of the cases consist of idiopathic epistaxis cases in accordance with the data in the lit-

erature. Other causes detected in patients have been nasal angiofibroma, aneurysm, and larynx carcinoma.

Pallin et al.[5], in their study, which included ten years of data published in 2005, stated that epistaxis cases peaked in individuals under the age of 10 and over 50. Epistaxis in childhood is twice as common as in the adult age group, and when considering the children's age group, more than half of people experience epistaxis at least once in years[5,19]. However, epistaxis in the childhood group usually does not require treatment; cases aged 50 years and over need treatment[20]. In this study, the mean age of the patients was 56.6 ± 17.8 years.

Epistaxis most often occurs in Kiesselbach's plexus and Woodruff's plexus[21]. In accordance with the literature, in this study, in 18 procedures where endovascular embolization was performed due to epistaxis, it was observed that the bleeding area was most often caused by these plexus areas when considering the embolized vascular structures.

When the studies related to embolization of epistaxis with endovascular treatment were evaluated, it was determined that the success rate depending on the procedure varied between 70% and 100%[2,12,22]. Seidel et al.[23], endovascular embolization therapy using a coil was performed in 12 patients due to epistaxis. Siedel et al.[23] found the procedure's clinical success rate was 75%. These patients did not develop complications such as stroke, vision loss, or tissue necrosis. Hayes et al.[24], 46 patients with resistant epistaxis were treated by an endovascular treatment using an n-butyl cyanate embolizing agent. Haye et al.[24], found an 89% success rate of the procedure and observed no complications. In this study, polyvinyl alcohol and microsphere microparticles were used in most of the procedures. The technical success rate is 100%. There were no complications in any of the procedures. Due to the fact that two patients had recurrent epistaxis despite treatment, two sessions of endovascular embolization treatment were performed. In both procedures, bleeding control was provided after the second embolization procedure. No recurrent epistaxis was observed. This study's first endovascular embolization treatment success rate was 88.9%. The success rate of embolization treatment for epistaxis was also consistent with the literature data.

Study Limitations

There are a number of limitations to this study. Firstly, due to the study's retrospective nature, the number of patients included is limited. Secondly, the embolization agents used in this study could not be compared among themselves and with surgical treatment methods in terms of effectiveness and safety due to the limited number of patients. Thirdly, the etiologies of epistaxis of the patients included in this study were heterogeneous, and the effectiveness of endovascular treatments could not be evaluated according to different etiological factors. However, despite all these limitations, important clinical information and technical details about the treatment of endovascular embolization in resistant and recurrent epistaxis patients were presented in this study.

Conclusion

Endovascular embolization treatment in patients with resistant and recurrent epistaxis can be an alternative to surgery, a safe and effective treatment method. However, to obtain more data about this treatment method, future studies are needed in which many patients are examined, and the effectiveness and safety of endovascular therapy are compared with other treatment methods.

Main Points: In some patients, epistaxis is resistant to treatment and recurs frequently. Resistant and recurrent epistaxis may be a life-threatening condition.

Endovascular embolization treatment in patients with resistant and recurrent epistaxis can be an alternative to surgery, a safe and effective treatment method.

Author contributions
HBO: Surgical and medical practice, concept, data collection or processing, analysis or interpretation, literature search, writing.
MRM: Data collection or processing, analysis or interpretation, literature search, writing.
FCP: Surgical and medical practice, concept, data collection or processing, analysis or interpretation, literature search, writing.
SS: Surgical and medical practice, concept.
EO: Surgical and medical practice, concept.

Conflict of interest
The authors declare that they have no conflict of interest.

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Ethical approval
This study was approved by the Cukurova University Institution Ethics Committee (102/20).

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