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Embolization of carotid artery branch in intractable epistaxis

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Summary

Background:

Long-term intractable epistaxis results in a series of complications including demise. Unprofessional therapy may account for severe topical and systemic complications. The authors assessed the efficacy and safety of embolization treatment of intractable epistaxis with the use of available embolizing materials.

Material/Methods:

Embolization was performed in 58 patients (39 males aged 24–48 and 19 females aged 26–44) admitted to the ENT Department, Medical University of Białystok in years 2000 – 2005.

Results:

65 embolization procedures, including reembolizations, were performed. In 41 procedures (63%) a sponge was used, in 14 (21.6%) PVA, in 10 (15.4%) PVA and coils. In 9 patients, bleeding of a lesser intensity recurred within early hours following the procedure – 84.5% embolization success. On longer follow-up, embolization success was assessed to be 100%.

Conclusions:

Embolization with the use of proper embolisation materials is an efficient method of arresting spontaneous and posttraumatic epistaxis and may be a safe treatment procedure when performed by experienced medical personnel.

Key words:

Epistaxis • carotid artery • embolization

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Background

Epistaxis is a disorder affecting ca. 60% of population. With such incidence, it is the second most frequent type of bleeding. It has been estimated that from 3% to 6% of patients require treatment because intensive or long-lasting epistaxis may lead to a decrease of arterial blood pressure, hypoxia of tissues and organs, and even to hemorrhagic shock [1, 2, 3, 4]. The most frequent conditions leading to epistaxis include: arterial hypertension, hematologic and infectious diseases, Rendau-Osler disease, traumas of the head and tumors. The factors that may contribute to the occurrence of epistaxis include: alcohol abuse, tobacco smoking, low air humidity and the use of anticoagulants. Systemic causes are estimated to account for ca. 70% of cases [3, 5, 6, 7, 8, 9].

The management of patients with epistaxis should be characterized by determination and consideration. Incorrect therapy may cause dangerous local and systemic complications. The most common and available methods of treatment, such as anterior and/or posterior packing, thermal or chemical coagulation, are usually effective and sufficient to arrest low-intensity bleeding, especially from the anterior part of the nasal cavity. Frequent insufficiency of these methods in the cases of massive hemorrhages from the posterior part of the nasal cavity necessitates surgical treatment or embolization [3, 9, 10, 11]. Ligation of the external carotid artery branch – the maxillary artery or the ethmoidal arteries – not always arrests the bleeding because of vascular anomalies, which occur in 10–15% of cases and/or extensive tissue damage, as well as because of easy development of collateral circulation [3, 12, 13].

Embolization is winning increasing popularity as a highly effective method. A variety of new embolization materials has been developed. However, embolization procedures are still associated with the risk of complications such as cerebral stroke, paresis or hemiparesis, and even death. Focal ischemia and necrosis of facial skin may also occur [3, 14].

The aim of the study was to assess the effectiveness and safety of the treatment of epistaxis with the use of selected embolization materials.

Materials and methods

Embolization was performed in 58 patients (39 males aged 24–48 and 19 females aged 26–44) admitted to the ENT Department, Medical University of Białystok in years 2000–2005 because of massive epistaxis resistant to con-

servative treatment. Radiological diagnostics and embolization procedures were performed in the Department of Radiology, Medical University of Białystok.

Bleeding from the nasal cavity was spontaneous in 42 cases (72.4%) and in 16 patients (27.6%) was a sequel of a trauma. The causes of spontaneous and posttraumatic hemorrhages and their frequency are presented in table I. In none of the patients essential radiological diagnostic revealed any signs of CNS damage.

The embolization procedure was preceded by angiography of the external and internal carotid artery according to Seldinger method, by percutaneous puncture of the right femoral artery under local anesthesia. Headhunter 4 F or 5 F catheters were used. Branches of the carotid artery – the source of bleeding – were visualized under X-ray

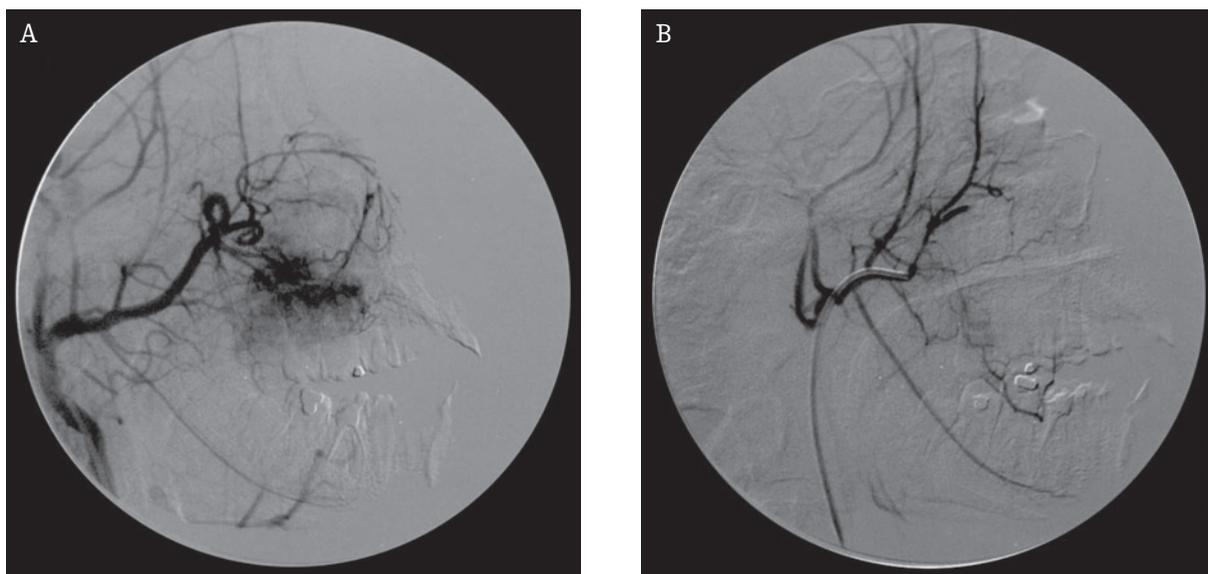


Figure 1. Condition before (A) and after (B) embolization of epistaxis from the branches of the right maxillary artery using PVA particles.

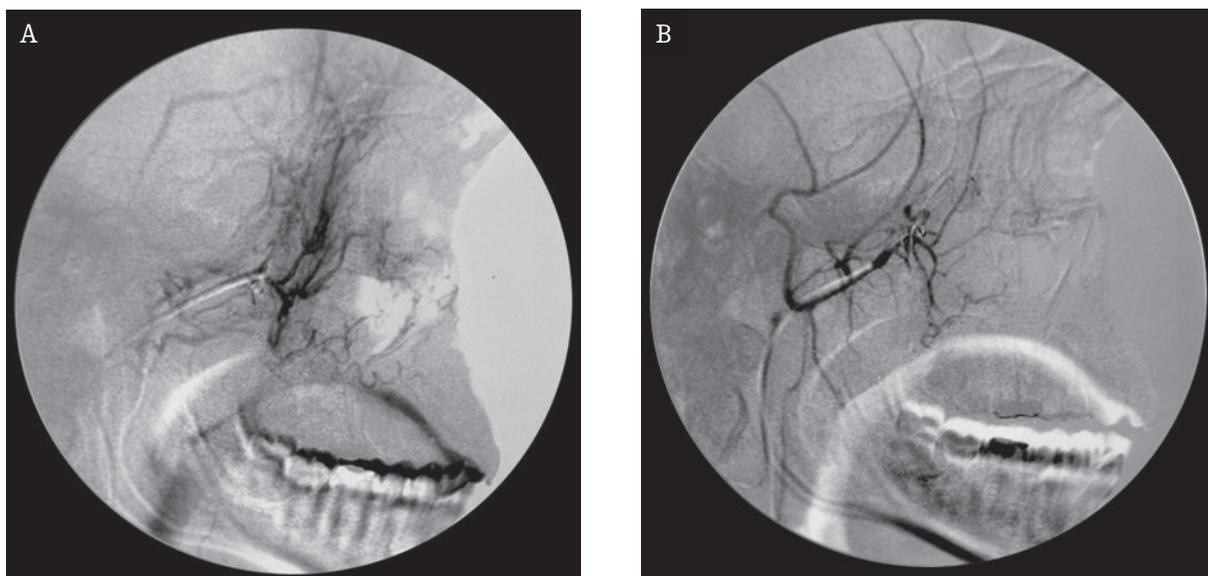


Figure 2. Condition before (A) and after (B) embolization of epistaxis from the branches of the right maxillary artery using a platinum microcoil.

Table 1. Causes of epistaxis in the study group (n=58).

Spontaneous			Posttraumatic		
	n	%		n	%
hypertension	26	44.8	fractures of the bones of paranasal sinuses	8	13.8
alcohol abuse	9	15.5	nasal traumas	6	10.3
idiopathic	6	10.3	fracture of the jaw	2	3.4
Marfan's syndrome	1	1.7			
Total	42	72.4		16	27.6

TV control. The materials used included sponge, embolization coils manufactured by BALT of 2-3 mm size and polyvinyl alcohol (PVA) in 250 to 750 micron granulation. The progress of embolization was monitored by means of repeated angiograms. After embolization of the internal maxillary artery (IMAX), the extent of collaterals of the ipsilateral facial artery and of the contralateral internal maxillary artery was assessed. A large number of collaterals led to extension of the embolization procedure to include these vessels. The success of the procedure, i.e. no recurrences of the hemorrhage without nasal packing was assessed in the early period – during the first 7 days after the procedure and in distant follow-up – up to 12 months.

Results

65 embolization procedures, including reembolizations, were performed. In 41 procedures (63%) a sponge was used, in 14 (21.6%) PVA, in 10 (15.4%) PVA and coils. In our material, there were 19 (29.2%) unilateral and 30 (46.1%) bilateral embolizations of the internal maxillary artery. Unilateral embolization of the internal maxillary artery and unilateral embolization of the facial artery was performed during 4 (6.1%) procedures. 6 procedures (9.2%) involved bilateral embolization of the internal maxillary artery with unilateral embolization of the facial artery. During the remaining 6 procedures (9.2%), both the facial artery and the internal maxillary artery were embolized bilaterally.

Beneficial therapeutic effect, i.e. cessation of bleeding, was obtained immediately after the procedure in all the cases. During the next hours of observation, no recurrences of the hemorrhage were observed in 49 patients – short-term success of embolization (84.5%). Nasal packing was effective only in 2 out of 9 patients with bleeding recurrences. Control angiography performed in the remaining patients demonstrated the sources of recurrent hemorrhages. Repeated procedures involved unilateral embolization of the facial artery in 3 cases, and in 4 bilateral embolization of the internal maxillary arteries. In 4 cases, a sponge was used, and in 3 cases PVA and embolization coils, obtaining a good therapeutic effect.

No serious complications associated with the central and peripheral nervous system were noted. The disorders and their duration are presented in table II. Good general condition of the patients and no recurrences of bleeding allowed their discharge from hospital after 3–4 days. Thirteen patients requiring further treatment were transferred to specialist centers. Control examinations that the emboli-

Table 2. Complications following the embolization procedure.

Type of complication	n	%	Duration (days)
Headache	9	15.5	2–3
Facial edema	3	5.2	3–4
Total	12	20.7	

zed patients underwent during the period up to 12 months after the procedure did not reveal any cases of bleeding recurrences, distant neurological or laryngological complications. Long-term success of the embolization procedures reached 100%.

Discussion

Epistaxis occurs most frequently as a result of damage to the ethmoidal arteries – branches of the ophthalmic artery supplied by the internal carotid artery, the nasopalatine and sphenopalatine arteries, which are branches of the maxillary artery arising from the external carotid artery, Vidian arteries and the capsular branches of the internal carotid artery [8, 15]. Embolization introduced by Duggan in 1970 for arresting posttraumatic epistaxis is still a popular technique [3, 4, 16]. In laryngology, it has also been applied to limit intraoperative bleeding and in treatment of intracranial complications of disorders of the ears and paranasal sinuses [11]. The reported variety of the causes of epistaxis is notable. The most frequent causative factor among the patients treated in the Department of Radiology was arterial hypertension, and, to a lesser extent, alcohol abuse. Idiopathic epistaxis accounted for 10.3% of cases only. Christiansen reports idiopathic epistaxis as the most common cause accounting for 61% of cases [9], whereas according to Luo it is most frequently due to tumors of the head and neck -58% [17]. We did not note the influence of low air humidity, use of anticoagulants and tobacco smoking, described by Oguni [3] among the causes of epistaxis.

Hemorrhages from the posterior nasal cavity, accounting for 5% of cases, are difficult to treat conservatively [18]. Failures of nasal packing with gauze or a balloon reach 26–52%, and reported complications such as nasal traumas, septal hematomas, abscesses, sinusitis, necrosis, or even death occur in 69% of cases [3, 4, 8, 9, 15, 19]. Surgical treatment involves ligation of one of the external carotid artery branches: the maxillary artery or the ethmoidal arteries [3, 9, 11]. Embolization is recommended in the cases of difficult surgical access to the bleeding vessel or its

supplying branches, and it enables its selective obliteration [3, 15, 20]. Embolization of the proximal IMAX segment is the equivalent of its surgical ligation [2, 10].

Nowadays there is a possibility of using various embolization materials: Kordecki used sponges of 1–2 mm particle size, [12, 13]; Luo – sponges, PVA and detachable balloons [17]; Ernest – embolization coils (2); Oguni – sponges, coils and their combinations [3]; Borsa and Christiansen – sponges, PVA, coils (9, 19), Mahadevia –N-butyl-cyanoacrylic glue [4]. In idiopathic epistaxis, we used sponges, PVA, or PVA in combination with embolization coils were used for embolization of epistaxis in the course of Marfan syndrome and posttraumatic hemorrhages.

The internal maxillary artery is one of the most frequently embolized blood vessels. Depending on the results of angiography, the procedure is performed uni- or bilaterally, sometimes with additional embolization of another blood vessel, most often the facial artery [8, 9, 10, 11]. In 46.3% of the procedures, the IMAX was embolized bilaterally. Unilateral embolization of the IMAX or the facial artery, or uni- or bilateral embolization of both the IMAX and the facial artery was necessary in a lower number of patients.

In the presented material of 58 embolized cases, high therapeutic efficacy, reaching 84.5% in the early postoperative period and 100% in the distant period, was obtained. All authors emphasize high effectiveness of embolization, reaching 86.3–100% success rates [2, 3, 8, 11, 20].

An undoubted advantage of embolization is the possibility of localization of the damaged blood vessel by angiography and performing the essential procedure obliterating the damaged and bleeding artery at the same time [21]. Procedures performed with extreme caution and by experienced operators carry a mortality risk of ca. 0.03% and morbidity risk of ca. 1.73% [21]. In order to limit life-threatening neurological complications, according to Brennan et al., preoperative assessment of flow in the encephalopetal arteries is necessary. It can, among others, demonstrate additional extracranial vascular relations that may lead to unintentional intracranial embolization [22]. The use of coils for IMAX embolization prevents migration of the embolization material through collaterals to the internal carotid artery [2]. The relative ease of the procedure makes it possible to be repeated in case of recurrence of the epistaxis [7, 8, 9]. The literature contains descriptions of postembolization complications such as infarcts of the brain, cranial nerve paralysis, loss of vision [15]. Most frequently, however, in ca. 45% of cases, the observed complications are mild [3, 9, 15]. We did not observe significant complications in any of the patients who underwent embolization in our Department.

Considering our own experience, we conclude that:

1. Embolization with the use of proper embolization materials is an efficient method of arresting spontaneous and posttraumatic epistaxis.
2. Embolization of the carotid artery branch in the treatment of epistaxis performed by experienced medical personnel reduces the risk of complications.

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