Intractable epistaxis: Transantral ligation vs. embolization: Efficacy review and cost analysis

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After posterior nasal packing, the two most common therapies for intractable epistaxis are transantral ligation of the internal maxillary artery and percutaneous embolization of the distal internal maxillary artery. However, optimal management of intractable posterior epistaxis remains controversial. We retrospectively reviewed the charts of 21 patients treated for intractable epistaxis and obtained data on presentation, risk factors, treatment, success rates, complications, and cost. Twelve patients received percutaneous embolization, five underwent transantral ligation, and four required both. The success rates for transantral ligation and percutaneous embolization were 89% and 94%, respectively. No mortality or serious morbidity occurred with either technique. A cost comparison revealed that transantral ligation was moderately less expensive than percutaneous embolization ($5941 vs. $6783). Although some authors advocate transantral ligation or percutaneous embolization as the procedure of choice for intractable epistaxis, a direct comparison of efficacy and cost reveals that they are comparable procedures with specific strengths and weaknesses. We present our experience and a review of the literature, highlighting the indications and advantages of each technique. We conclude that the choice of treatment modality should be based on the benefits of each procedure as it pertains to the specific needs of the individual patient. (OTOLARYNGOL HEAD NECK SURG 1995;113:674-8.)

Approximately 60% of the adult population will have epistaxis. Fortunately, medical intervention is required in only 6% of these cases.[1] Eighty percent of all epistaxis originates from the anterior septum[2] and is readily controlled with cautery and anterior packing. Unfortunately, posterior bleeding is much more problematic. This is illustrated by the myriad of treatment options advocated in the literature: posterior nasal packing, electrocautery, cryotherapy, vascular ligation and embolization.

Traditionally, there is an ascending scale of treatment for epistaxis: anterior rhinoscopy with silver nitrate cautery, anterior nasal packing, endoscopically guided electrocoagulation, and posterior nasal packing. Transantral ligation (TAL) of the internal maxillary artery (IMA) was first described by Seiffert[3] in 1928 and was popularized by Chandler and Serrins[4] in 1965. This procedure has traditionally stood as the definitive treatment of posterior epistaxis after unsuccessful posterior nasal packing. In 1974 Sokoloff et al.[5] described the first two cases of epistaxis treated with percutaneous embolization (PE). Since that time, this technique has been standardized by Lasjaunias and Berenstein,[6] and some authors have advocated it as the modality of choice for intractable posterior epistaxis.[7]

Although several recent citations compare TAL with PE, no comparison of each, including a cost analysis, has been published. We review the recent literature for indications, advantages, success rates, and complications of each modality. We also present our experience with 21 patients treated with a total of 16 PEs and 9 TALs.

PATIENTS AND METHODS

From March 1983 to December 1993, 21 patients came to the University of Utah Department of Otolaryngology with intractable epistaxis requiring surgical intervention. There were 16 men and 5 women, ranging from 27 to 84 years of age (mean, 56

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Table 1. Summary of 21 cases of intractable epistaxis

Patient no.	Age (yr)/sex	Cause	Treatment	Hospital stay (days)
1	68/M	HHT	PE	3
2	39/M	Idiopathic	PE	2
3	84/M	Coumadin	PE (×2)	3/3
4	65/M	Idiopathic	PE	4
5	65/M	Idiopathic	PE	0
6	46/M	Idiopathic	PE	2
7	66/M	Idiopathic	PE	0
8	69/F	Idiopathic	PE	2
9	46/F	Alcoholic, coagulopathy	PE	8 (died)
10	58/M	Idiopathic	PE	0
11	65/M	ITP	PE	8 (died)
12	48/F	Idiopathic	PE	1
13	30/M	Idiopathic	TAL	8
14	76/F	Idiopathic	TAL	6
15	32/M	Idiopathic	TAL	1
16	27/F	Portsmouth disease	TAL	4
17	44/M	Idiopathic	TAL	5
18	74/M	Idiopathic	TAL/PE	2/1
19	67/M	HHT	TAL/PE	2/2
20	35/M	Idiopathic	TAL/PE	2/5
21	73/M	Idiopathic	TAL/PE/MM	9

HHT, Hereditary hemorrhagic telangiectasia; *ITP*, idiopathic thrombocytopenic purpura; *MM*, medial maxillectomy.

years). Fifteen patients had an idiopathic etiology, two had hereditary hemorrhagic telangiectasia, and four had other coagulopathies (Table 1). Before any radiologic or surgical intervention, initial treatment with anterior and posterior nasal packing failed in all patients. Twelve patients underwent PE alone, five had TAL alone, and four had TAL followed by PE. Of the final group, PE was performed at 8 months, 10 months, and 4.5 years after TAL. The final patient underwent two attempts at TAL before presentation and subsequently failed both TAL and PE at our institution. Bleeding was ultimately controlled with a medial maxillectomy. Two of the five patients who had TAL underwent ligation of the anterior ethmoid artery.

Angiography and embolization were performed with patients under local anesthesia with sedation. Through a transfemoral route, a Seldinger technique was used to cannulate the vessel. A 5F to 7F sheath (with a 5F to 7F guiding catheter) was used to angiographically study the internal and external carotid system in an attempt to localize the bleeding site. Once the anatomy was determined and significant pathology such as aneurysms or arteriovenous fistulas had been ruled out, selective embolization of both distal IMAs was performed with polyvinyl alcohol particles averaging 200 to 300 μm (Tracker microcatheter; Target Therapeutics, San Jose, Calif.). Embolization of the ipsilateral facial artery was performed if collateral flow was believed to be the source of continued bleeding. Postoperative angiography was then performed to evaluate the embolization and any continued bleeding.

TAL was performed through the traditional Caldwell-Luc approach as described by Pearson et al.[8] and Chandler and Serrins.[4] Approximately 1 cm^2 of the posterior maxillary wall was removed to gain access to the pterygomaxillary fossa. The IMA and collaterals were then identified with the operating microscope. Surgical clips were placed on the proximal portion of the IMA, followed by the descending palatine and distal IMA (i.e., sphenopalatine/posterior nasal arteries).

RESULTS

Control of Epistaxis

TAL successfully controlled epistaxis in eight (89%) of nine patients (Table 2). Three patients returned with recurrent epistaxis 8 months, 10 months and 4.5 years later and were successfully embolized.

Catheter embolization successfully controlled epistaxis in 15 (94%) of 16 patients (Table 2). One patient returned 7 months later with recurrent epistaxis and was successfully reembolized.

Both TAL and PE failed in one patient. He ultimately underwent a medial maxillectomy, which controlled the hemorrhage.

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Table 2. Literature review: TAL vs. PE

Author	Year	No. of patients	Success rate (%)	Complication rate (%)	Length of stay (days)
TAL					
Rosnagle[17]	1973	60	90	8	4.7
McDonald[18]	1980	46	87	30	—
Wang[9]	1981	82	86	40	5.6
Nair[19]	1982	12	92	33	4.5
Schaitkin[2]	1987	32	76	47	7.4
Metson[13]	1988	100	91	—	—
Present study	1994	9	89	11	3.9
TOTAL			87	28	
PE					
Sokoloff[5]	1974	2	100	—	—
Roberson[20]	1979	10	80	30	—
Hicks[21]	1989	7	100	57	—
Strutz[22]	1990	11	91	—	—
Siniluoto[11]	1993	31	71	3	—
Elden[10]	1994	108	88	25	—
Present study	1994	16	94	19	2.7
TOTAL			89	27	

Table 3. Cost comparison: TAL vs. PE

Procedure	Average cost*
TAL	
Hospital room ($535.00/day)	Average 3.9 days = $2087
Surgeon fee	$1544
Operating room fee	$1830
Anesthesiologist fee	$480
TOTAL	$5941
PE	
Hospital room ($535.00/Day)	Average 2.7 days = $1445
Interventional radiologist fee	$1500
Angiography suite fee	$3523
Anesthesiologist fee	$315
TOTAL	$6783

*Comparison based on analysis of eight patients. Prices are projected to 1994 costs for those patients treated previously.

Cost

A comparison of TAL vs. PE at our institution reveals that the surgeon and neuroradiologist fees are quite comparable ($1544 vs. $1500). The average cost of the angiography suite is higher than that of the operating room ($3523 vs. $1830). However, the longer average length of stay for TAL (3.9 days = $2087) vs. PE (2.7 days = $1445) brings the cost of PE to within $842 (Table 3).

DISCUSSION

Efficacy

Optimal treatment for intractable posterior epistaxis is controversial. Failure rates for posterior packing range from 26% to 52%.[2,9] Although TAL has traditionally stood as the definitive treatment for posterior epistaxis, recent citations have shown PE to be equally effective.[10] A review of the literature reveals the success rate for both TAL and PE to be approximately 85% to 90% (Table 2). Our results compare favorably with these data: TAL, 89%, and PE, 94%.

The most common definable cause of failure for PE is anterior ethmoid bleeding.[6,11,12] The anatomy of the ethmoidal arteries is varied. In some instances they arise in part or solely from the sphenopalatine artery and can be embolized. In other instances the ethmoidal arteries arise from the ophthalmic branch of the internal carotid artery, preventing embolization. In this case surgical intervention is indicated.

The most common cause of failure for TAL is the inability to accurately identify and ligate the IMA.[13] Localization of the IMA in the pterygomaxillary fossa is challenging, and clips may be placed on smaller vessels mistaken for the IMA.

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Table 4. Advantages/indications: TAL vs. PE

Parameters	PE	TAL
Advantages	Local anesthesia Distal embolization High success rate Pretreatment angiogram Shorter hospitalization	Common technique High success rate Ethmoid ligation
Disadvantages	Specialized technique	General anesthesia Longer hospitalization
Relative indications	Intractable epistaxis Cardiovascular instability Unsuccessful TAL	Intractable epistaxis Anterior ethmoid bleeding Unsuccessful PE
Relative contraindications	Severe atherosclerosis Anterior ethmoid bleeding Dangerous vascular anomalies Dye allergies	Cardiovascular instability

Table 5. Complications: TAL vs. PE

TAL	PE	Both
Sinusitis Hemorrhage Oroantral fistula Dental injury	Hemiplegia Facial paralysis Skin necrosis	Facial parasthesias Facial pain Hematoma Ophthalmoplegia Blindness

In the event of persistent epistaxis, both techniques are repeatable. However, in our experience, a good working relationship between the otolaryngologist and the neuroradiologist provides the greatest chance for success.

Indications

Both TAL and PE have distinct advantages in different clinical situations (Table 4). Some of the most common considerations include the following.

Cardiovascular status. Cardiovascular stability is a major issue in elderly, anemic patients. PE is advantageous because it can be performed with the patient under local anesthesia and eliminates the risk of a general anesthetic required for TAL.

Source of bleeding. Although both procedures are equally efficacious for occlusion of the IMA. PE has the advantages of a pretreatment angiogram and distal embolization. However, if the anterior and posterior ethmoid arteries are isolated branches of the internal carotid system, they cannot be embolized, and TAL is indicated.

Underlying vascular disease. In rare instances patients with marked atherosclerosis of the proximal external carotid artery may have limited access to the IMA for embolization, and TAL is indicated.

Hospital resources. Interventional radiology is a rapidly growing field. However, it still remains a specialized technique not available at all institutions. TAL is more widely available. Therefore the choice of treatment modality also depends on the availability of personnel and facilities.

Cost

Although cost containment has moved to the forefront in medical care, *quality of care* must be the motivating factor behind therapy. Although PE is moderately more expensive at our institution (Table 3), we choose the appropriate treatment modality based on the needs of the individual patient. We incorporate factors such as patient history, age, hematocrit level, and location and cause of bleeding, as well as the patient's desires, before making a treatment decision.

Complications

Multiple complications have been reported for TAL and PE (Table 5). Although most risks for TAL are relatively minor (sinusitis, oroantral fistula, dental injury, parasthesias), there is a small but finite risk of blindness and ophthalmoplegia.[14] The patient must also undergo general anesthesia, which can be a significant risk to an elderly, anemic patient.

Local complications of PE are primarily caused by

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tissue ischemia (parasthesias, skin sloughing). Although these are relatively minor complications, endovascular therapy has an inherent risk of aberrant flow of embolization material. This can result in facial paralysis or stroke.[7,12,15,16]

Historically, the complication rates for both of these procedures are similar: TAL, 28%, and PE, 27% (Table 2). Major complications are rare and have appeared mainly as isolated case reports.[14-16] Our results compare favorably with those in the literature. Morbidity for TAL was 11% and consisted of one injury to the second division of the trigeminal nerve with postoperative parasthesia. Morbidity for PE was 19% and consisted of three groin hematomas.

Resident Training

Percutaneous embolization for epistaxis occurs primarily at academic institutions and may not be available in the community. Otolaryngology and neuroradiology training programs are also based at academic institutions. Although neuroradiologists must be trained to perform and advance this technique, otolaryngology residents must also receive adequate training in TAL because this may be the only technique available at nonacademic institutions.

CONCLUSION

Our experience and a review of the literature lead us to conclude that TAL and PE are equally efficacious, with similar success rates, complication rates, and costs. Although controversy exists in the literature as to the superiority of each, we believe these techniques are complementary rather than competitive. The otolaryngologist and neuroradiologist should have a good working relationship to provide the most efficacious and cost-effective treatment. We therefore recommend that the choice of treatment modality be based on the strengths of each procedure as they pertain to the specific needs of the individual patient.

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