

Posterior epistaxis: systematic review on the effectiveness of surgical therapies*

Binja Feusi¹, David Holzmann², Johann Steurer¹

¹ Horten Centre, University of Zurich, Switzerland

² Dept. Otorhinolaryngology, HNS, University Hospital, Zurich, Switzerland

SUMMARY

Objective: *The optimal surgical treatment for patients with posterior epistaxis and failed conservative therapy is unknown. Therefore we planned a systematic review studying all available publications assessing the effect on bleeding recurrence and postoperative complications of ligation of the internal maxillary artery or the sphenopalatine artery.*

Methods: *We searched the electronic databases Medline, Medline In Process, and Cochrane Library. Data extraction was performed following standard methods.*

Results: *Twenty-eight studies could be included in the systematic review. All studies were retrospective and no single study comparing different methods could be identified. Fifteen studies reported on the effect of the ligation of the internal maxillary artery (LIMA) and 13 on the effect of the ligation of the sphenopalatine artery (LSA). The severity of postoperative complications and duration of hospital stay seem to be lower in the LSA group. A conclusive statement about the frequency of rebleeding in the two groups is not possible.*

Conclusion: *According to the available data on postoperative complications and duration of hospital stay ligation of the sphenopalatine artery compared favourably to the ligation of the internal maxillary artery. The most effective treatment for patients with posterior epistaxis including costs should be evaluated in a controlled clinical trial.*

Key words: posterior epistaxis, surgery, ligation of internal maxillary artery, ligation of sphenopalatine artery, rebleeding

INTRODUCTION

Epistaxis is a common and most often easily manageable problem. Sixty to 70 percent of adults have experienced an episode, up to 10 percent of who have sought medical attention [1]. It is the most common admission complaint in otorhinolaryngologic practices, although surgical intervention is rarely necessary [2].

About 10% [3] patients visiting a physician present with more severe, sometimes life-threatening epistaxis arising from the larger vessels in the posterior and superior nasal cavity. Major bleeding can compromise the patient's airway and in rare instances results in hemodynamic instability.

In general there are two different options to treat posterior epistaxis. The first one is based upon the principle of packing, and the second is closure of the supplying vessel(s) by either surgical ligation or percutaneous embolization. Short time recurrence rate with nasal packing is considered to be up to 50% [4]. The ideal package time is not known and prolonged packing increases the risk of pressure necrosis and infections in the sinusal region.

The vascular ligation techniques have changed over time from the external carotid artery [5] to the internal maxillary artery [6]

and the sphenopalatine artery [7] with or without ligation of the ethmoidal artery. Ligation of the external carotid artery requires neck exploration with the potential risk of damaging the hypoglossal and vagal nerves is antiquated. Therefore closure of the maxillary or sphenopalatine artery is considered to be the surgery of choice. However, there still is no consensus established which of the two procedures should be performed, although different studies were published assessing the success rates of each technique.

We planned a systematic review using robust methodology, studying all available publications and assessing the effect on bleeding recurrence and postoperative complications of the ligation of the internal maxillary artery or the sphenopalatine artery in the treatment of posterior epistaxis.

MATERIALS AND METHODS

Data Sources

We searched the electronic databases Ovid Medline (1966 - April week 4, 2004), Ovid Medline In Process (7 May 2004), and Cochrane Library (2004, Issue 1). In cooperation with an information specialist we developed a search strategy. The

detailed search strategy for Medline is shown in appendix 1. All searches were conducted in May 2004. No restrictions regarding the language or the year of publication were imposed. By reviewing the bibliographies of relevant primary articles we tried to identify further articles not captured by the electronic searches.

After reading all possibly relevant manuscripts by full-text all authors not reporting details about the included patients or the follow time were contacted to provide the missing data.

Study Selection

Studies were included if the adult population consisted of patients with posterior which were surgically treated either by ligation of the internal maxillary artery or the sphenopalatine artery. Studies in which the arteries were occluded by percutaneous embolization techniques were excluded. All studies including RCT, cohort studies, and case series were included. Case series were only included with a minimum of three patients. The minimal follow up time of the studies had to be 30 days to assess at least the short term outcome.

Two reviewers (BF, JS) independently assessed all identified titles and abstracts for inclusion. Any discrepancies were resolved by discussion. All articles considered as possibly relevant were obtained in full-text and read by one reviewer (BF). Any uncertainties about inclusion were eliminated by discussion with a second reviewer (JS) who had read the concerning article. Each individual study was assessed for its data description and analysis. One reviewer on predefined criteria carefully

executed data extractions and the results were checked by a second reviewer. Where reported the outcome over longer follow up times and the nature and frequencies of complications of the surgical procedures are described.

Analysis

The extracted data were entered into an Excel Work sheet (Office 2000[®], Microsoft Corp., Redmond, Washington, USA).

RESULTS

Literature Search

Results of literature searches can be followed in Figure 1. By the electronic database searching we initially identified 955 different articles. No publication could be identified in the Cochrane Central Register of Controlled Trials. After reviewing titles and abstracts the two reviewers agreed on 108 to be possibly relevant and differed on relevance of 84 manuscripts. Of those 84 finally 51 were included to obtain in full-text after discussion. Reading errors mainly caused the disagreement. Altogether 159 articles were read in full-text. Twenty-eight studies [4,8-34] could be included in the systematic review. From 18 contacted authors one provided the results of interest, which allowed us to include this study [19].

Study Description

Table 1 shows details of the 28 included studies. Fifteen studies reported the results of the ligation of the internal maxillary artery [21][4,22-34] and 13 on the effect of the ligation of the sphenopalatine artery [8-20]. All of the studies were retrospective.

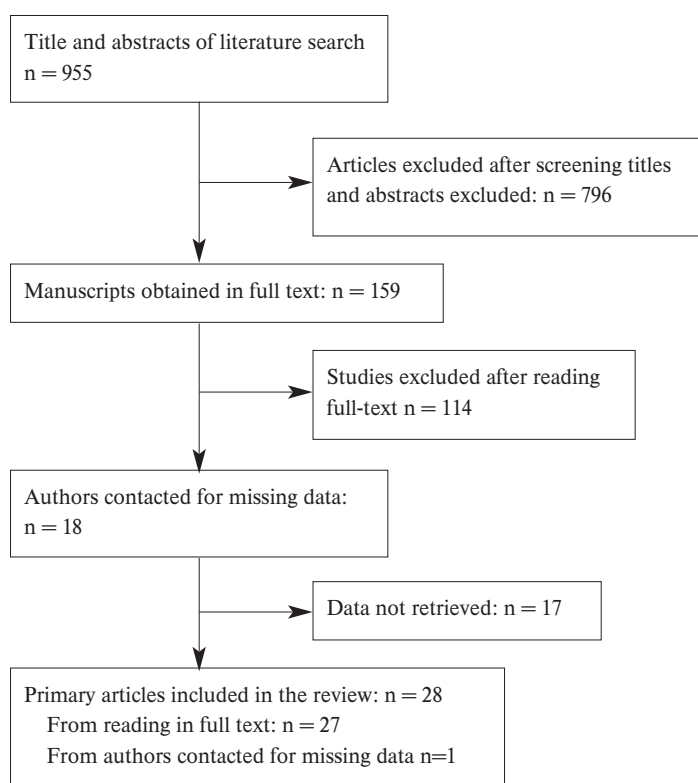
Ligation of the maxillary artery

In a time span of 18 years (1970 to 1998), 15 studies providing results after ligation of the maxillary artery in 472 patients could be identified. Information about age and gender of the patients were given in 13 studies, the mean age was about 57 years. Duration of the recruitment phases varied between 2 and 10 years and the follow up time were in a range between one and 48 months. In seven studies (145 patients) no rebleeding occurred within the first 30 days, in the remaining 8 reports it varied between 6 and 27%. Data about the rebleeding rate within one year were given in 8 studies and varied between 0 and 44%. Information about the duration of the surgical procedure was not provided in any study. The length of postoperative hospital stay varied between 2 and 11 days. In only one report the duration was 2 days (28), whereas in the other patients stayed between 5 and 8 days. The rate of complications showed a wide range (2 to 85%). Temporary facial swelling and ecchymosis and persisting facial numbness were the most often reported complications. The detailed list of postoperative complications is described in Table 2.

Ligation of Sphenopalatine artery

Over a time period of 22 years (1982 until 2004), 13 studies (264 patients) reporting on the success rate of the ligation of

Figure 1. Study selection process for systematic review on a comparison of different surgical treatments of posterior epistaxis.



the sphenopalatine artery could be found. The mean age of patients was 60 years (17-91.5) in 2 studies age of the patients was not specified. Patients were recruited over a time period of 0.5 to 3 years and the follow up time varied between 1 and 38 months. The rebleeding rate within the first month was 0 in three studies (28 patients) and in the remaining varied between 3 and 30%. Rebleeding within one year occurred between 4 and 30%; in one report the one year success rate was 100%. Only one study [16] included data about anticoagulant therapy after the operation. One of the 5 patients with rebleeding was on anticoagulant therapy because of an artificial heart valve. Six authors reported that no postoperative complications occurred, whereas in one study [16], 53% of the patients had complications. Crust formation, sensation of dryness in the nose and persistent posterior rhinorrhea were the most fre-

quent complications (Table 2). Four authors [11,14,18,20] reported on the operation time varying between 30 and 77 minutes. In nine studies the postoperative hospital stay was reported, in six studies patients could leave the hospital 1 to 3 days after surgery, whereas in the two other reports postoperative hospital stay was 9 and 13 days.

DISCUSSION

We found in the published literature no study comparing head to head the effect of different surgical procedures in the treatment of patients with posterior epistaxis where conservative treatment failed. Ligation of the sphenopalatine artery in patients seems to have less severe peri- and postoperative complications compared to the ligation of the internal maxillary artery. In addition the studies reporting on sphenopalatine liga-

Table 1. Description of studies reporting on the demographic data and outcome after ligation of the internal maxillary artery in patients with posterior epistaxis. IMAX: Internal maxillary artery ligation; TrIMAX: transantral ligation of the internal maxillary artery; EIMAX: Endoscopic ligation of the maxillary artery; AEA: anterior ethmoidal artery ligation; EA: ligation of both ethmoidal arteries.

	Technique	Patients (numbers)	Age: average, range	Rebleeding rate within 30 days (%)	Rebleeding rate within 1 year (%)	Complication rate (%)	Duration of patient recruitment (years)	Average duration of procedure (minutes)	Hospital stay (days)	Duration of follow up (months)
Allen (21)	TrIMAX + AEA,	17		6		0	5		11	>1
Cullen (22)	TrIMAX + AEA	11	55.5	27		18	8			>6
Ellis (23)	TrIMAX	13	55, 24 - 85	0	8	15			6	>17
Federspil (24)	TrIMAX + EA									
	+ SB	41		0	2	2	3			>12
Green (25)	TrIMAX	7	42 - 70	14	29					>8
Mc Donald (26)	TrIMAX + AEA	46	53	13		72	7		>5	36
Metson (34)	TrIMAX+ EA	100	49.7 - 60.1	9			8			
Premachandra (27)	TrIMAX	14	65, 28 - 85	0		35	9		5	6 - 96
Pritikin (28)	EIMAX	15	53.7, 22-83	0	0	0	3		2	3-12
Rosnagle (29)	TrIMAX	64	55.9, 10-93	10	15	6	6		5	-48
Schaitkin (4)	TrIMAX +EA	13	54, 32-72	12	24	85	4		7	>6
Seifert (6)	TrIMAX	19	50 - 60	0	11	0	2		7 - 10	>12
Shaw (31)	IMAX	14	62, 24 - 72	0		21	5		8	>1
Singh (32)	IMAX + AEA	29	5 - 90	0		21	6			>1
Strong (33)	TrIMAX + AEA	9	50.9, 27-76	11	44		10		4	>1

Table 2. Description of studies reporting on the demographic data and outcome after ligation of the sphenopalatine artery in patients with posterior epistaxis. SA: Sphenopalatine artery ligation; TrSA: Transantral sphenopalatine artery ligation; TrsESA: Transseptal endoscopic sphenopalatine artery ligation; ESA: Endoscopic sphenopalatine artery ligation; EESA: Endoscopic electrocoagulation of the sphenopalatine artery; SAC: Sphenopalatine artery coagulation; ESAD: Endoscopic sphenopalatine artery diathermy; ECSA: Endoscopic electrocautery of the sphenopalatine artery.

	Technique	Patients (numbers)	Age: average, (range)	Rebleeding rate 30 days (%)	Rebleeding rate 1 year (%)	Complication rate (%)	Duration of patient recruitment (years)	Average duration of procedure (minutes)	Hospital stay (days)	Duration of follow up (months)
El Guindy (8)	TrsESA	9	48-67	0		0				3-6
Holzmann (9)	ESA	75	62.1 (26-92)	3	4	16	2			2-18
O'Flynn (10)	ESA	12	38 - 79	8	17	0	1			9
Rasmussen (11)	EESA	16	53.5 (41-81)	17	17	0	0.5	30	1-2	>3
Rockey (12)	ESA + AEA	17 (1 + AEA)	66.7, 53-79	30	30		2		3	>1
Rudert (13)	SAC	31	58, 26-80	3	3	0	3		9	23
Sharp (14)	ESA	10 (one bilateral)	53.5, 17-79	0	0	0		57	3	9
Simpson (15)	SA	14		7		7				4 - 38
Snyderman (16)	ESA + AEA	38 (4bilateral, 25 + AEA)		11	13	53	2		3	1 - 28
Srinivasan (17)	ESAD + AEA	10 (4 + AEA)	62.4, 47-76	10	10	0	1		2	10
Tsai (18)	ECSA	9	62, 38-85	0	11	0		54	13	2 - 14
Wiorowski (19)	ESA + EA	10 (4 + EA)	66.4, 49-88	10		0	2		2	1
Wormald (20)	ESA	13	55.9, 23-79	8	8	0	1	77	2	5 - 28

tion indicate that the duration of hospital stay is shorter compared to the patients where the maxillary artery was occluded surgically. These results favour the method of sphenopalatine artery ligation compared to the surgical occlusion of the internal maxillary artery. However, the most effective surgical management of patients with posterior epistaxis where conservative management failed remains unclear. It seems to be rational that ligation of an artery should be completed at the most distal part of blood supply to reduce the risk of rebleeding from vessels refilled over anastomotic blood vessels.

This systematic review has several limitations. They are mainly due to lack of results from prospectively planned comparative studies. The effects of the ligation of the sphenopalatine artery and the maxillary artery were not compared in a randomized controlled trial. All of the published studies were retrospective case series. Inclusion and or exclusion criteria and the number of eligible patients for surgery were not reported in any of the published papers. Information about loss to follow up is not given in any paper. These shortcomings do not allow a pooling of data and a comparison between the outcomes of the different surgical procedures.

The results of this systematic review do not allow the definite conclusion that one method is more effective than the other. Our conclusion differs from the recommendations by Kumar et al [35]. Kumar et al. compared the effect of the ligation of the sphenopalatine artery of 11 case series with only one study on the effect of the ligation of the internal maxillary artery by Merton [34], whereas in this review all available studies were included.

The choice which surgical procedure is performed in patients with posterior epistaxis and failed conservative therapy will mainly depend on the preferences of the surgeon. The best surgical procedure for patients with failed conservative treatment, after tamponade or balloon continues to be not clearly defined. The choice of the surgical management depends on the experience and preferences of the surgeons.

During the last two decades the angiography and selective embolization gained more impact in the treatment of intractable PE [36-42]. However, the indication of this option still has been biased by the availability of an experienced interventional neuroradiologist. Major complications after embolization like facial nerve paralysis or stroke are rare [43,44] and depend very much on the experience of the neuro-radiologist.

In further research two clinical relevant questions should be answered. A first question concerns the time point for a surgical procedure. Should surgery performed in some patients without a conservative trial of tamponade or balloon technique. Second, which technique the endoscopic sphenopalatine artery ligation or the ligation of the internal maxillary artery is associated with better outcomes in terms of rebleeding rate, postoperative complications, duration of hospital stay and costs.

REFERENCES

- Petruson B, Rudin R (1975) The frequency of epistaxis in a male population sample. *Rhinology* 13: 129-133.
- Kotecha B, Fowler S, Harkness P, Walmsley J, Brown P, Topham J (1996) Management of epistaxis: a national survey. *Ann R Coll Surg Engl* 78: 444-446.
- Mahmood S, Lowe T (2003) Management of epistaxis in the oral and maxillofacial surgery setting: An update on current practice. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 95: 23-29.
- Schaitkin B, Strauss M, Houck JR (1987) Epistaxis: medical versus surgical therapy: a comparison of efficacy, complications, and economic considerations. *Laryngoscope* 97: 1392-1396.
- Hyde FT (1925) Ligation of the external carotid artery for control of idiopathic nasal haemorrhage. *Laryngoscope* 35: 899.
- Seiffert A (1928) Unterbindung der Arteria maxillaris. *Zeitschrift für Hals-, Nasen-, Ohrenheilkunde* 22: 323-325.
- Stamm AC, Pinto JA, Neto AF, Menon AD (1985) Microsurgery in severe posterior epistaxis. *Rhinology* 23: 321-325.
- ElGuindy A (1998) Endoscopic transseptal sphenopalatine artery ligation for intractable posterior epistaxis. *Ann Otol Rhinol Laryngol* 107: 1033-1037.
- Holzmann D, Kaufmann T, Pedrini P, Valavanis A (2003) Posterior epistaxis: endonasal exposure and occlusion of the branches of the sphenopalatine artery. *European Archives of Oto-Rhino-Laryngology* 260: 425-428.
- O'Flynn PE, Shadaba A (2000) Management of posterior epistaxis by endoscopic clipping of the sphenopalatine artery. *Clin Otolaryngol All Sciences* 25: 374-377.
- Rasmussen JL, Buchwald C (2001) [Treatment of recurrent epistaxis with endoscopic electrocoagulation of the sphenopalatine artery]. [Danish]. *Ugeskrift for Laeger* 163: 4404-4406.
- Rockey JG, Anand R (2002) A critical audit of the surgical management of intractable epistaxis using sphenopalatine artery ligation/diathermy. *Rhinology* 40: 147-149.
- Rudert H, Maune S (1997) [Endonasal coagulation of the sphenopalatine artery in severe posterior epistaxis]. [German]. *Laryngo-Rhino-Otol* 76: 77-82.
- Sharp HR, RoweJones JM, Biring GS, Mackay IS (1997) Endoscopic ligation or diathermy of the sphenopalatine artery in persistent epistaxis. *J Laryngol Otol* 111: 1047-1050.
- Simpson GT, Janfaza P, Becker GD (1982) Transantral sphenopalatine artery ligation. *Laryngoscope* 92 (9 Pt 1): t-5.
- Snyderman CH, Goldman SA, Carrau RL, Ferguson BJ, Grandis JR (1999) Endoscopic sphenopalatine artery ligation is an effective method of treatment for posterior epistaxis. *Am J Rhinol* 13: 137-140.
- Srinivasan V, Sherman IW, O'Sullivan G (2000) Surgical management of intractable epistaxis: audit of results. *J Laryngol Otol* 114: 697-700.
- Tsai HM, Shu CH (2002) Transnasal sphenopalatine artery electrocautery for posterior epistaxis. *Chung Hua i Hsueh Tsa Chih - Chin Med J* 65: 529-533.
- Wiorowski M, Schultz P, Perrot JB, Gentine A, Debry C (2004) Indications and results of cauterization by endoscopic approach of the sphenopalatine artery in severe posterior epistaxis. *Auris, Nasus, Larynx* 31: 131-133.
- Wormald PJ, Wee DT, van Hasselt CA (2000) Endoscopic ligation of the sphenopalatine artery for refractory posterior epistaxis. *Am J Rhinol* 14: 261-264.
- Allen GW (1970) Ligation of the internal maxillary artery for epistaxis. *Laryngoscope* 80: 915-923.
- Cullen MM, Tami TA (1998) Comparison of internal maxillary artery ligation versus embolization for refractory posterior epistaxis. *Otolaryngol - Head Neck Surg* 118: 636-642.
- Ellis DA, LeLiever WC (1980) Indications for internal maxillary artery ligation in the treatment of epistaxis. *J Otolaryngol* 9: 228-232.
- Federspil P (1971) [Blood vessel ligations in uncontrollable epistaxis]. [German]. *HNO* 19: 171-175.
- Green A (1976) [Treatment of posterior epistaxis by ligation of the internal maxillary artery in the pterygo-maxillary fossa]. [French]. *Orl; J Oto-Rhino-Laryngol Rel Special* 38: Suppl-8.

26. McDonald TJ, Pearson BW (1980) Follow-up on maxillary artery ligation for epistaxis. *Arch Otolaryngol* 106: 635-638.
27. Premachandra DJ, Sergeant RJ (1993) Dominant maxillary artery as a cause of failure in maxillary artery ligation for posterior epistaxis. *Clin Otolaryngol All Sciences* 18: 42-47.
28. Pritikin JB, Caldarelli DD, Panje WR (1998) Endoscopic ligation of the internal maxillary artery for treatment of intractable posterior epistaxis. *Ann Otol Rhinol Laryngol* 107: 85-91.
29. Rosnagle RS, Yanagisawa E, Smith HW N (1973) Specific vessel ligation for epistaxis: survey of 60 cases. *Laryngoscope* 83: 517-525.
30. Seifert R, Hulse M (1983) [Clinical experience with blood vessel ligation in uncontrollable nosebleed]. [German]. *HNO* 31: 177-179.
31. Shaw CB, Wax MK, Wetmore SJ (1993) Epistaxis: a comparison of treatment. [Review] [20 refs]. *Otolaryngol - Head Neck Surg* 109: 60-65.
32. Singh B (1992) Combined internal maxillary and anterior ethmoidal arterial occlusion: the treatment of choice in intractable epistaxis. *J Laryngol Otol* 106: 507-510.
33. Strong EB, Bell DA, Johnson LP, Jacobs JM (1995) Intractable epistaxis: transantral ligation vs. embolization: efficacy review and cost analysis. *Otolaryngol- Head Neck Surg* 113: 674-678.
34. Metson R, Lane R (1988) Internal maxillary artery ligation for epistaxis: an analysis of failures. *Laryngoscope* 98: 760-764.
35. Kumar S, Shetty A, Rockey J, Nilssen E (2003) Contemporary surgical treatment of epistaxis. What is the evidence for sphenopalatine artery ligation? [Review] [24 refs]. *Clin Otolaryngol All Science* 28: 360-363.
36. Breda SD, Choi IS, Persky MS, Weiss M (1989) Embolization in the treatment of epistaxis after failure of internal maxillary artery ligation. *Laryngoscope* 99: 809-813.
37. Merland JJ, Melki JP, Chiras J, Riche MC, Hadjean E (1980) Place of embolization in the treatment of severe epistaxis. *Laryngoscope* 90: 1694-1704.
38. Parnes LS, Heeneman H, Vinuela F (1987) Percutaneous embolization for control of nasal blood circulation. *Laryngoscope* 97: 1312-1315.
39. Sokoloff J, Wickbom I, McDonald D, Brahme F, Goergen TC, Goldberger LE (1974) Therapeutic percutaneous embolization in intractable epistaxis. *Radiology* 111: 285-287.
40. Elden L, Montanera W, Terbrugge K, Willinsky R, Lasjaunias P, Charles D (1994) Angiographic embolization for the treatment of epistaxis: a review of 108 cases. *Otolaryngol Head Neck Surg* 111: 44-50.
41. Valavanis A, Setton A (1993) Embolization of epistaxis. In: Valavanis A, editor. *Interventional Neuroradiology*. Berlin, Heidelberg, New York: Springer-Verlag; p. 55-61.
42. Vitek JJ (1991) Idiopathic intractable epistaxis: endovascular therapy. *Radiology* 181: 113-116.
43. Strutz J, Schumacher M (1990) Uncontrollable epistaxis. Angiographic localization and embolization. *Arch Otolaryngol Head Neck Surg* 116: 697-699.
44. Metson R, Hanson DG (1983) Bilateral facial nerve paralysis following arterial embolization for epistaxis. *Otolaryngol Head Neck Surg* 91: 299-303.

Prof. Johann Steurer
 Horten Centre, University Hospital
 Rämistrasse 100
 CH-8091 Zurich
 Switzerland

Tel: +41-1-255-3198
 Fax: +41-1-255-9720
 E-mail: johann.steurer@usz.ch