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ORIGINAL CONTRIBUTION

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Outcome of treatment for severe epistaxis: nasal packing and endoscopic sphenopalatine artery ligation*

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Abstract

Background: Severe epistaxis is a frequent emergency condition encountered by otolaryngologists and is often treated with nasal packing. In the event of failure surgical treatment is considered. We aimed to evaluate the efficacy of Nasal Packing (NP) and Endoscopic Sphenopalatine Artery Ligation (ESPAL) as treatment of severe epistaxis in terms of failures and recurrences including risk factors.

Methodology: Retrospective descriptive study of patients with epistaxis treated with NP, admitted to an ENT department from 2011-2017. If initial treatment with NP failed, patients were considered for ESPAL.

Results: An analysis of 511 patients was performed. All patients were treated with NP at the time of admission, and 14% of patients were treated with ESPAL due to failure of NP. The majority of patients was only admitted once. Twelve percent were readmitted within 30 days, 7% were readmitted >30 days later. Treatment failure after ESPAL was 7.9%. No significant difference in the risk of readmission was found between patients treated with NP alone and patients treated with ESPAL.

Conclusion: The majority of epistaxis patients were effectively treated with NP alone. We found good effect of ESPAL although no significant differences in risk of readmission NP vs. ESPAL were identified.

Key words: epistaxis, nasal packing, endoscopic sphenopalatine artery ligation, comorbidity, treatment efficacy

Introduction

Epistaxis is a very common medical condition frequently encountered by otolaryngologists. Thus, it is estimated that 60% of the population will experience epistaxis at least once in their lifetime[(1)]. Most cases (90-95%) are simple anterior bleedings that are controlled by conservative procedures, i.e. compression performed by the patient, or treated in outpatient settings using chemical or electrical cauterization[(2)]. However, 5-10 % of epistaxis cases are located in the posterior part of the nasal cavity or affects the nasal mucosa more diffusely. Such cases are often more complicated and difficult to manage and may require admission to an ENT department for several days.

Treatment of posterior epistaxis comprises several modalities including topical decongestants, cauterization (given the origin of bleeding can be identified), Nasal Packing (NP), ligation of the sphenopalatine artery, and embolization[(1,2)].

Posterior NP is often used as first line treatment of posterior epistaxis, can cause hospital admission and is accompanied by moderate to profound discomfort for the patient. Due to the continuous improvement of endoscopic endonasal procedures over the last decades, Endoscopic Sphenopalatine Artery Ligation (ESPAL) in general anesthesia has become increasingly popular, and several studies have shown long term success rates of ESPAL in the treatment of severe epistaxis ranging from 79-97% [(3-6)].

Dedhia et al.[(7)] performed a cost effectiveness analysis revealing that ESPAL is cost-saving as first–line therapy for posterior epistaxis for patients treated ≥ 3 days or more with NP. Several stu-

dies have described algorithms for treatment of severe epistaxis, all suggesting an early use of ESPAL [8–11]. However, despite being acknowledged as a safe and feasible treatment for intractable epistaxis, timing of ESPAL is still a matter of debate. Besides the timing of ESPAL, updated setup at the ENT departments is required including easy access to endoscopic sinus surgery equipment and experienced surgeons. Furthermore, identification of risk factors associated with unstable hemostasis/re-bleeding after initial NP are warranted in order to qualify patient selection for ESPAL at an early stage to avoid prolonged admission. It may be hypothesized that patients with most comorbidity, longest time of admission, and the highest use of anticoagulants and antihypertensive agents are more likely to be at risk of unstable hemostasis/re-bleeding after initial posterior NP and thereby become candidates for ESPAL.

The aim of this study was to describe an unselected consecutive adult population admitted to hospital with NP due to epistaxis and to evaluate the use and efficacy of ESPAL. Risk factors associated with ESPAL as well as risk factors associated with readmission were determined.

Materials and methods

A retrospective study of consecutive patients with NP due to epistaxis admitted to the ENT department, Regional Hospital West Jutland, Denmark, was performed covering a seven-year period from January 1st, 2011 to December 31st, 2017.

All senior on-call ENT specialists at the department are trained in performing ESPAL making the procedure readily available on a 24 hour basis which means that several surgeons are involved in ESPAL. Hence, ESPAL was not only performed by specialized rhinologists.

In this study we defined epistaxis as severe when the patient needed treatment with NP and admission to hospital.

Nasal packing used in our institution was the Rapid Rhino® (Smith&Nephew) inflatable device, occasionally in combination with gauze packing and in rare occasions posterior packing with a Foley catheter was applied.

All patients were initially treated with NP at the time of admission, subsequently some patients received additional treatment with ESPAL.

Indications for ESPAL were severe epistaxis with unstable hemostasis after initial NP or re-bleeding immediately after removal of NP.

In all ESPAL procedures, cauterization of the artery was performed; some cases had both cauterization and ligation.

Electronic patient files were evaluated and the following information was anonymized and registered: age, sex, length and number of hospital admissions, treatment modalities, comorbidities, use of anti-coagulants and antihypertensive agents, smoking status, and alcohol consumption. Side of bleeding for patients undergoing ESPAL was also registered.

Table 1. Patient demographics.

Variable	N	%
Number of patients	511	
Age (years) median ± SD [range]	73 ± 13.8 [18-98]	
Sex Female Male	 204 307	 39.9 60.1
Smoking (background population§) Alcohol abuse* (background population§)	127 36 	24.9 22 7 8.5
Comorbidity Hypertension (background population§) Cardiovascular disease (background populationα) No comorbidity (background population§) >one diagnosis	 389 400 50 345	 76.1 19.0 78.3 15.5 7.8 64.4 67.5
Medication Antithrombotic/anticoagulant Agents (AA) ≥ two types of AA Vitamin K antagonist Antihypertensive treatment ≥ two types of antihypertensive AA and antihypertensive treatment	 380 105 146 389 237 333	 74.4 20.5 28.6 76.1 46.4 65.2

*>7 units a week for women, >14 units a week for men. § Danish Health Authority. αThe Danish Health Data Authority.

Bleeding location, anterior or posterior, was not consistently distinguished in the patient charts and was therefore not included in the study. Inclusion criteria were adults (age ≥ 18 years) admitted with epistaxis.

Exclusion criteria were epistaxis due to traumas, surgery, cancer, or hemorrhagic diathesis.

Primary outcome was the number of patients undergoing ESPAL after NP.

Secondary outcome was readmission after NP and ESPAL. Readmission could be due to bleeding episodes within 30 days after discharge (treatment failures), whereas recurrences were defined as epistaxis with onset later than 30 days after discharge and were included as new events. In addition, potential risk factors were registered, i.e. age, gender, smoking habits, alcohol consumption, comorbidity, and medication.

Statistical analysis including Cox regression and Kaplan-Meier survival analysis were performed using STATA.

Results

During the seven-year period, 610 patients with epistaxis were admitted to the ENT department, of which 511 patients met the

Table 2. Demographic differences between ESPAL and NP.

	ESPAL	NP	p-value, CI 95%
Patients, n	73	438	
Age, years	64.6	72.6	p<0.0001, 4.8; 11.2
Antihypertensive, %	65.8	75.5	p=0.07, 0.007; 0.2
AA, %	55.3	76.6	p<0.0001, 0.11; 0.32
No comorbidity, %	17.8	8.5	p=0.01, 0.02; 0.17

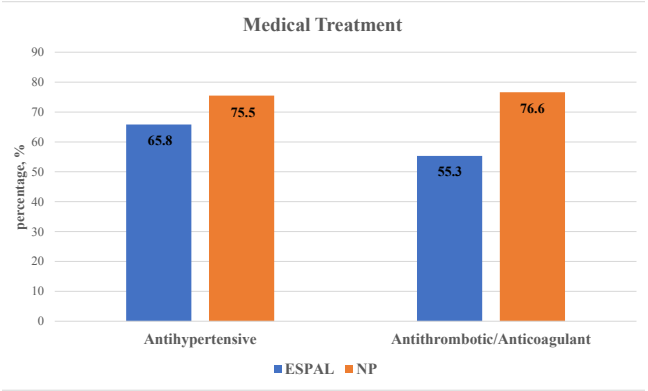

Figure 1. Patients treated with ESPAL or NP in current medical treatment. Antihypertensive and/or antithrombotic/anticoagulants.

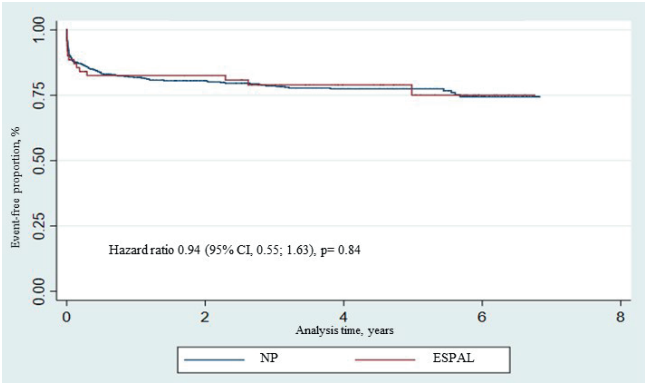

Figure 2. Kaplan-Meier plot of re-admission to hospita! after treatment with NP or ESPAL.

inclusion criteria with a total of 636 admissions. Demographics are listed in Table 1.

A total of 461 (90.2%) patients suffered from co-morbidities, predominantly hypertension and cardio-vascular disease such as atrial fibrillation, ischemic heart disease and stroke. Demographic differences between patients treated with ESPAL and NP only are listed in Table 2.

Figure 1 provides information of the use of medication for the ESPAL and NP group.
All patients were initially treated with NP at the time of admission. A total of 415 patients (81% of patients, 65% of admissions) were only admitted once, whereas 96 patients (19% of patients) had > 1 admissions (221 admissions in total), 438 patients (86%) were successfully treated with NP alone in 560 admissions (88% of admissions), and 377 patients (74%) treated with NP were only admitted once during the study period. Due to unstable hemostasis/re-bleeding, 73 patients (14% of patients) were treated with ESPAL in 76 admissions (12% of admissions) (Table 3). Thirty-eight patients (7% of all patients, 52% of ESPAL) were only admitted once and treated with ESPAL. Five patients (1% of all patients, 7% of ESPAL) were treated with ESPAL on the day of admission due to uncontrollable bleeding despite initial NP.

A total of 76 ESPAL procedures were performed during the study period, ~11 procedures annually (range 7-14). In all cases ESPAL was initially performed as a unilateral procdure. The average time span from NP until ESPAL was 2.1 ± 1.4 days, and ESPAL treated patients were discharged after 1.9 ± 1.5 days.
During follow up until 31st of December 2017, 415 patients (81%) were only admitted once.
Ninety-six patients (19%) were re-admitted to hospital due to re-currence of epistaxis with a total of 125 re-admissions. Fifty-nine patients (11.5%) with 66 admissions (10.4%) were readmitted within 30 days after discharge. Thus, the treatment failure rate within 30 days was 11.5% (of patients). Thirty-seven patients (7% of patients, 9.3% of admissions), had a new event of epistaxis with onset >30 days after discharge.
One patient was re-admitted < 30 days after ESPAL due to a new case of contralateral epistaxis and was therefore not regarded as a recurrence. Treatment failure after ESPAL (re-admission within 30 days) was registered among six patients (7.9%) with 13 readmissions during the study due to ipsilateral epistaxis.
Two patients initially treated with NP and ESPAL were later referred to acute embolization due to continuous bleeding, one subsequently treated with ligation of the external carotid artery. Additional information about the risk of readmission and treatment failure is provided in Table 4.

Risk of readmission after ESPAL compared to the risk of readmission after treatment with NP alone during follow up: Odds ratio: 0.77 (95% CI: 0.4;1.5), p=0.43. Risk of re-admission less than 30 days after treatment with ESPAL compared to treatment with NP alone: Odds ratio: 0.64 (95% CI: 0.3;1.5), p= 0.32.
During the entire study period 12 patients were re-admitted after previous treatment with ESPAL (15.8%).

Using Cox regression unadjusted hazard ratio for patients treated with ESPAL vs. NP was 0.94 (95% CI: 0.55;1.63), p=0.84, i.e. the hazard of re-admission during the study period was between 45% lower and 63% higher for patients treated with

Table 3. Admissions and length of stay of hospital, NP and ESPAL.

	Total	Re-admissions		Only NP		ESPAL	Time from NP to ESPAL	Time from ESPAL to discharge[x]
		0	≥1	All	1 adm.			
Patients, n (%)	511	415 (81)	96 (19)	438 (86)	377 (74)	73 (14)		
Admissions, n (%)	636	415 (65)	125 (20)	560 (88)	377 (59)	76 (12)		
Length of stay in Hospital								
Days, mean (SD, CI 95%)	2.21 (± 1.5)	2.13 (± 1.4)	2.36 (± 1.7)	1.99 (± 1.2)	1.94 (±1.2)	3.84 (± 2.0)	2.01 (± 1.4)	1.82 (± 1.6)
Median	2	2	2	2	2	4	2	1

Table 4. Risk of readmission and treatment failure.

	Overall risk of readmission	Overall risk of failure (readmission within 30 days)
All admissions %, (n) 95% CI		
Patients	18.8% (96/511) 95% CI: 0.16; 0.22	11.5% (59/511) 95% CI: 0.09; 0.15
Admissions	19.7% (125/636) 95% CI: 0.17; 0.23	10.4% (66/636) 95% CI: 0.08; 0.13
Only NP		
Patients	13.9% (61/438) 95% CI: 0.11; 0.18	10.7% (47/438) 95% CI: 0.08; 0.14
Admission	21.8% (122/560) 95% CI: 0.19; 0.25	10.7% (60/560) 95% CI: 0.08; 0.14
ESPAL		
Patients	17.1% (13/76) 95% CI: 0.1; 0.27	7.9% (6/76) 95% CI: 0.03; 0.16
Admissions	17.1% (13/76) 95% CI: 0.1; 0.27	7.9% (6/76) 95% CI: 0.03; 0.16

ESPAL compared to patients treated with NP alone.
Adjusted for age and medication, antihypertensive and/or Antithrombotic /Anticoagulant (AA), we found no significant change in risk of re-admission, with hazard ratios ranging from 0.76 to 1.43; 0.2< p <0.88.

Discussion

In the present study we found that 14% of hospitalized epistaxis patients progressed from NP to ESPAL, typically after two days. Twelve percent of all patients were re-admitted within 30 days (failures) and another 7% after 30 days (recurrences). Patients treated with ESPAL were significantly younger with less comorbidity and lower use of medication compared to patients treated only with NP. The risk of readmission was the same for patients treated with NP alone and patients undergoing ESPAL. Finally, the risk of readmission was not significantly associated with age, comorbidity, or medication.
In line with previous studies we found that men were more frequently admitted to hospital due to severe epistaxis than women, being middle-to advanced age, presenting some underlying co-morbidities and using antihypertensives/antithrombotic/anticoagulant medication [12,13]. In general, the incidence of co-morbidity was high compared to the background population and significantly higher in the group treated only with NP. Many patients treated with NP for epistaxis in Denmark are treated in the hospital Emergency Department or in an outpatient facility without admission to hospital and this can result in a selection of patients admitted to hospital being the elderly with more comorbidity, either feeling insecure or being clinically unfit for treatment in the outpatient setting.
In our study, 12% of cases were treated with ESPAL. Previous studies comparing treatment modalities for epistaxis presented proportions of ESPAL treatments ranging from 5-32% [13,14].
During surgery, additional targeted diathermy was performed in cases where a bleeding point was clearly identified. In some cases NP was applied as a postoperative precaution.
Our patients treated with ESPAL may be selected as they were younger, less co-morbid and using less medication than patients treated with NP. The physicians may have decided to continue NP despite unstable hemostasis/re-bleeding in patients with the most comorbidity/medication due to a certain risk associated with general anesthesia and prioritized to adjust anti-coagulants/anti-hypertensives.
We found an overall high usage of AA for all admitted patients which is a well-known risk factor for epistaxis [15–17]. In the group treated with NP alone, we found significantly higher usage of ≥ 1 AA compared to the group treated with ESPAL, 76.6% vs. 55.3%, respectively. The result is coherent with the significantly higher degree of comorbidity in the group treated with NP compared to patients treated with ESPAL. This could be an important factor in deciding treatment modality for the patient during admission to hospital since the presence of a reversible factor, e.g. dysregulated use of AA could increase the probability of the patient receiving conservative treatment with NP while awaiting the effect a temporary discontinuation of AA treatment before surgery would be considered. Total Length Of Stay In Hospital

(LOS) was significantly longer for patients treated with ESPAL compared to patients treated with NP alone. This difference was expected as all patients were initially treated with NP at the time of admission, and ESPAL was only performed if hemostasis could not be achieved with NP or in case of recurrence when packing was removed, usually after 24-48 hours.

Previous studies have presented LOS of 4-7 days for patients treated with NP [18–22]. Marin et al. [13] described a mean LOS of 3.6 days although treatment modality was not specified. The shorter LOS found in our study could be due to the fact that many patients treated with NP at our institution are discharged after 24 hours observation, if the patient is found clinically fit, and subsequently scheduled for removal of the NP in an outpatient setting after 1-2 days. Postoperative LOS after ESPAL was 1.8 which is in line with previous studies [5].

Despite numerous previous studies favoring the use of ESPAL for severe epistaxis, the optimum timing of ESPAL is still controversial. In order to facilitate the selection for and timing of the use of ESPAL Lakhia et al. [23] suggested the Wexham criteria: Persistent posterior epistaxis uncontrolled by packing; Hemoglobin drop[4g/dL and/or blood transfusion required; Three episodes of recurrent epistaxis requiring re-packing during a single admission; Repeated hospital admission for recurrent ipsilateral epistaxis (3 occasions in the last 3 months). In our study, time from admission to ESPAL was 2.1 days. Dedhia et al. [7] found that duration of NP of 3-5 days significantly favored ESPAL as first-line treatment, whereas duration of NP of 2 days eliminated the positive cost-effectiveness. McDermott et al. [24] found mean time from hospital admission to ESPAL was 2.8 days and significant shorter length of stay in hospital for patients treated with ESPAL ≤1 day from admission. Based on our findings and previous studies we suggest early use of ESPAL within 1-2 days after admission if initial NP treatment fails [4,23].

When comparing the risk of readmission during the entire study period and within 30 days from admission (treatment failures), we found no significant difference in the risk of readmission after primary treatment with ESPAL compared to treatment with NP alone. In terms of treatment efficacy and need for revision surgery, our results are in line with previous studies. Thus, in a systematic review, Kitamura et al. [25] quantified the failure rates after ESPAL and found a pooled re-bleeding rate of 13.4%. However, follow-up after ESPAL was not specified. Nouraei et al. [5] found five year re-intervention free proportions of 90% in patients treated with ESPAL. Gede et al. [26] had a mean follow-up at 6.7 years for 42 patients after ESPAL: 12% had recurrent epistaxis, and 10% required revision surgery due to recurrent epistaxis during the follow-up.

We found no significant difference in the re-admission rates between the group treated with ESPAL and NP alone which could be caused by a success rate better than expected for treatment with NP alone. This could also be of interest in terms of timing of ESPAL since early use of ESPAL (within 24 hours after admission) might result in surgical treatment of patients who could have been treated sufficiently with NP alone. We found no significant association between age, gender, comorbidity or use of medication and the risk of readmission. Previous studies have described success rates for nasal packing for severe epistaxis of 62-70% although some studies define treatment failure as a re-current bleeding episode contrary to our study where treatment failure is defined as a recurrent bleeding episode that requires admission to our ENT department [13,14,27].

Higher levels of discomfort and pain for the patient treated with NP compared to ESPAL have previously been described. Nikolau et al. [28] demonstrated higher VAS scores for NP compared to ESPAL. The aspect of patient discomfort should also be considered when choosing treatment strategy for the epistaxis patient.

The limitations of our study are the retrospective design and the risk that some minor recurrences may have been treated elsewhere, such as the emergency room in other hospitals in the region, causing an underestimation of failures/recurrences.

On the other hand, our study presents a large study population with a long observation period in order to assess the long-term risk of recurrences and demonstrates a comparison of the efficacy of ESPAL vs. NP.

Conclusions

This study focused on severe epistaxis requiring admission to hospital. The majority of the patients were effectively treated with NP alone with a mean LOS of two days. No differences in risk of re-admission NP vs ESPAL were identified. Only a future RCT can further specify the timing of ESPAL. However, ethics may challenge a randomized design. Therefore, based on this study and previous literature, we suggest ESPAL if initial NP-treatment fails within one to two days.

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Authorship contribution

JG: Study design, literature search, data analysis and manuscript production. MN: data extraction and manuscript review. TO:

Design, analysis and expert manuscript review.

Availability of data and materials

Not applicable.

Conflict of interest

All authors declare no conflict of interest.

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