Treatment of epistaxis using the National Inpatient Sample and Centers for Medicare/Medicaid Services
A comparison of endovascular and endoscopic techniques

Tory McKnight, B.S,[1] Michael Karsy, M.D [2], Blair Barton, M.D [1], Glen D'Souza, M.D [1], Theodore Klug, M.D [1], Aykut Unsal, D.O [1,3], Elina Toskala, M.D., Ph.D, M.B.A [1], James Evans, M.D [2], Reid Gooch, M.D [1], Marc Rosen, M.D [1,2], Gurston Nyquist, M.D [1,2], Mindy Rabinowitz, M.D [1,2]

Department of Otolaryngology, Thomas Jefferson University [1], Department of Neurological Surgery, Thomas Jefferson University[2], Department of Otolaryngology, Drexel University [3]

Introduction

- Epistaxis is the most common otolaryngological emergency
  - Affects up to 60% of the world population
  - 6-10% of cases require medical intervention
- **Endovascular arterial embolization (EAE)** and **transnasal endoscopic sphenopalatine artery ligation (TESPAL)** are utilized for cases of intractable posterior epistaxis
  - Both reportedly over 90% effective
  - The clinical choice of which to chose can be challenging
- Previous cost analyses of national databases have been conducted to add data to inform the clinical choices
  - Conclusions: EAE is more expensive and associated with increased length of stay, which likely accounts for the cost
  - Limitations: Analysis of only the National Inpatient Sample (NIS), and only of years 2008-2013

Objective

Specific Aim:

- Conduct an updated cost analysis of TESPAL and EAE utilizing The National Inpatient Sample (NIS) and The Center of Medicaid and Medicare Services (CMS)
- Assess recent trends for the type and location of hospital where each occurs

Materials and Methods

- Cross-sectional analysis was conducted of the NIS (2001-2018) and CMS (2012-2017)
- Inclusion criteria (Figure 1):

1. CMS: Patients with CPT code for endoscopic ligation or endovascular embolization as a treatment for epistaxis
2. NIS: Patients with an ICD-9 and ICD-10 diagnostic code for epistaxis, as well as a procedure code pertaining to endoscopic ligation or endovascular embolization

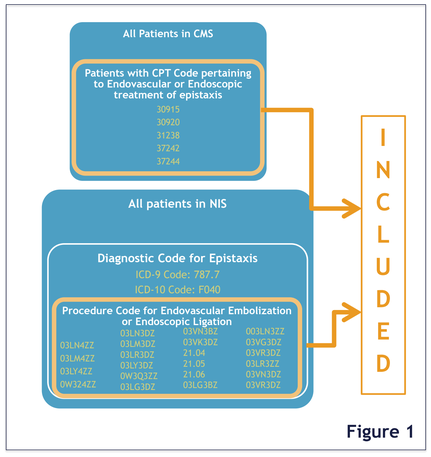


Figure 1

Figure 1: Inclusion Criteria. Note that the NIS and CMS databases report on different aspects of care.
NIS provides data pertaining to an entire hospital stay; i.e cost of stay, reason for admission, disposition at discharge.
CMIS allows you to isolate data pertaining to a single, line-item procedure

Results

Characteristic	N 14,419	Embolization n=9,333	Ligation n=5,086	*P value*
Age (years), mean ± SD		63 ± 16	61 ± 16	0.001
Gender (%)	14,419			0.1
Female		61	59.7	
Male		39	40.3	
Admission from Hospital/AF (%)		22.9	19.8	0.0001
Length of stay (days) ± SD		4 ± 4	4 ± 5	0.003
Mean hospital charges (dollars) ± SD		56,675 ± 49,470	29,179 ± 27,646	0.001
Discharged to hospital or AF (%)		11.5	7.2	
Patient disposition at d/c (%)	14,098			0.0001
Routine		80.8	86	
Transfer to short-term hospital		2.5	2.4	
Skilled nursing facility		8.5	6.1	
Home health		6.9	4.6	
Against medical advice		0.4	0.3	
Death		0.8	0.6	

*significant at p value < 0.05
#Information on race was only available for 11,802 patients

Figure 2. NIS (2001-2018): Characteristics of patients EAE vs TESPAL

Demonstrates that the cost of hospital stay for EAE is nearly twice that of TESPAL. However, length of stay is the same.

Despite the increased cost, embolization occurs more frequently.

Demonstrates that the patients undergoing EAE are slightly older, more likely to be admitted from another hospital, and more likely to be discharged to another hospital

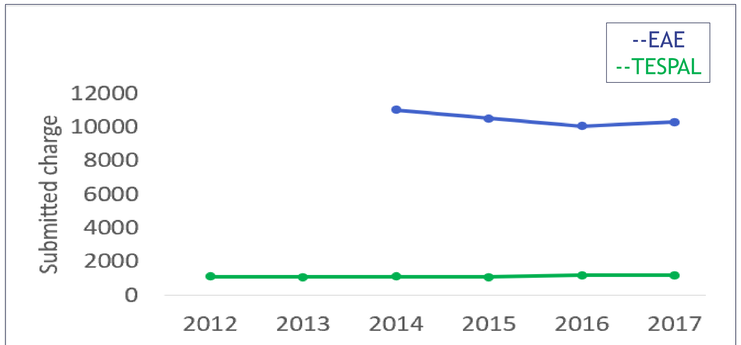


Figure 3. CMS (2012-2017) cost per procedure (*reported as a national mean)*
EAE is more expensive every recorded year. The cost of EAE is nearly 11x as expensive as the cost of TESPAL.

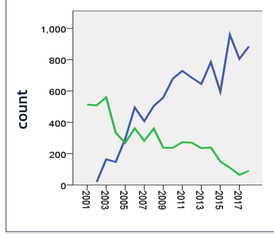
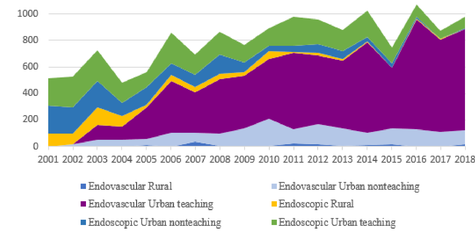


Figure 4. NIS (2001-2017): National procedure count, EAE vs TESPAL

The number of EAE procedures has been increasing year over year. Concurrently, the number of TESPAL procedure has been dropping.

Results Continued

Figure 5. NIS (2001-2018) Distribution of procedures by location (rural vs urban) and hospital-type (teaching vs non-teaching)



- 2002- approximately even distribution of EAE and TESPAL, even distribution of procedures occurring at urban and rural hospitals, and at teaching and non-teaching hospitals
- 2005 - 2006- the majority begins to favor EAE, occurring specifically at urban, teaching hospitals
- The percentage of procedures that are EAE occurring at urban teaching hospitals has increased year over year, while the others have decreased. By the end of the series, "EAE occurring at urban, teaching hospitals" constitutes over 80% of total cases.

Discussion

- The cost of the hospital stay for EAE is nearly twice that of TESPAL (Fig. 2). Contrary to previous studies which covered fewer years, in the present analysis, the increased cost of EAE relative to TESPAL cannot be contributed to length of stay (Fig. 2).
- The population undergoing EAE may be more frail; they are slightly older, they are more likely to be admitted from another hospital, more likely to be discharged to a skilled nursing facility/other hospital, more likely to die while hospitalized, and more likely to require a home nursing aid (Fig.2). EAE may be favored over TESPAL in frail populations because it does not require general anesthesia.
- Although EAE is more expensive than TESPAL as a procedure, the procedure-cost alone does not account for the entire delta of cost per hospital stay. Perhaps increased frailty/medical conditions contributes to the increased cost in caring for patients undergoing EAE.
- The dramatic shift toward EAE occurring at urban-teaching hospitals may reflect availability of providers and resources, and therefore represent a need for more widespread TESPAL training.

Conclusion

- It is possible that the population undergoing EAE is more frail, which would contribute, in part, to the higher mean annual cost of hospital in EAE than in TESPAL.
- This analysis suggests a cost-benefit in TESPAL over EAE in treating refractory posterior epistaxis.

- Andersen, P. J., Kjeldsen, A. D., & Neppet-Rasmussen, J. (2005). Selective embolization in the treatment of intractable epistaxis. *Acta Otolaryngol*, *125*(3), 293-297. https://doi.org/10.1080/00016480410023029
- Christensen, N. P., Smith, D. S., Barnwell, S. L., & Wax, M. K. (2005). Arterial embolization in the management of posterior epistaxis. *Otolaryngol Head Neck Surg*, *133*(5), 740-753. https://doi.org/10.1016/j.otohns.2005.07.041
- Dubel, G. J., Ahn, S. H., & Soares, G. M. (2013). Transcatheter embolization in the management of epistaxis. *Semin Intervent Radiol*, *30*(3), 249-262. https://doi.org/10.1055/s-0033-1353478
- Gifford, T. O., & Orlandi, R. R. (2008). Epistaxis. *Otolaryngol Clin North Am*, *41*(3), 525-536, viii. https://doi.org/10.1016/j.otc.2008.01.003
- Hira, A., & Chao, K. (2011). Direct endoscopic intranasal injection of Onyx for the preoperative embolization of a recurrent juvenile nasal angiofibroma. *Interv Neuroradiol*, *17*(4), 477-481. https://doi.org/10.1177/159101991101700413
- Manners, R. N., Steady-McCoy, L., & Guy, J. (1991). Central retinal and posterior ciliary artery occlusion after particle embolization of the external carotid artery system. *Ophthalmology*, *98*(4), 527-531. https://doi.org/10.1016/s0161-6420(91
- Seno, S., Arikata, M., Sakurai, H., Owaki, S., Fukui, J., Suzuki, M., & Shimizu, T. (2009). Endoscopic ligation of the sphenopalatine artery and the maxillary artery for the treatment of intractable posterior epistaxis. *Am J Rhinol Allergy*, *23*(

@ResearchAtJeff