

# A Radio- Anatomic Study of Nasoseptal Flap for Endoscopic Skull Base Reconstruction Using Neuronavigation: A Cadaveric Study

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## Introduction

Innovations and technical refinements have expanded the access of endoscopic skull base surgeons beyond sellar region. One inherent concern is the increased risk of cerebrospinal fluid leak. Nasoseptal flap, a vascularized pedicle flap has dramatically reduced the risk of CSF leak. In this study we measure the dimensions of nasoseptal flap theoretically in thin cut CT scan. We further compare these measurements in cadaver studies with the help of neuronavigation.

## Methods

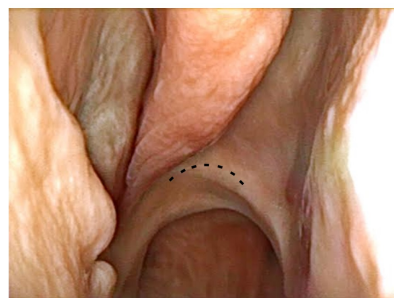
Five disarticulated fresh frozen Caucasian adult heads were dissected for this study. CT scans of these cadaver heads were performed and theoretical size of skull base defects and nasoseptal flaps were measured from various landmarks. Finally standard Hadad-Bassagasteguy flap was raised. The flap dimensions were measured using neuronavigation. These were compared on both sides and with the theoretical sizes.

**Figure 1**



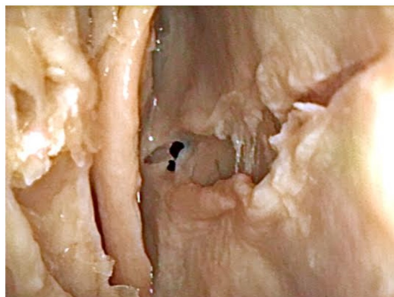
Exposure of anterior cranial base

**Figure 2**



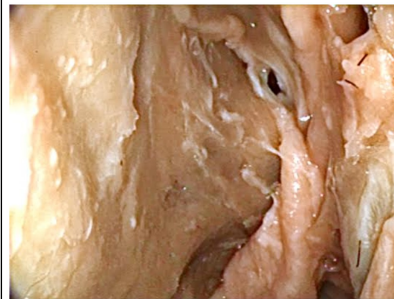
Inferior incision

**Figure 3**



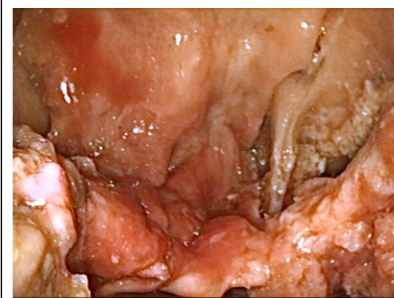
Superior incision

**Figure 4**



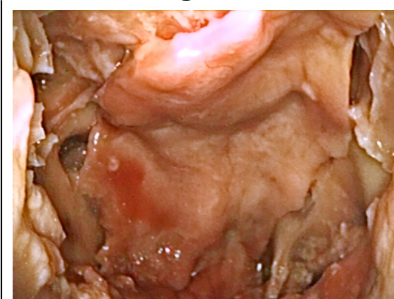
Elevation of graft from nasal septum

**Figure 5**



Placement of graft in nasopharynx before further bone removal

**Figure 6**



Placement of graft to cover anterior skull base

## Results

In all specimens, the theoretical flaps were adequate to cover the anticipated defects. However, a 5mm margin between the edges of the mucoperichondrial flaps and the bony edges, required for strong apposition, were not achieved in all instances. The flaps were long enough to cover the inferior aspect of the clival defect, with adequate 5mm margins. The results are summarized in the table below.

**Table 1**

Parameters	Spec 1	Spec 2	Spec 3	Spec 4	Spec 5	
<b>Sphenoid sinus type</b>	Post sellar	Post sellar	Post sellar	conchal	Post sellar	
<b>L SPP to SO</b>	7	10	11	8	8	
<b>R SPP to SO</b>	9	8	9	9	10	
<b>Left</b>	Theoretical length of flap	78	79	80	70	77
	Theoretical width of flap	36	30	34	33	28
	Theoretical length of flap	78	79	80	70	75
	Theoretical width of flap	36	30	34	33	29
<b>Sequence</b>						
<b>Left</b>	Sup required length of flap TCCTS	99	97	105	84	95
	Sup required length TS	67	76	69	58	65
	Sup required width of flap	25	27	27	28	25
	Sup required length of flap TCCTS	93	86	96	83	96
<b>Right</b>	Sup required length TS	69	75	73	61	67
	Sup required width of flap	25	27	27	28	23
	Sup practical length of flap	75	78	79	70	74
<b>Left</b>	Sup practical length of flap	73	79	82	72	77
	Sup practical width of flap	34	34	35	26	29
<b>Inferior</b>	Inf required length of flap	59	60	57	52	54
<b>Left</b>	Inf required width of flap	28	26	29	28	26
	Inf required length of flap	59	60	58	51	53
<b>Right</b>	Inf required width of flap	28	26	29	28	25
	Practical length of flap	73	73	65	66	63
<b>Left</b>	Practical inf width of flap	30	29	30	28	25
	Practical inf length of flap	77	73	62	61	65
<b>Right</b>	Practical width of flap	28	29	31	28	28

Summary of measurements

## Conclusions

Nasoseptal flap plays a significant role in planning of reconstruction after an endoscopic endonasal procedure. However variable anatomy is plausible and the actual flap is always smaller than the theoretical one. Surgeons should consider this individual variation and plan accordingly in each case.

## Learning Objectives

-Theoretical measurements of flaps tend to be longer than that which is practically achievable and might prove to be insufficient. This is true especially in the setting of the co-occurrence of factors such as a very anterior and inferior defect, a combined transsphenoid and transcribriform approach and a small nose.

-Extending the dissection to the inferior nasal wall, or once past the vertical attachment of the middle turbinate extending the flap superiorly potentially yields a much wider flap.

-alternative options need to be anticipated and explored when a larger exposure is required

## References

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- Kassam AB, Thomas A, Carrau RL, Snyderman CH, Vescan A, Prevedello D, et al: Endoscopic reconstruction of the cranial base using a pedicled nasoseptal flap. *Neurosurgery* 63:ONS44-52; discussion ONS52-43, 2008
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