Endonasal flaps for vascularized ventral skull base reconstruction in the setting of osteoradionecrosis

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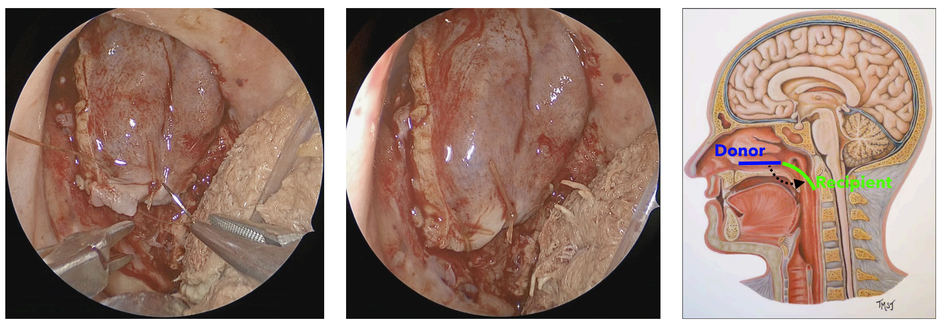
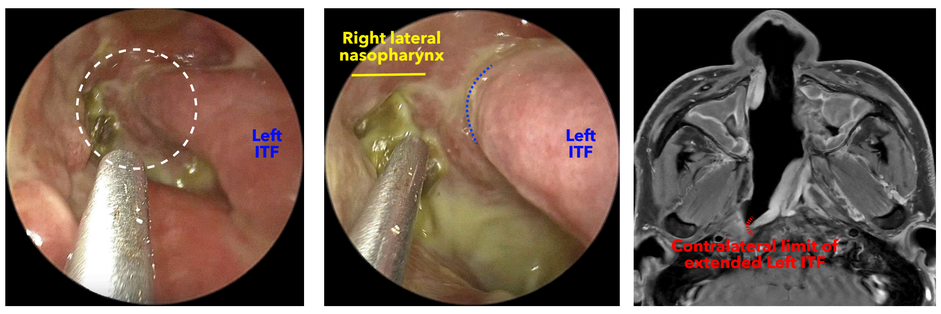
Key Points:
Anatomical Extent of Endonasal Flaps

1. The inferior extent of the nasoseptal flap

> Can reach the C1/C2 junction and may be secured to the prevertebral fascia with sutures via transoral endoscopic approach.



2. The contralateral limit of the extended inferior turbinate flap



3. Endonasal flap repairs are an effective vascularized tissue option for the reconstruction of medically refractory ORN.

> Given a relatively favorable morbidity profiles, if available endonasal flaps should be considered prior to pericranial flaps.

Abstract

Background

- The reconstructive toolbox for osteoradionecrosis (ORN) of the ventral skull base includes several vascularized options including pedicled nasoseptal flap (NSF), regional pericranial flaps, and microvascular free tissue transfer.
- Endonasal flaps confer the least donor site morbidity. However, NSF is often unavailable after the resection and reconstruction of anterior skull base tumors.
- The posteriorly pedicled inferior turbinate flap (ITF) is typically spared from radiation and represents a potential option for ventral skull base reconstruction.
- The literature describing endonasal flap for skull base reconstruction in the setting ORN remains limited.

Objective

- A case series demonstrating the utility of endonasal flaps, including the NSF and the posteriorly pedicled extended inferior turbinate flap (ITF), for vascularized reconstruction of ventral skull base ORN defects.

Clinicopathologic Variables

- n=4. Age range: 28-71 years. 1:1 male: female.
- 1 clival cordoma, 3 nasopharyngeal carcinoma.

Treatment

- Each patient underwent sequestrectomy followed by reconstruction incorporating a combination of NSF and/or ITF.
- All received broad spectrum antibiotics
- 2 of 4 received hyperbaric oxygen therapy
- All cases demonstrated complete mucosalization over the defect.

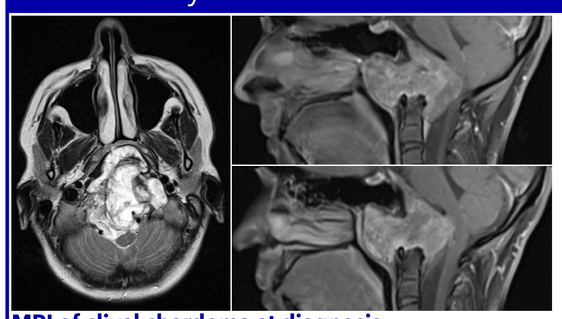
Outcomes

- 3 of 4 exhibited symptomatic improvement and resolution of ORN on MRI.
- 1 of 4 showed symptomatic improvement but persistent ORN on MRI (Case 3).

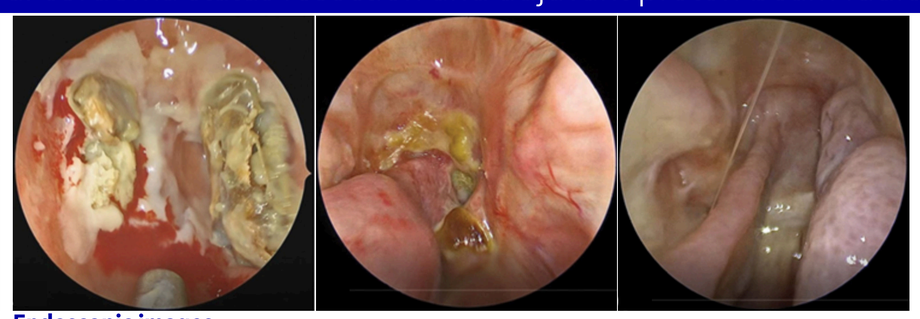
Conclusions

- Extended ITF, with or without contralateral NSF, is a useful endonasal addition to the toolbox for ventral skull base reconstruction.
- Endonasal flap repairs are effective vascularized tissue options for reconstruction in the setting of ventral skull base ORN.

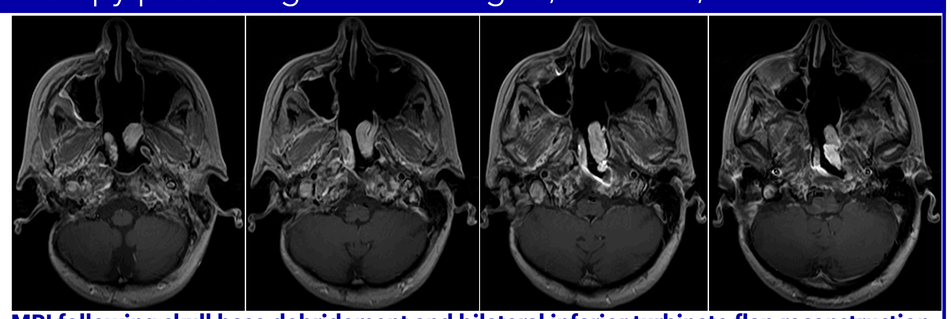
Case 1: 28 year old woman with clival cordoma status resection and adjuvant proton beam radiotherapy presenting with meningitis, CSF leak, and ORN.



MRI of clival chordoma at diagnosis.
Left: Axial T2 showing a hyperintense mass extensively involving the clivus and extending inferiorly to C2.
Right: Two para-sagittal post-constrast T1 sections showing obliteration of the nasopharynx with dorsal extension, mass effect and displacement of the cervicomedullary junction.



Endoscopic images
Left: Skull base osteoradionecrosis prior to sequestrectomy and reconstruction
Middle: Right inferior turbinate flap inset with persistent skull base dehiscence.
Right: Left inferior turbinate flap with healed reconstructed defect.

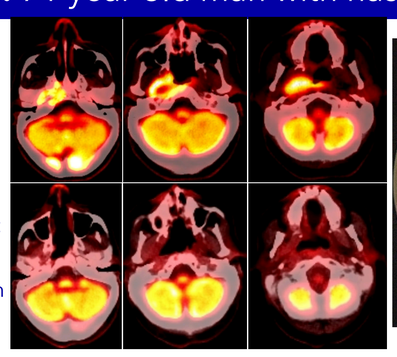


MRI following skull base debridement and bilateral inferior turbinate flap reconstruction.
Axial postcontrast T1 60 months following two-stage reconstruction showing with complete soft tissue skull base coverage with **bilateral inferior turbinate flaps** and closure of cerebrospinal fluid fistula.

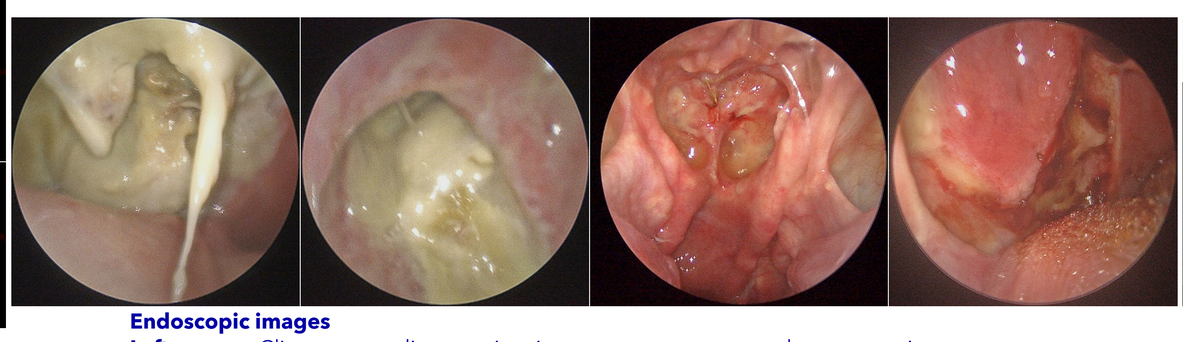
Case 2: 71 year old man with nasopharyngeal carcinoma status post chemoradiotherapy and salvage proton beam therapy presenting with ORN.

At diagnosis: cT3N0M0 Stage III NPC

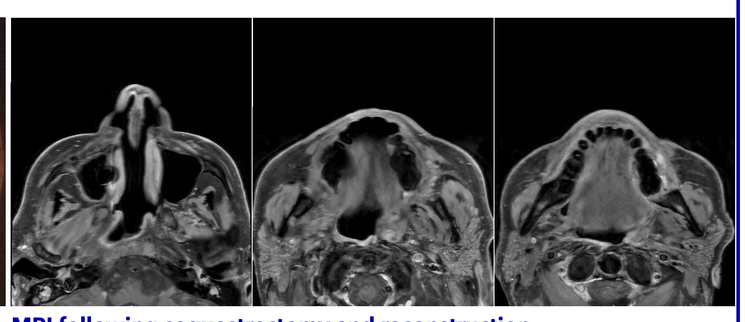
Status post 70 Gy with carboplatin



FDG PET-CT of nasopharyngeal carcinoma
Top: Before primary CRT, showing FDG avid NPC
Bottom: 16 months after CRT showing resolution of FDG avidity

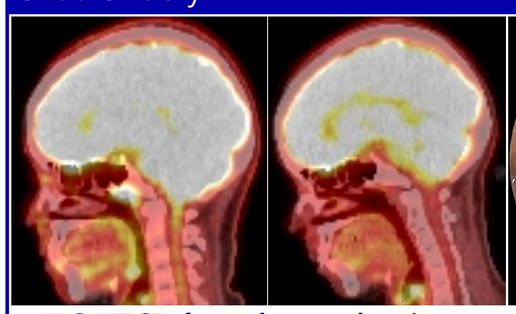


Endoscopic images
Left: Clivus osteoradionecrosis prior to sequestrectomy and reconstruction.
Mid Left: ORN of C1 and C2 vertebral bodies prior to sequestrectomy and reconstruction.
Mid Right: Nasopharyngeal view of healed reconstructed defect.
Right: Oropharyngeal view of healing reconstructed defect.

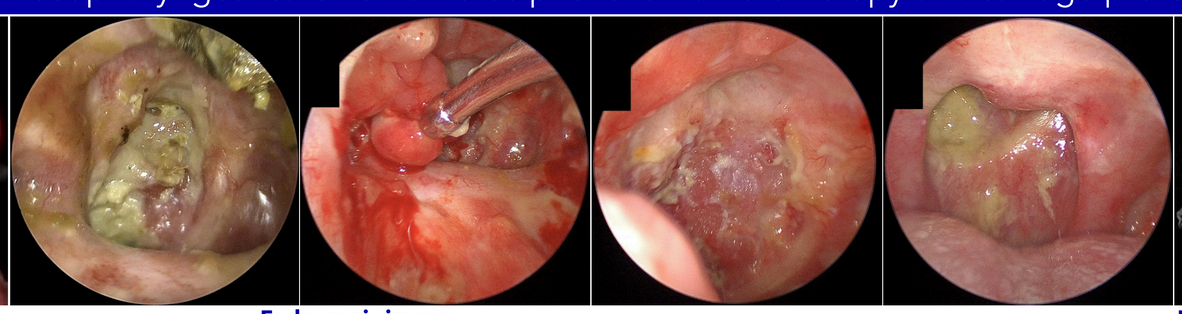


MRI following sequestrectomy and reconstruction
Axial postcontrast T1 10 months postoperatively showing complete soft tissue coverage of clival remnant and anterior aspects of C1 and C2 vertebral bodies using **bilateral nasoseptal flaps.**

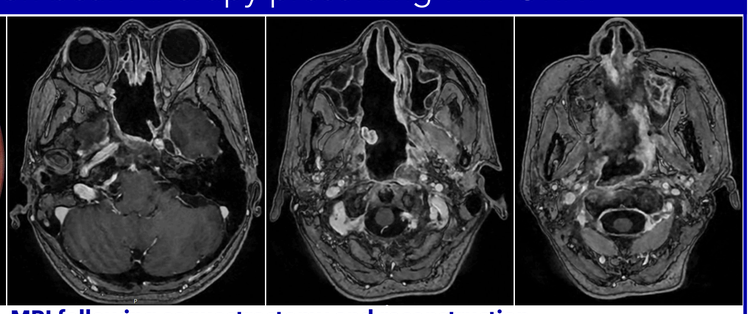
Case 3: 53 year old woman with nasopharyngeal carcinoma status post chemoradiotherapy and salvage proton beam therapy presenting with ORN.



FDG PET-CT of nasopharyngeal carcinoma
Left: Before primary chemoradiotherapy showing FDG avid nasopharyngeal lesion, cT1N1M0, Stage I NPC.
Right: 18 months after CRT (70 Gy with cisplatin) showing resolution of FDG avidity

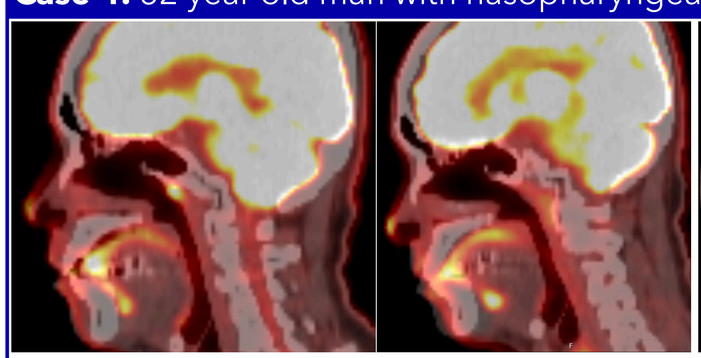


Endoscopic images
Left: Clivus osteoradionecrosis extending inferiorly into oropharynx prior to sequestrectomy and reconstruction.
Mid Left: Right inferior turbinate flap pedicle.
Mid Right: Nasopharyngeal view of healed reconstructed defect.
Right: Oropharyngeal view of healed reconstructed defect.

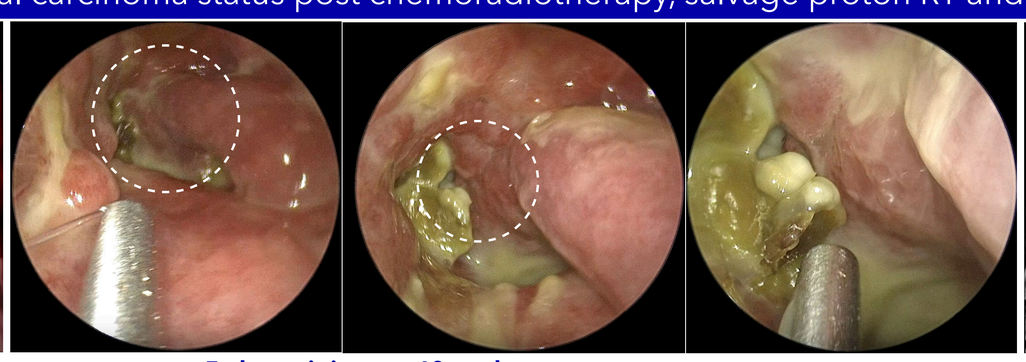


MRI following sequestrectomy and reconstruction
Axial postcontrast T1 9 months postoperatively showing complete soft tissue coverage of clival remnant and anterior aspects of C1 and C2 vertebral bodies using **Right inferior turbinate flap and Left nasoseptal flap.**

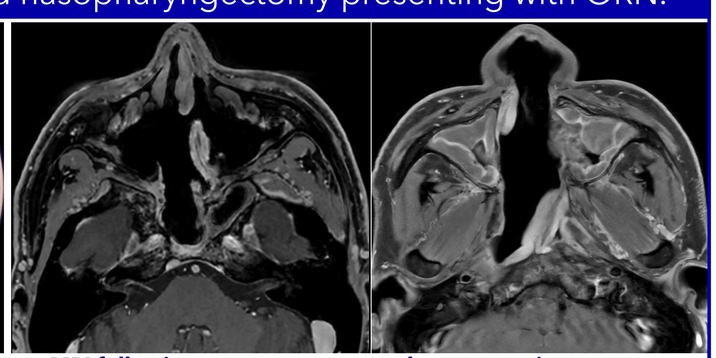
Case 4: 52 year old man with nasopharyngeal carcinoma status post chemoradiotherapy, salvage proton RT and nasopharyngectomy presenting with ORN.



FDG PET-CT of nasopharyngeal carcinoma
Left: FDG avid rcT1N1M0 Stage II Recurrent NPC
Right: 7 and 4 months s/p salvage proton RT and nasopharyngectomy.



Endoscopic images, 10 weeks postop
Left to right: Progressive close up view of nasopharynx showing contralateral limit of extended Left inferior turbinate flap: beyond midline but not reaching the lateral nasopharynx.



MRI following sequestrectomy and reconstruction
Axial postcontrast T1 14 months postoperatively showing extent of **Left inferior turbinate flap** mucosalization over Right internal carotid artery**.**