

Importance of Separation of the Nasopharyngeal and Extradural Spaces

Susan Kaweski, M.D., and Ian T. Jackson, M.D.

ABSTRACT—The extradural dead space must be separated from the nasopharynx to avoid a potentially lethal complication. This can be accomplished by a variety of methods involving vascularized flaps. However, the flap must be large enough to close the defect and it must be well vascularized. A case is presented to illustrate these important features.

The combination of intracranial dead space and a nasopharyngeal connection occurring after cranial vault advancement and reshaping or after extensive skull base tumor resection can be potentially lethal. Infection can result leading to meningitis or abscess formation with eventual loss of the craniotomy flap.¹ Reconstruction is therefore crucial to obliterate the dead space and restore the separation between the cranial contents and the contaminated oropharyngeal and nasopharyngeal areas.²⁻⁶

A case is presented in which two vascularized flaps failed to achieve an adequate barrier between these areas. After radiation, extensive loss of the frontal bone flap resulted, requiring additional reconstructive measures to repair the area.

CASE REPORT

A 49-year-old male with a history of chronic sinusitis presented in January 1994 with occluded left nares. Nasal biopsy revealed this to be a poorly differentiated esthesioneuroblastoma which involved the sphenoid, frontal, and maxillary sinuses and invaded one orbit. He underwent resection of the tumor using an intra- and extracranial approach. A galeal frontalis myofascial flap was used to occlude the connection between the nasopharynx and the subdural space. Postoperatively, the patient had a course of radiation therapy because tumor cell spill is always a possibility.

Three months later a CT scan revealed a dead space behind the frontal bone which communicated with the nasopharynx (Fig. 1). A radial forearm free flap was used to cover the entire inner aspect of the frontonasal bony complex to fill the dead space. The volume of the flap was inadequate and in addition failed to achieve closure of the communication which consequently resulted in devascularization of the frontal bone. Radiation damage to the overlying skin complicated this situation and the bone became exposed in the frontal area (Fig. 2). With debridement this healed, but the connection into the nasopharynx persisted (Fig. 3). In order to deal with this problem, the remainder of the frontal bone flap and the bone of the glabellar area was removed, and a large free rectus abdominis myocutaneous flap was placed into the residual defect. The skin of the flap reconstructed the cutaneous defect and the muscular portion occluded the nasopharyngeal connection (Fig. 4). Postoperatively, the patient did well and the frontal and nasal defects were subsequently reconstructed with cranial bone grafts (Fig. 5).

DISCUSSION

This case illustrates the problem of a dead space with a persistent nasopharyngeal connection. The galeal frontalis flap is a highly vascular flap and this is commonly used to separate the intracranial area from the nasopharynx.^{7,8} In this patient, perhaps due to ischemia,

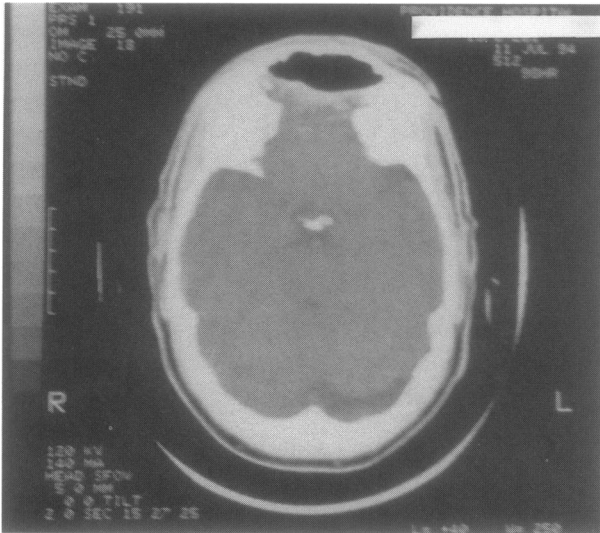


Figure 1. Postoperative CT scan reveals the persistent dead space behind the frontal bone.



Figure 3. Loss of the frontal bone and the resulting defect at 1 year postresection.

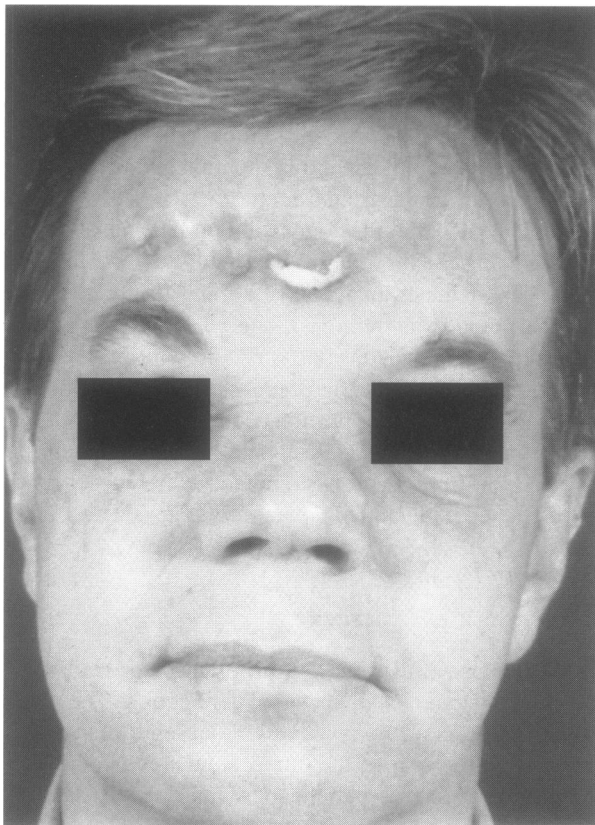


Figure 2. Exposure of frontal bone after an attempt to separate the extradural space from the nasopharynx using a radial forearm free flap.

the flap did not provide adequate closure and in addition, the radial forearm flap failed to achieve a seal and this resulted in bone loss.

An extradural nasopharyngeal connection can be disastrous if there has been dural repair because meningitis or brain abscess may result.^{1,9-12} There may be acute or chronic infection around bone grafts ultimately resulting in their absorption.

If there is a persistent cavity behind the frontal bone it will undergo ischemic necrosis. In order to close the nasopharyngeal intracranial connection following tumor resection to prevent any extradural dead space, a well-vascularized flap is necessary. The galeal frontalis myofascial flap is considered to be the workhorse for anterior skull base reconstruction and is based on the supraorbital and supratrochlear vessels.¹³ The inferior edge of the frontal craniotomy can be removed so as to create a slot for passing the flap through the bone and onto the area requiring coverage. If a medial orbital wall bone graft needs a vascularized flap, a second flap can be introduced.¹⁴

If the galeal frontalis flap is unavailable, the temporal galeal flap can be used. The superficial temporal vessels supply this flap which can be raised almost to the midline and brought through into the frontal area to extend just beyond the midline.¹⁴ Care must be exer-

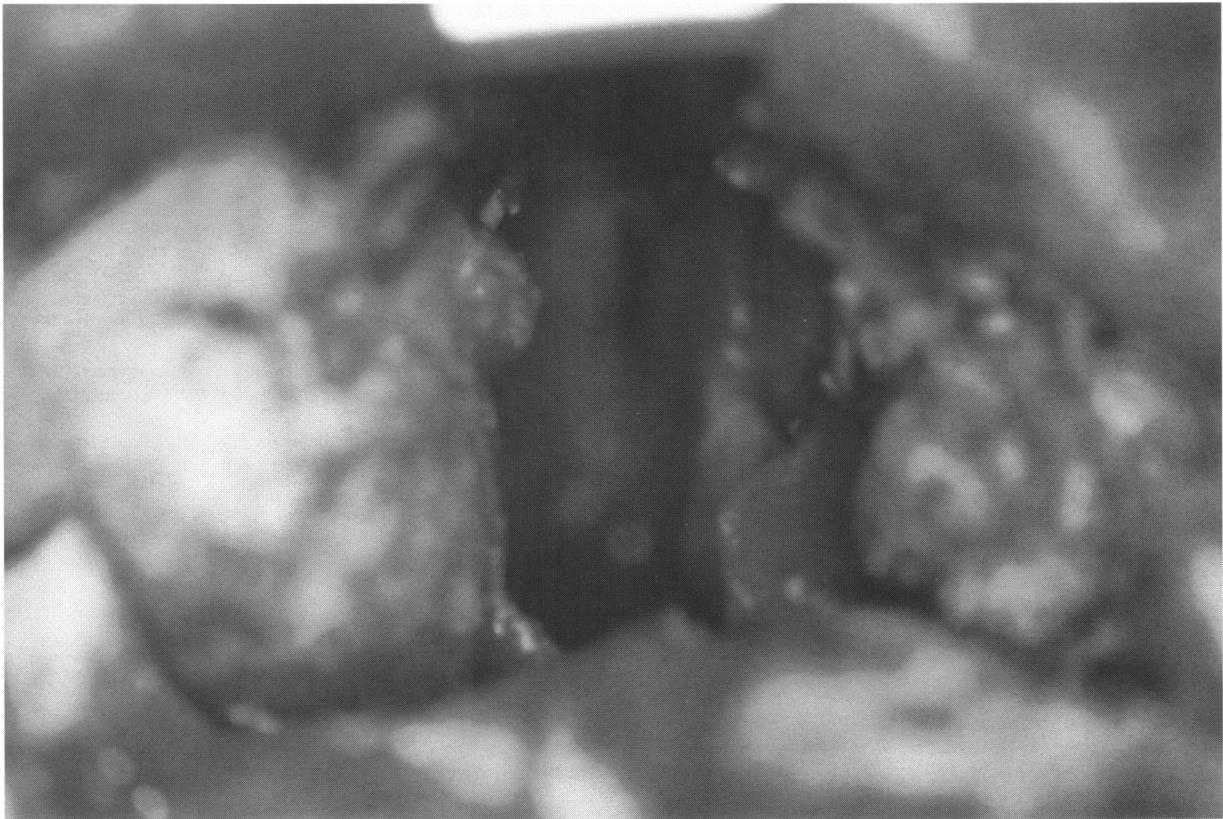


Figure 4. View of defect into the nasopharynx from the back of the anterior cranial fossa following debridement.

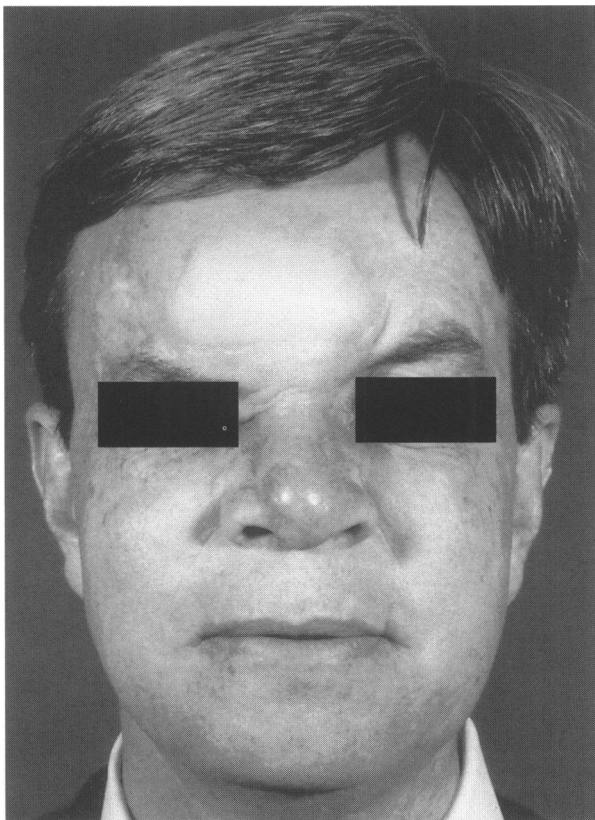


Figure 5. Postoperative appearance after placement of a free rectus abdominis flap to close the skin and anterior cranial fossa defect. Further trimming and reconstruction is planned.

cised to avoid taking the flap anterior to the hairline, as this may cause damage to the frontal branch of the facial nerve. Recently, a reversed superficial temporal vessel flap has been described.¹⁵

The temporalis muscle can be used in orbital defects, or if it is sufficiently mobilized, can extend across to the medial orbital wall in the subcranial area. Both the superficial temporal vessels and deep temporal vessels supply this flap, the main flow arising from the deep vessels. The flap can therefore be elevated on its pedicle just above the coronoid process of the mandible.¹⁴

Various musculocutaneous flaps have been used to reconstruct this area including trapezius flaps which have been utilized by placing the skin island beyond the muscle edge and totally mobilizing the muscle by dividing all origins and insertions. This flap does provide adequate bulk but at the expense of function and a noticeable bulge of the neck.¹⁶ Pectoralis major muscle flaps can be used but they also create a neck deformity.¹⁷

In the rare event of local flaps being insufficient to close the defect, free tissue transfer should be planned. If the extracranial or subcranial defect is large, latissimus dorsi, omentum and rectus abdominis flaps should be considered.¹⁸ These will effectively close the communication between the brain and the nasopharynx and aid reconstruction of the extracranial region.

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ACKNOWLEDGEMENT

We would like to thank Mrs. Gretchen Laginess for the preparation of this manuscript.