Reconstruction of Skull Base Defects

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KEYWORDS

• Skull base reconstruction • Nasoseptal flap • Pericranial flap • Temporoparietal flap • CSF leak • Endoscopic skull base surgery

KEY POINTS

- This article describes an array of options for skull base reconstruction.
- Techniques used for acellular grafting, cellular grafting, and vascularized flap reconstruction are described, as well as benefits and limitations of each.
- A standard approach to patient management, from preoperative evaluation to postoperative care is also described.

INTRODUCTION

Endoscopic skull base surgery has become increasingly complex over recent years. As approaches to the skull base have expanded, reconstructive options have broadened and diversified. A multitude of reconstruction techniques are discussed in the literature. Most recently, vascularized grafts have been used for reconstruction. As endoscopic techniques have expanded to include large intradural and even intra-arachnoidal surgery, combinations of these reconstructive options have been used in tandem.

TREATMENT GOALS AND PLANNED OUTCOMES

The primary goal of the reconstructive surgeon is to provide a watertight separation between the sinonasal tract and intradural space to prevent postoperative

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cerebrospinal fluid (CSF) leak, thereby decreasing the risk of devastating sequelae like pneumocephalus and/or meningitis while promoting timely and uncomplicated wound healing.

PREOPERATIVE PLANNING AND PREPARATION

Before surgery, careful consideration of the tumor characteristics, including its type, proximity to other structures, and expected surgical defect, must be undertaken. In addition, patient factors that could affect postoperative healing must be considered, including other underlying health problems, smoking history, prior radiotherapy, and obesity.

PATIENT POSITIONING

Patients undergoing endoscopic endonasal skull base surgery, either extradural or intradural, are largely managed in a standardized fashion with few very specific modifications that are outside the scope of this discussion. Once general anesthesia has been established, meticulous positioning and preparation are undertaken before the commencement of the procedure. In a select group of patients, including those with known elevated intracranial pressures, morbid obesity, and/or those in whom large dural defects with resultant high-flow CSF leaks are expected, consideration for placement of a lumbar drain before starting the procedure should be undertaken. With the evolution of skull base surgery over the past decade, it became common to have lumbar drains placed before surgery for CSF diversion.[1] It was thought, from experience with open cranial cases, that diversion would relieve pressure in the setting of postoperative edema. However, like all interventions, lumbar drains came with a unique and separate set of risks and complications, including headache, meningitis, tension pneumocephalus, and herniation. The literature reports a 3% risk of major complications, and 5% risk of minor complications associated with lumbar drains.[2] Because of this, several recent studies have been performed to assess the need for lumbar drains in the preoperative period for endoscopic skull base resections. Garcia-Navarro and colleagues[3] reviewed 46 cases in which 67% of patients had lumbar drains placed. Only 2 patients had postoperative CSF leaks, and they found no significant relationship between lumbar drain usage and postoperative CSF leak rate. Ransom and colleagues[4] retrospectively reviewed 65 patients who had lumbar drains placed at the time of surgery. They found a postoperative CSF leak rate of 6.2%, whereas their lumbar drain complication rate was 12.3%, and recommended very judicious us of lumbar drains to avoid further complications. Because of this, the use of lumbar drains should be restricted to only very specific patients at the discretion of the surgeon.

Once the decision for lumbar placement has been made and performed, the bed is then turned 90° away from the anesthesia team. Next, at the discretion of the surgeon, the patient may remain flat or be placed in a modified beach chair position, with the head of bed elevated and feet lowered. A degree of reverse Trendelenberg also may be used to optimize positioning. It is our standard practice to not place the patient in pin immobilization, but scenarios exist when this immobilization is used, particularly when a combined endonasal and transcranial approach is required. Finally, depending on the proposed reconstruction, additional required surgical sites (eg, abdomen, lateral thigh, and scalp) are prepped and draped in the standard fashion to facilitate surgical access. Once this is completed, the image guidance system is brought into the field and positioned in the standard fashion following patient registration.