CASE REPORT

Successful Repair of Large Skull Base Defect Following JNA Excision

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Abstract

Juvenile nasopharyngeal angiofibroma (JNA) is a highly vascular tumor of young males. Surgical excision remains the principal modality of treatment. Tumors with intracranial extension may require major surgical resections which are not devoid of complications. We here present a case of JNA with massive intracranial extension with postsurgery huge skull base defect with resultant encephalocele which was repaired successfully using rectus abdominis free flap.

Keywords: Juvenile nasopharyngeal angiofibroma, skull base , rectus abdominis free flap.

INTRODUCTION

Juvenile nasopharyngeal angiofibroma is a vascular tumor of adolescent males. This benign tumor originates along the posterolateral nasal cavity and from this region of initial growth may spread extensively following the natural soft tissue planes. When significantly advanced, these angiofibromas can result in bone destruction and eventual intracranial extension. Advancements in skull base surgery have helped achieve the goals of surgical resection by improving surgical access and vascular control, thereby lowering overall morbidity. Despite these advancements reconstruction of skull base defect created by tumor and surgery itself remains the principal challenge for the surgeons. In the vast majority of cases, skull base defects are the result of tumor extirpation involving the cranial base. With the development in skull base reconstruction, free flaps have greatly expanded possibilities in term of creating a safe seal to the intracranial space. In the present case report we describe an unusual case of huge encephalocele with large anterior and middle skull base defect following excision of angiofibroma with postoperative complication of brain abscess. Reconstruction of this skull base defect was done successfully with rectus abdominis free flap.

CASE REPORT

A 14 years old boy presented to the Department of Otorhinolaryngology, All India Institute of Medical Sciences, New Delhi with history of nasal obstruction and epistaxis for 4 years. He was already a diagnosed case of juvenile nasopharyngeal angiofibroma and was operated outside for the same 4 years back. He had recurrence of the tumor after 4 months of surgery for which he was reviewed at our institute 2 years back. At that time radiological investigations showed a large recurrent tumor in left side nasal cavity, maxillary sinus, infratemporal fossa with extension to temporal lobe and involvement of left cavernous sinus. He was planned for external beam radiotherapy and received 36 grey in 18 # in 3 weeks. Patient initially presented to department of ENT in emergency with left sided nasal bleed after 3 months of completion of radiotherapy. MRI showed tumor in left nasal cavity, nasopharynx, pterygopalatine fossa, left sphenoid with erosion of greater wing of sphenoid and middle cranial fossa extension. He underwent excision of extracranial part of tumor by maxillary swing approach and subsequently temporal craniotomy was done in neurosurgery department for the intracranial part of tumor. In postoperative period, patient developed seizures and right hemiplegia. He was diagnosed as left temporal lobe abscess and left temporal craniotomy and abscess drainage was done. During follow-up visits, patient developed palatal necrosis and subsequently there was a large palatal defect, from which a mucosa covered smooth pinkish mass could be seen hanging in oral cavity (Fig. 1). We got a contrast enhanced CT scan done which showed a large left sided skull base defect with huge encephalocele prolapsing

Figure 1: Clinical photograph showing large encephalocele protruding out in oral cavity

into oral cavity and oropharynx (Fig. 2). In view of high chances of infection, it was decided to cover the defect with free flap. Patient underwent free rectus abdominis flap repair under general anesthesia. Free rectus abdominis flap based on deep inferior epigastric artery was harvested. Lateral rhinotomy incision was made and cheek flap was raised. Encephalocele was seen protruding in oral cavity. Cervical incision was given and facial vessels were dissected out for microvascular anastomosis on left side of neck. Microvascular anastomosis was done between facial vessels and deep inferior epigastric vessels with 9-0 nylon (Figs 3A and B). Encephalocele was covered with rectus abdominis muscle and was sutured all around the defect. Neck wound was closed in two layers. In postoperative period, regular monitoring of flap viability was done. Postoperative period remained uneventful with good take up of flap (Fig. 4). At follow-up period of 18 months patient was disease free without any further episode of intracranial complication.

DISCUSSION

There are three requirements for successful skull base reconstruction.[1,2] The first is separation of the cranial cavity from the nasopharynx, the paranasal sinuses, and the orbit. The second is watertight dural reconstruction. The third is an adequate support of the brain tissue. These are essential to prevent postoperative CSF leakage, meningitis, extradural abscess, and brain herniation. Local flaps, distant flaps, and free flaps have been introduced into the skull base to seal off any defects. According to the size of dead space at the skull base resulting from tumor resection, many types of flap with sufficient bulk are available. The obliteration of dead space at the skull base using well-vascularized tissue with an adequate dural closure is most important to achieve successful skull base reconstruction. Even if complete watertight dural repair with fascial graft is difficult, a well-vascularized flap with sufficient volume may prevent postoperative CSF leakage with the help of a perioperative lumbar spinal drainage.

A discussion of cranial base anatomy with particular emphasis on blood supply is relevant to surgical reconstruction of this region, particularly following approaches to the anterior and middle cranial bases.

The blood supply to the soft tissues adjacent to the anterior skull base is primarily via branches of the internal carotid artery. The frontal scalp is supplied mainly by the supratrochlear and supraorbital arteries with accessory supply from the anterior branch of the superficial temporal artery. Preservation of the supraorbital and supratrochlear arteries is critical in maintaining vascularity to galeopericranial flaps.[3] Unfortunately, the blood vessels of the anterior skull base are not of sufficient caliber to allow microvascular anastomosis, and free flaps require that the vascular pedicle be extended to distant areas such as the upper neck or to the lateral face where larger vessels can be found.[4]

Blood supply to the extracranial soft tissues, middle cranial fossa is via branches of the terminal branches of the external carotid artery. The temporoparietal fascia and the temporalis muscle are important sources of adjacent local tissue, which can be used in reconstruction of the middle cranial base. The temporoparietal fascia is supplied by the superficial temporal artery. Routine elevation of the scalp and cervicofacial skin flaps generally results in disruption of the temporal vessels in the preauricular region. Therefore, if the temporoparietal fascia flap is being contemplated as a reconstructive modality, dissection of the flap with isolation and protection of its pedicle must be performed prior to the surgical access necessary to access the tumor.

Options for skull base reconstruction include the following:

- Grafts
  - Skin
  - Fascia
  - Fat or dermis-fat
  - Allografts—Dura, dermis, bone
- Local flaps[1-5]
  - Forehead and scalp flaps—Cutaneous
  - Galeal-pericranial—Fascial
  - Temporal system—Muscle, fascial, osseus
  - Septonasal – Mucosal
- Regional flaps[6,7]
  - Pectoralis major—Myocutaneous
  - Latissimus dorsi—Myocutaneous
  - Inferior trapezius—Myocutaneous

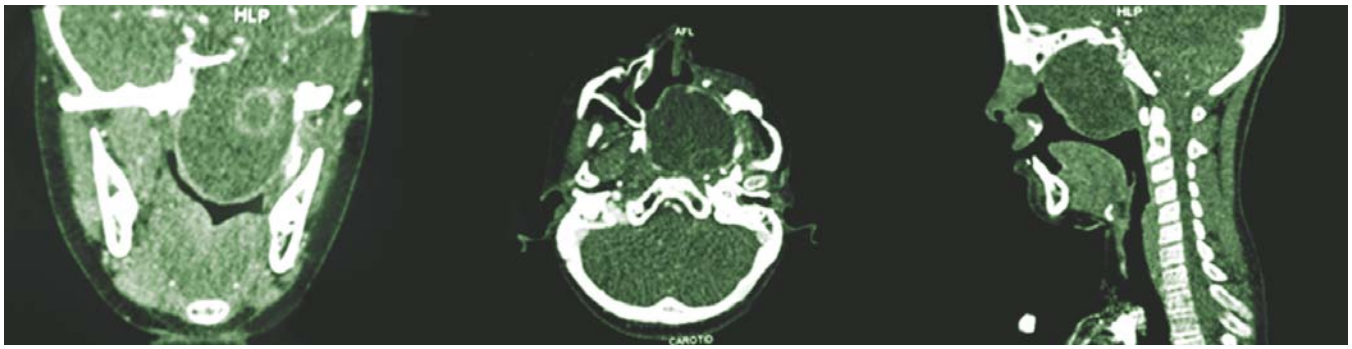
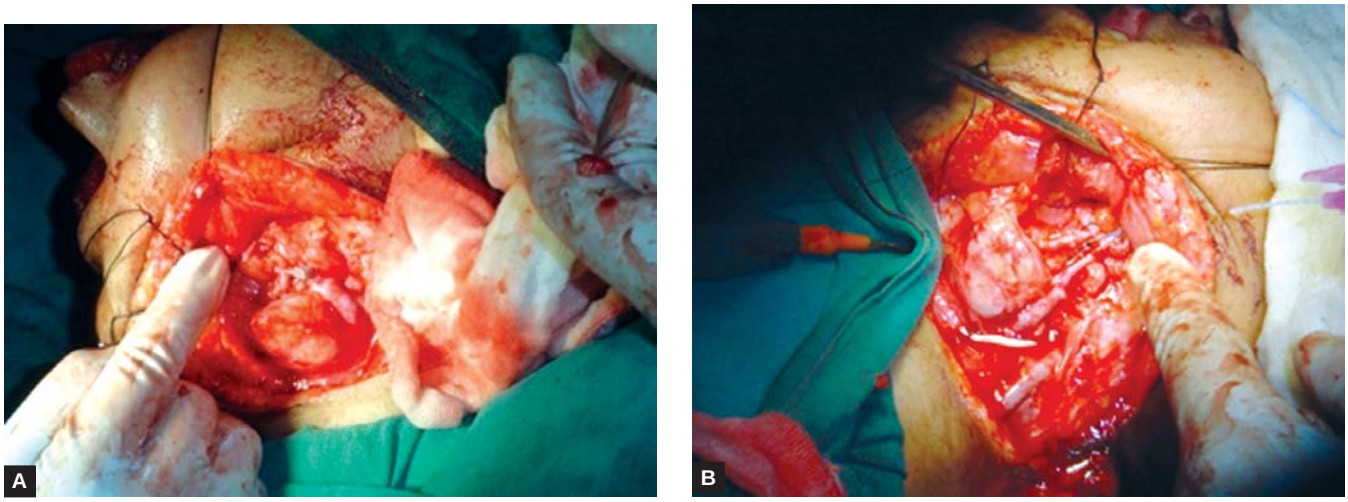


Figure 2: CT scan (Coronal, axial and sagittal cuts) showing large encephalocele prolapsing in oral cavity and oropharynx



Figures 3A and B: Intraoperative photograph showing microvascular anastomosis between facial vessels and deep inferior epigastric vessels

Figure 4: Postoperative clinical photograph showing well-healed flap

- Revascularized free flaps[8-11]
  - Radial forearm—Fasciocutaneous
  - Rectus abdominis—Myofasciocutaneous
  - Subscapular—Osseo/myofasciocutaneous
  - Latissimus dorsi—Myocutaneous
  - Gastro-omental—Fascial/mucosal

Rectus abdominis flaps are based on the deep inferior epigastric artery and vein and can be harvested as either a myogenous or a myofasciocutaneous flap. Early in the application of free revascularized flap reconstruction to skull base defects, the rectus abdominis flap became the workhorse free flap for anterior and middle cranial base reconstruction.[11] Advantages of the flap include (1) potential for a very large cutaneous skin paddle, (2) ease of harvest, (3) long vascular pedicle, and (4) versatility in allowing simultaneous work while tumor removal is completed. Disadvantages include an overly bulky reconstruction when taken as a myocutaneous flap in individuals who are obese. Because of this problem, the rectus abdominus flap is often harvested as a muscle–only flap to restore lost bulk, with skin grafting used as necessary in cutaneous defects. In our case there was a large anterior and middle skull base defect with a huge encephalocele prolapsing in oral cavity which was successfully reconstructed using rectus abdominis free flap.

CONCLUSION

As the number of surgeries for skull base lesions increase, so will the incidence and size of skull base defects. This case is a classical example of that. As mentioned, there are many ways to close it. Though rectus abdominis flap is a very sturdy flap, the choice of technique used for closure should be individualized as per the case.

REFERENCES

1. Schramm VL Jr, Myers EN, Maroon JC. Anterior skull base surgery for benign and malignant disease. Laryngoscope 1979;89:1077-91.
2. Johns ME, Winn HR, McLean WC, Cantrell RW. Pericranial flap for the closure of defects of craniofacial resections. Laryngoscope 1981;91:952-59.
3. Schaefer SD, Close LG, Mickey BE. Axial subcutaneous scalp flaps in the reconstruction of the anterior cranial fossa. Arch Otolaryngol Head-Neck Surg 1986;112:745-49.
4. Jackson IT, Adham MN, Marsh WR. Use of the galeal frontalis myofascial flap in craniofacial surgery. Plast Reconstr Surg 1986;77: 905-10.
5. Arden RL, Mathog RH, Thomas LM. Temporalis muscle-galea flap in craniofacial reconstruction. Laryngoscope 1987;97: 1336-42.
6. Sasaki CT, Ariyan S, Spencer D, Buckwalter J. Pectoralis major myocutaneous reconstruction of the anterior skull base. Laryngoscope 1985;95:162-66.
7. Rosen HM, Simeone FA, Bruce DA. Single stage composite resection and reconstruction of malignant anterior skull base tumors. Neurosurgery 1986;18:7-11.
8. Jones NF, Schramm VL, Sekhar LN. Reconstruction of the cranial base following tumor resection. Br J Plast Surg 1987;40:155-62.
9. Guignard RM, Savary M, Campiche R. Team approach of sinusoorbital tumors invading the skull base. Eur J Plast Surg 1988;11:169-74.
10. Nohira K, Watanabe A, Ohshima 0, Ito T. A microsurgical reconstruction of the anterior cranial base and the orbit immediately following the resection of an ethmoid sinus carcinoma: A report of two cases. Jpn J Plast Reconstr Surg 1991;34:1189-98.
11. Yamada A, Harii K, Ueda K, Asato H. Free rectus abdominis muscle reconstruction of the anterior skull base. Br J Plast Surg 1992;45:302-06.