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Case Report

Surgical management of large scalp infantile hemangiomas

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Abstract

Background: Infantile Hemangiomas (IH) are the most common benign tumor of infancy, occurring in over 10% of newborns. While most IHs involute and never require intervention, some scalp IHs may cause severe cosmetic deformity and threaten tissue integrity that requires surgical excision.

Case Description: We present our experience with two infants who presented with large scalp IH. After vascular imaging, the patients underwent surgical resection of the IH and primary wound closure with excellent cosmetic outcome. We detail the surgical management of these cases and review the relevant literature.

Conclusion: In some cases the IHs leave behind fibro-fatty residuum causing contour deformity. Surgery is often required for very large lesions causing extensive anatomical and/or functional disruption. The goal of surgical intervention is to restore normal anatomic contour and shape while minimizing the size of the permanent scar.

Key Words: Congenital abnormality, hemangioma, scalp, surgical management

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INTRODUCTION

Infantile hemangiomas (IH) are the most common soft tissue tumors of infancy, and present at the time of birth or within the first month of life in up to 12% of children.[16] IH often proliferate rapidly during the first few weeks of life, approximately 80% of the superficial hemangioma growth is achieved by 3 months of age.[14] They are most frequently located in the head and neck region (60%), followed by the trunk (25%) and the extremities (15%). Approximately 80% of them are solitary, and 20% can proliferate in multiple sites.[9]

Conventional management of IH includes watchful waiting, with medical management indicated for more difficult lesions. Scalp IH, however, require special consideration due to their location and potential for life-threatening, functional, or cosmetic side effects. When they present as small lesions, they can be observed as most spontaneously involute by 5-7 years of age.[4] However, large scalp lesions can be associated with serious sequelae such as ulceration, bleeding, and cardiac failure, as well as unaesthetic outcomes such as abnormal growth of the cranial vault.[11] Other complications of scalp IHs include the disruption of the visual axis in large frontal lesions, disruption of the anterior hairline as the lesion involutes leaving behind a large region of alopecia, and the disruption of the aural anatomy that can become permanent if the lesion is not removed early.[20]

Due to the high association with complications and functional impairment of scalp IH, many authors have

advocated early surgical consideration.[7,20] We aim to present two cases of large scalp IHs that were causing significant cosmetic and/or functional impairment in infants and required surgical removal. We also review the literature regarding the management strategies available to treat these lesions.

CASE REPORTS

Patient 1

History and Examination: An otherwise healthy male infant was born with a 4 × 5 × 6 cm (AP, transverse, CC) mass of engorged vessels overlying the right parietal region [Figure 1]. The fontanelle was soft and flat and the remainder of the physical and neurological examinations was normal. Preoperative laboratory was normal and a computed tomography/computed tomography angiography (CT/CTA) demonstrated a vascular pattern consistent with an IH. After a period of observation, the lesion developed venous engorgement with early signs of skin necrosis at its apex. Imaging demonstrated inward displacement of the underlying skull and impingement upon the right brain convexity [Figure 1]. Due to the large lesion causing extensive anatomical disruption of the surrounding tissues and high risk of permanent disfigurement, we decided to proceed with surgical excision.

Operative details: When the patient was 12 weeks, he was taken to the operating room for surgical excision. The patient was prepped and draped in a sterile fashion. The planned circumferential incision was infiltrated with local anesthetic with epinephrine and a #15 blade scalpel was used to incise the skin. Dissection was carried in a circumferential manner outside the lesion in the avascular galeal plane with a needlepoint-insulated bovie [Figure 2]. The lesion was gently dissected from the pericranium and judicious use of bonewax effectively closed transosseus venous channels. Primary closure of the defect was carried

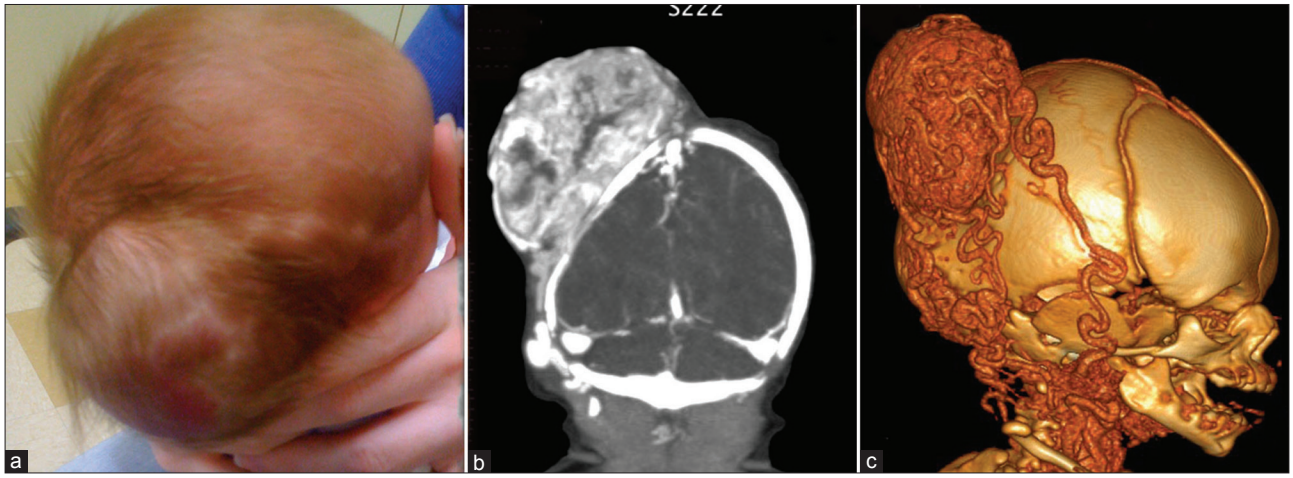

Figure 1: A parietal mass (a) on the right measuring 4 × 5 × 6 cm (AP, transverse, CC). CTA (b) Some inward displacement of the underlying skull and impingement upon the right brain convexity. CTA reconstruction (c) The extent of the lesion

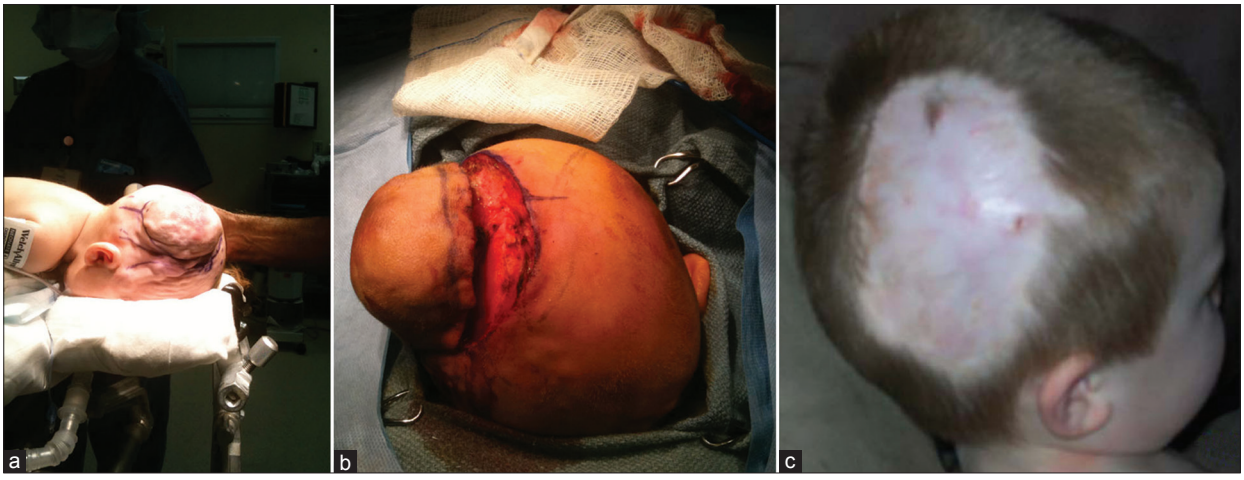

Figure 2: Intraoperative images (a, b) The right parietal hemangioma and circumferential dissection in the avascular galeal plane around the lesion. Follow-up image (c) 6 months later shows excellent wound healing

out with elevated supraperiosteal flaps from both the left and right advancing toward the midline and closed using #4-0 Vicryl interrupted sutures. Estimated blood loss for the entire procedure was 10 cc. The patient tolerated the procedure well without any complications.

Follow-up: More than 3 years after resection, the child is doing well with an excellent cosmetic outcome [Figure 2]. He is walking and achieving all milestones appropriately.

Patient 2

History and Examination: An otherwise healthy female was born with large frontal IH on the left side of the forehead. After birth the lesion was seen to increase in size when she cried or was exposed to warm ambient temperature suggestive of venous congestion. The lesion also began to increase in size slightly on the lower pole and the patient started developing some ptosis and amblyopia of the ipsilateral eye. Due to the large size of the lesion causing substantial anatomical disruption including encroachment of the visual axis urgent surgical resection was considered. A magnetic resonance imaging (MRI) scan was carried out which depicted a 3.5 × 7 × 5 cm (AP, transverse, CC) hyperintense mass centered within the left frontal and supra-orbital region. The lesion was in close relationship to the anterior superior sagittal sinus (SSS) and no clear fat plane was seen between them [Figure 3]. To further study the drainage of the lesion, a diagnostic cerebral angiogram was carried out that depicted a pedunculated hemangioma in the frontal region with some venous pooling and eventual communication in the SSS [Figure 4].

Operative details: When the patient was 6 months old, she was taken to the operating room for resection of the frontal IH. Circumferential dissection was carried out with a needlepoint bovie. The single venous pedicle communicating with the SSS was ligated with bipolar cautery and bonewax. Closure was then carried out by the plastic surgery service. To close the large defect, extensive elevation of the fasciocutaneous flaps was required. Multiple galeatomies in the flaps allowed the flap to be expanded and generate enough laxity to cover the defect fully with minimal tension.

Follow-up: Six months of follow-up, the patient is

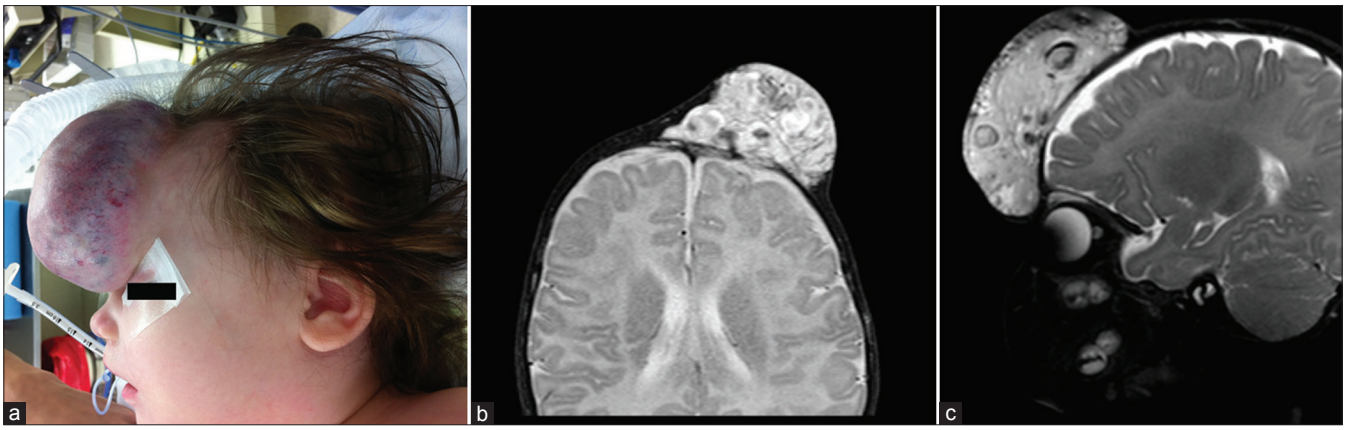

Figure 3: Intraoperative image of the 3.5 × 7 × 5 cm (AP, transverse, CC) hemangioma (a) Postcontrast T1-weighted MRI scans (b, c) The hyperintense mass centered within the left frontal and supra-orbital region vascular lesion

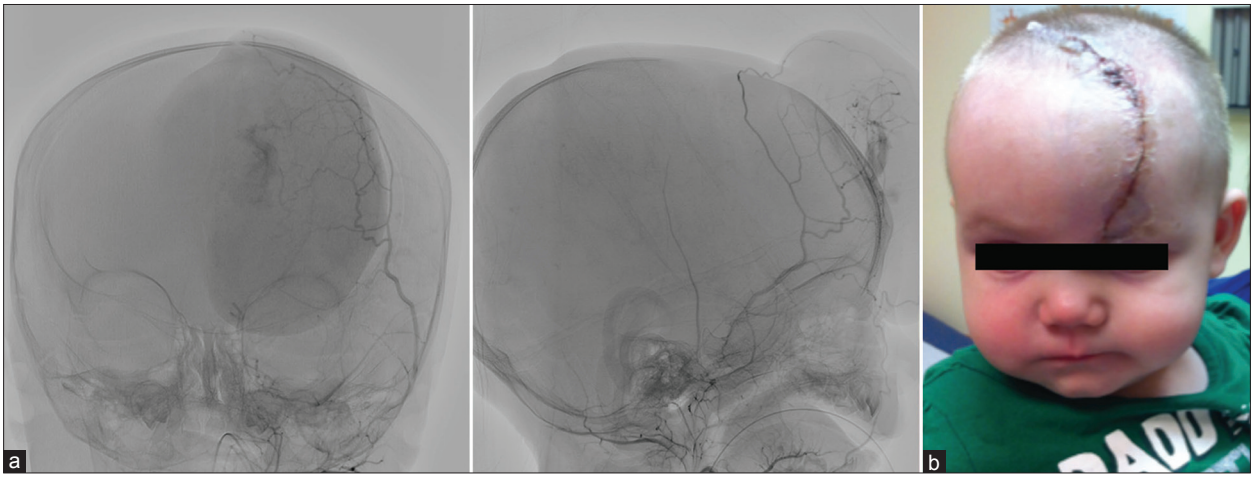

Figure 4: Preoperative angiography (a, b) A pedunculated hemangioma in the frontal region with some venous pooling and eventual communication in the superior sagittal sinus. Postoperative picture taken 6 weeks later shows the scar

doing well with no visual problems and is achieving milestones [Figure 4].

DISCUSSION

Most IH are small, inconsequential, and regress without therapy. When medical treatment is indicated, a host of agents have been used. Topical, systemic or intralesional steroids have been the most commonly used agents. Pulse dye laser therapy is also used, especially in cases of ulceration or superficial telangiectasias.[7] Recently there has been increasing interest in the efficacy of propranolol in treating IHs.[2,3,6,12,15,17] A systemic review by Marqueling and colleagues showed an average response rate of 98%, with response being defined as any improvement. Serious side effects reported were rare with symptomatic hypotension, hypoglycemia, and symptomatic bradycardia.[15] Rebound growth was documented in 17% of propranolol-treated patients.[15] Also a small percentage of patients may not respond to propranolol therapy due to drug resistance.[5]

Clinically IH have been described as abortive, proliferative, or involuting. Historically, surgical intervention was delayed until the infant was older and the lesion began to involute with diminishing intralesional flow. With evolving medical therapies, surgical excision now is reserved for patients in whom medical management is contra-indicated, not tolerated, or has failed.[7] With larger scalp IH, bleeding, ulceration, or hemodynamic instability may also warrant surgical intervention. Severe cosmetic deformity or IH threatening normal visual development are also indications for surgical excision.[19] Surgical management may also be suitable for patients in whom the cosmetic outcome with conservative management may be poor. Large IH with complete involution, may often leave behind atrophic fibrofatty tissue along with alopecia from thin, abnormal dermis.[23]

We described two infants who presented to our service with large scalp IHs that were causing significant cosmetic deformity and had a risk of unaesthetic involution. One caused visual impairment with increasing ocular compression. Early surgical intervention in these cases was undertaken to avoid functional and unaesthetic manifestations. Both endovascular and open surgical procedures have been described for scalp IH; transarterial embolization of feeding arteries with ethanol,[24] coils,[13] onyx,[22] and/or polyvinyl alcohol (PVA)[21] has been proven to safely and effectively treat scalp IH in the short term. However, embolization alone is not a definitive treatment as collateralization and recanalization can occur.[22] Additionally, atrophic tissue and alopecia may persist resulting in poor cosmetic outcomes.

There are few reports in the literature on the outcome after surgical resection of scalp IH.[1,7,10,16,18,20,23] In 1985, Fujino and colleagues described their experience with surgical removal of IHs in infants. They reported minimal intraoperative bleeding and few wound-related adverse effects with meticulous microsurgical technique.[10] Mulliken and colleagues presented their series of 25 children who underwent surgical excision and purse-string closure for facial and scalp IHs. They showed good cosmetic outcome with their surgical technique.[16] More recently, Spector and colleagues reported six patients who underwent excision for proliferative IH of the scalp with good cosmetic outcomes and no complications.[20]

Preoperative investigations should include modalities to discern the venous drainage of the lesion as this may dictate the intraoperative management of the patient. Midline scalp and lumbar vascular malformations are associated with underlying central nervous system malformations and MRI may help uncover some of these congenital abnormalities.[8] While lateral scalp IH generally drain into scalp veins, midline IH may drain into the SSS. A connection with the SSS needs to be evaluated to better plan the surgery. In patient number 2, the MRI was not able to rule out drainage into the SSS and a diagnostic angiogram clearly demonstrated drainage to the SSS.

The main concern for operating on IHs is the risk of exsanguinations, as even small amounts of blood loss in an infant may be dangerous. This risk may be minimized by staying in the avascular galeal plane outside the IH while carrying out the excision. Sharp dissection with a needlepoint bovie or iris scissors with careful cauterization of any vessels allows for adequate demarcation of the IH from surrounding tissue. To minimize the risk of air embolism in those lesions with intracranial venous drainage, pedicle ligation with suture or bipolar coagulation is essential. Likewise, judicious use of bonewax is highly effective in closing transosseus venous channels, which may communicate with cerebral venous drainage. After surgical resection, careful and meticulous closure of the wound is of utmost importance. At our institution, plastic surgery accomplishes the primary closure of wounds. Various reports have described circular excision and purse-string closure as a simple and rapid method for closing wound, which results in excellent cosmetic outcomes.[1,20] and long-term disease control.[25] While there are no guidelines regarding the optimal age to surgically address large scalp IH, Spector and colleagues have documented very good cosmetic results with early excision (less that 4 months of age).[20] This is because of the "accordion-like" laxity inherent within the scalp of infants younger than 4 months. This allows the surgeon to completely remove the lesion and close the defect primarily for a good cosmetic outcome.[20] For patients older than 4 months, tissue expansion may

be required to close the wound (as seen in patient 2).

CONCLUSION

Scalp IH usually do not require surgical attention. In some cases where medical therapy is ineffective or cosmetic and functional integrity is threatened, meticulous surgical resection and primary wound closure can be carried out safely with good cosmetic outcome. Careful attention must be directed to the venous drainage pattern of surgically treated lesions.

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