Early Surgical Treatment of Hemangiomas in Functional Areas

ABDEL NASSER EL-NAGGAR, M.D.

The Department of Plastic Surg., Faculty of Medicine, Beni Swif University.

Abstract

In spite of the numerous advances made over the last two decades, the treatment of hemangiomas continues to be one of the greatest enigmas facing modern medicine. There are no clear criteria concerning the indications to be followed and even less concerning the most appropriate therapeutic procedures for each type of lesion. The end result of involution is potentially worse than the scarring that would occur with surgery. Thus, surgical intervention is commonly indicated only if the growth is life threading or highly problematic from a medical or psychological point of view. For example lesion growth that affect the ability of the eye to see, the ear to hear, or the passage of air in and out of the lungs are frequently candidates for surgical treatment.

This paper reviews the general principles of surgical treatment of facial and scalp hemangiomas without losing sight of the fact that the traditional surgical treatment should not be considered as an independent tool of treatment but as a therapeutic weapon improving the quality of life of the patient with hemangioma.

Key Words: Hemangioma – Surgical treatment.

Introduction

According to Mulliken, vascular lesions can be classified as hemangiomas and vascular malformations (VM) based on their clinical and histologic characteristics [1,2]. Hemangiomas are cellular tumors, exhibiting endothelial-cell proliferation.

They are common occurring in about 12% of all children under 1 year of age.

They typically and exclusively appear in early infancy, often beginning as a small macula and growing rapidly in the 1st to 4th weeks, then undergoing fatty replacement and involution by adolescence.

About 50% of all hemangiomas are involuted by the age of 5 years, about 100% by the age of 12. The histologic appearance depends on the stage of evolution which are (1) the proliferating phase (0-1 year of age), (2) the involuting phase (1-5 years of age), and (3) the involuted phase (>5 years of age). These stages are typically clinically apparent and can be distinguished microscopically and immunohistochemically [3].

In the proliferating phase, the hemangioma is composed of plump, rapidly dividing endothelial cells that form tightly packed sinusoidal channels.

Even at this early stage, the endothelial cells express phenotypic markers of mature endothelium [3], in addition to markers of activated endothelium. Urinary markers of angiogenesis, such as basic fibroblast growth factor and high molecular weight matrix metalloproteinases are usually high in infants with proliferating hemangiomas and diminish to normal levels during regression [4,5].

In the involuting phase, there is decreasing endothelial proliferation, increasing apoptosis, and the beginning of fibrofatty replacement of the hemangioma. The net result is loss of volume of the tumor and increasing softness of the overlying skin.

During the involuted phase, after regression is complete, all that remains are a few tiny capillary-like feeding vessels and draining veins (some of which can be abnormally large) surrounded by islands of fibrofatty tissue admixed with dense collagen and reticular fibers. The endothelium lining these vessels are flat and mature, multilaminated basement membranes persist around the residual tiny capillary-sized vessels.

The mechanism of involution is not clearly understood. Celluly, there is a decreased amount of endothelial cell label uptake and decreased number of mast cells, with the tissue being replaced by fibrofattystroma during this phase [6].
Although most hemangiomas regress spontaneously, 10% to 20% ultimately require some form of treatment.

Approximately 14% to 20% of infants have multiple lesions, sometimes in other organ systems, such as the liver, gastrointestinal tract, and brain. Skeletal deformities are very rare with hemangiomas.

Infrequently, a "mass effect" may occur on adjacent bone, or they may be associated with minor cartilaginous or bony overgrowth, presumably due to local increased blood flow.

Cervicofacial and thoracic hemangiomas have a 5% to 10% risk for associated underlying structural abnormalities of the aortic arch and brachiocephalic and interacranial arteries [7,8].

Hemangiomas of the lumbosacral region have a high incidence of concomitant spinal dysraphism, tethered cord, and anomalies of the pelvic region [9].

Vascular malformations (VMs) are less frequently seen, in about 0.5% of all newborns. These lesions result from abnormal blood or lymphatic vessel morphogenesis. Histologically, VMs are characterized by normal endothelial cells and normal numbers of mast cells throughout their history. They are present at birth, but may not become clinically apparent until late infancy or childhood.

VMs are classified by the predominant type of vessel involved and include capillary (CM), venous (VeM), lymphatic (LM), and arteriovenous malformations (AVM). Another way of classifying vascular lesions is by their flow characteristics hemangiomas, as well as CMs, VeMs, and LMs, are low-flow lesions while AVMs are high-flow lesions.

Differentiation between a hemangioma and VM is very important for management and therapy, but sometimes be quite difficult. The history and physical examination remain the most important diagnostic parameters. Ultrasound can be helpful; a duplex scan may aid in differentiating between low and high-flow malformations.

Ulceration is the most common complications of hemangioma, and it usually occurs during the proliferation phase. A risk exists for secondary infection, bleeding, and scarring bleeding usually responds to pressure, although surgical ligation may be needed if bleeding is refractory or voluminous.

Visual obstruction with periorcular hemangioma is a feared complication. Hemangiomas are the most common orbital tumor of children, and deep orbital tumours may present with only unilateral proptosis. Earlier and more aggressive treatment may be necessary to prevent visual compromise [10,11].

Nasolaryngeal obstruction is common with "beared" area or neck hemangiomas airway hemangiomas are rare and typically present in infants 6 to 12 weeks of age with cough and stridor, particularly during feeding or crying. Approximately 60% are associated with cutaneous lesion of the periauricular region, chin, lower lip, or neck [12,13].

These patients need to be observed closely and evaluated immediately when any signs of airway compromise are noted. Tracheostomy or aggressive treatment of the hemangioma may be warranted. Another associated finding of cervicofacial hemangiomas is the presence of intracranial arterial anomalies [14].

Auditory canal obstruction is associated with parotid hemangiomas. These lesions are almost always involve the entire gland and may be bilateral obstruction of the external auditory canal can lead to conductive hearing loss, although normal auditory development will occur unless the lesions are bilateral. Large parotid hemangiomas can also cause airway compromise and ocular impairment [15].

**Patients and Methods**

Between March 2005 and July 2008 a total of 15 patients with scalp and face hemangiomas treated in Cairo University Hospital (Kasr El-Aini) by surgical excision. The patients were predominantly females (11 females and 4 males) range in age between six months and 15 months. As clinically classified (Table 1) one patient had nasal tip hemangioma, two patients had upper lip hemangioma, one patient had lower lip hemangioma, two patients had preauricular hemangioma, one patient had large cheek hemangioma reaching lower eyelid and disturbing vision, one patient had temporal ulcerating hemangioma, five patients had scalp hemangiomas in different areas of the scalp, and two patients had nasolabial hemangioma.

Three patients had multiple hemangiomas one in the thigh and two in the upper limb in addition to face or scalp lesions two patients had been treated unsuccessfully by other physicians with vascular laser and steroid injection, but the patient relatives usually did not know the type of laser used.
Table (1): Distributions of hemangiomas.

<table>
<thead>
<tr>
<th>Site of lesion</th>
<th>Sex distribution</th>
<th>No of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nose</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>Upper lip</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>Lower lip</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>Preauricular</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Cheek</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Temporal</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Scalp</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Nasolabial</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>

Table (2): Patients profile.

<table>
<thead>
<tr>
<th>Patients</th>
<th>Age (month)</th>
<th>Sex</th>
<th>Sites &amp; clinical features</th>
<th>Follow-up (month)</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>F</td>
<td>Nose</td>
<td>12</td>
<td>Fair</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>F</td>
<td>Upper lip</td>
<td>36</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>F</td>
<td>Upper lip</td>
<td>16</td>
<td>Good</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>F</td>
<td>Lower lip</td>
<td>6</td>
<td>Poor</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>F</td>
<td>Preauricular</td>
<td>30</td>
<td>Good</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>M</td>
<td>Preauricular</td>
<td>26</td>
<td>Good</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>F</td>
<td>Cheek</td>
<td>20</td>
<td>Good</td>
</tr>
<tr>
<td>8</td>
<td>15</td>
<td>M</td>
<td>Temporal</td>
<td>7</td>
<td>Fair</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>M</td>
<td>Scalp</td>
<td>11</td>
<td>Good</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>M</td>
<td>Scalp</td>
<td>16</td>
<td>Good</td>
</tr>
<tr>
<td>11</td>
<td>6</td>
<td>F</td>
<td>Scalp</td>
<td>14</td>
<td>Good</td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td>F</td>
<td>Scalp</td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>13</td>
<td>11</td>
<td>F</td>
<td>Scalp</td>
<td>3</td>
<td>Good</td>
</tr>
<tr>
<td>14</td>
<td>13</td>
<td>F</td>
<td>Nasolabial</td>
<td>40</td>
<td>Good</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>F</td>
<td>Nasolabial</td>
<td>16</td>
<td>Good</td>
</tr>
</tbody>
</table>

Table (3): Aesthetic results.

<table>
<thead>
<tr>
<th>Result</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>12</td>
</tr>
<tr>
<td>Fair</td>
<td>2</td>
</tr>
<tr>
<td>Poor</td>
<td>1</td>
</tr>
</tbody>
</table>

All the patients were evaluated initially in terms of lesions (site, size, number and functional problems) the size ranged from two to six cms, distribution as described before (Table 1) and three patients had psychological upset to parents which were, nasal tip lesion, upper lip lesion and cheek lesion which disturbing the infant vision two patients had complications in the form of ulceration and bleeding one in temporal region and the second in the scalp.

At the same time all patients underwent general and systemic evaluation in addition to proper examination to exclude hidden lesions different modalities of treatment of hemangiomas had been discussed with patient relatives and surgical excision with its benefits and cost and why we will use surgical treatment modality? Consent and photographs (pre-operative and post-operative) were taken. All patients were followed up post-operatively to evaluate degree of satisfaction which depend on many factors including site of scar, type of healing, visual analysis of the results from aesthetic point of view, occurrence of complications specially wound dehesence, hypertrophic or keloidal scar.

**Operative technique:**

All operations were done under general anaesthesia and local infiltration with lidocain 1% with epinephrine (1:100000) along the proposed incision lines. It is important to infiltrate the lidocain at the proper depth within the subcutaneous layer as this provide the maximum hemostasis and serve as an aid to surgery secondary to hydrodissection. Hemangioma is surgically excised with 2 mm safety margin, to minimize bleeding, followed by proper hemostasis. The topographic and anatomic tissue loss determined.

Reconstruction using various flaps and techniques had been done to improve aesthetic results.

Single layer closure of subcutaneous tissue with 5/0 vicryl as inverted interrupted sutures and skin closure with prolene 6/0 as simple interrupted sutures.

Drainage of subcutaneous plane with suction drain for 24-48 hours and stitches removed 5-7 days post-operatively.

**Results**

This study included 15 patients 4 boys and 11 girls with 15 hemangiomas in the head (scalp and face) and three peripheral, one in the thigh and two in the forearm. The average age, specific site involved sex distribution, and response to surgical excision are shown in (Tables 1, 2).

Eleven patients were younger than one year at the time of presentation, two children were younger than two years and two patient above ten years.
Twelve patients had been operated in single stage while the remaining three patients operated in two stages.

All patients with facial hemangioma treated by surgical excision with respect to units and subunit principle of the face to minimize scar visibility as lines of healing properly placed, so that, their scar lines are camouflaged. So it resembles ridges and valleys of facial units and subunits.

**Evaluation of results:**

Hemangioma considered clinically cured with good results if the lesion were absent, the site of scar were in hidden area, healing were by primary intition, no deformity or facial asymmetry, and patient relatives are satisfied.

If the lesion reduced obviously in size the facial deformity improved, healing by secondary intension and relatives were accepting it was considered fair.

The treatment was considered poor if there was no change in size, wound complications or healing by 2ry intension, persistancy of deformity or facial asymmetry and patient relatives were unsatisfied.

**Table (4).**

<table>
<thead>
<tr>
<th>Criteria of evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete excision of lesion.</td>
</tr>
<tr>
<td>Facial deformity or asymmetry.</td>
</tr>
<tr>
<td>Type of healing (1 ry 2 ry).</td>
</tr>
<tr>
<td>Site of scar hidden or visible.</td>
</tr>
<tr>
<td>Wound complication. Early: (bleeding, infection, necrosis). Late: hypertrophic scar, keloid).</td>
</tr>
<tr>
<td>Relatives satisfaction:</td>
</tr>
<tr>
<td>- Satisfied.</td>
</tr>
<tr>
<td>- Accepting.</td>
</tr>
<tr>
<td>- Unsatisfied.</td>
</tr>
</tbody>
</table>

With respect to the criteria of evaluation this study of 15 patients with facial and scalp hemangioma twelve of them had good results, two had fair result and one patient had poor result.

As regards complications wound infection and healing of wound by secondary intension occurred in case with temporal hemangioma which presented pre-operatively with ulcer and infection. No marginal flap necrosis or bleeding had occurred and no failure of excision at all. No obvious scalp alopecia, no keloid and no recurrence, dehiscence of wound in lower lip that treated conservatively and healed by secondary intension.
Fig. (2-D): Four years post operative.

Fig. (2-E,F): One month after second intervention.

Fig. (3-A,B): 6 months old female patient with cheek hemangioma.

Fig. (3-C): Defect of surgical excision.
Fig. (3-D): Reconstruction with local flap.

Fig. (4-A,B): Six months old female patient with hemangioma of nasal tip.

Fig. (3-E,F): One month after surgery.

Fig. (4-C,D): 5 months post operative waiting for second step reconstruction.
Discussion

For the most commonly encountered blood vessel lesions, the involuting, infantile "strawberry" hemangioma (estimated to be present in 1% to 2.6% of neonates \[16\] and 10% to 12% of one year olds \[17\]) it has been axiomatic in the plastic surgical and pediatric literature that the lesions be left alone when possible to undergo their inevitable involution.

Most pediatricians and even many plastic surgeons will counsel watchful waiting of the lesion as it progresses through the usual stages of proliferation and (variable) involution. Although patience may be virtuous for many hemangiomas, large lesions of face and scalp deserve special scrutiny.

Beside the commonly accepted reasons for surgical intervention (e.g., ulceration, hemodynamic instability, airway obstruction), large (and even not so large) hemangiomas of the scalp may invite a more aggressive surgical approach for the following reasons. First, even if a hemangioma undergoes complete involution, the remaining fibrofatty skin is often atrophic \[18\]. The dermal layer is extremely thin and devoid of normal skin appendages.

This can lead to large alopecic areas and/or derangement of the natural hair line. Second, hemangiomas of the parietal scalp may impinge on the ear. Because of the well-known pliability of the neonatal ear, though to be secondary to the effects of maternal estrogens, extrinsic deforming forces may result in a permanent deformity. Thus, there is an opportunity to both remove the deforming force and reshape the ear within an early postpartum window of opportunity \[19,20\].

There appears to have been a paradigm shift in the management of hemangioma. Historically, these
lesions were "managed expectantly" on the grounds that involution would occur spontaneously and thus active management would be unnecessary. More active management was reserved for "complicated" hemangiomas. The problem was that once the proliferative phase had begun, often with associated complications (usually bleeding, ulceration, or obstruction), treatment of whatever type was often difficult, with an incomplete response. Often, medical treatment [21-24] was used, usually high-dose steroids, with an incomplete response and not insignificant morbidity similarly, laser treatment [25-28] had unpredictable results, and various lasers have been used with a variable response. Consequently surgical management has now been advocated [29-32]. There appears to be a number of reasons for this. First, it is difficult to predict how extensive the proliferative phase will be, and small lesions at birth can mushroom to become "uncontrollable".

Second, most hemangiomas occur on the head and neck, and involutions often take many years, with psychological sequelae. Furthermore, involution is not infrequently incomplete, necessitating surgery anyway.

Third many hemangiomas are initially quite small and are amenable to simple excision. Finally, there are certain sites where very little involution is reported to occur and where the physical appearance is most unsightly and disfiguring, with concomitant psychological sequelae [29,30].

A number of different modalities [29-32] have been proposed to affect treatment, depending on the site and size of the lesions. Mulliken advocate circular excision and insertion of purse-string suture. The latter can be performed serially and is ideal for small lesions on the face or larger lesions on the trunk; the mean length of the hemangiomas in their study was 2.4 cm in their study [31], only 20% of excisions were actually undertaken in the proliferative phase.

However, perhaps the greater challenge arises where the lesions are large and occur on the face. These lesions cause considerable anxiety and stress for both parents and child. It is this situation where surgical excision is likely to be a demanding, multistaged procedure, with sometimes variable aesthetic results. The problem is aggravated by the fact that the hemangioma may involve vital structures and thus also have functional consequences. An example of the latter is a large hemangioma of the nose, eyelids, or lips or a lesion involving a combination of these areas. Zide et al. [29] have reported on their experience in treating large, disfiguring lip hemangiomas, operating on children before they attend school at a mean age of 4.8 years, and noted that 1.3 to 27 children needed only two procedures; the others required further surgery over quite a long time period, again highlighting the difficulty of using surgery as a modality of treatment finally and perhaps most importantly indications for surgical excision of hemangiomas are eyelid obstruction risking the development of amblyopia, nasal tip hemangioma, lip hemangioma specially that, localized, circum scribed lesions that are raised and rapidly growing should be treated primarily by surgery since laser therapy has little chance of stopping the development of hemangioma, and surgical treatment will inevitably be required. If the lesions are seen early, when they are still flat and small laser therapy may be tried, as it may prevent further growth at this stage. The treating surgeon is in the best position to know which lesions can be safely and easily excised, and which should be left to undergo maximal involution before proceeding with surgical therapy.

References


