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Surgical Management of Head and Neck Vascular Malformations

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ABSTRACT

Background: Vascular malformations cause functional and cosmetic abnormalities. This study presents experience of surgical management and outcome of these morphologic disorders. **Place and Duration of Study:** The study was carried out from January 2005 to December 2009 at the Department of Plastic and Reconstructive Surgery Shaikh Zayed Hospital, Lahore. **Patients and Methods:** All the patients with vascular malformations in the head and neck region above the age of 10 years were included. **Results:** Thirty two patients were included in the study. Male to female ratio was 1:1.6. Slow flow malformations were 3.5 times more common than high flow malformations. Primary closure was achieved in 12 cases. Staged debulking was done in 10 patients with complete excision in 4 patients and incomplete excision in 6 patients. Full thickness skin grafting was performed in 6 cases while flap reconstruction was done in 4 cases. Overall complication rate was 22% with recurrence of lesion in 6.25% cases. Massive hemorrhage occurred in two patients during surgery requiring whole blood transfusion. **Conclusion:** Proper diagnosis, knowledge and surgical expertise for excision and reconstruction is essential for favorable outcome in these lesions.

Key words: Vascular malformations, vascular anomalies, slow flow malformations, high flow malformations.

INTRODUCTION

Vascular malformations (VM) can lead to cosmetic deficit, malfunction, significant morbidity or mortality in both children and adults[1]. These soft tissue tumors present from simple discoloration to devastating malformations. These lesions result from morphologic anomalies in vascular development. They originate in utero, arising as early as the first trimester[2]. The treatment and prognosis are based on types, subtypes and architecture of the lesions [3]. High flow lesions can bleed profusely spontaneously and during surgery and can be quite challenging. Similarly large sized slow flow malformations can cause cosmetic and functional deformities requiring surgical intervention. We present our experience in the management of these anomalies in the head and neck region.

PATIENTS AND METHODS:

The study was conducted at Department of Plastic and Reconstructive Surgery, Shaikh Zayed hospital, Lahore from January 2005 to December 2009. All the patients with vascular malformations on the head and neck region over the age of 10 years were included in the study. Patients with clinical diagnosis of hemangioma were excluded from the study because Hemangiomas are a separate entity of vascular anomalies with a defined natural history characterized by distinct periods of proliferation, plateau, and involution. Seventy percent of these lesions settle by the age of 7 years[4]. Patient's demographic data like age, sex, site and size of lesion, number and nature of previous surgeries, selective embolization or sclerotherapy were recorded. Diagnosis was established on the basis of history and clinical examination. The lesions were

classified as Slow Flow and High Flow according to The International Society for the Study of Vascular Anomalies classification system[5]. Three-Dimensional Computerized Tomography (3-D CT scan) with contrast was carried out in patients with high flow vascular malformations or slow flow malformations with suspicion of involvement of deep venous channels. Elective surgery was performed under general anesthesia. Decision about total excision, or debulking and reconstruction was made on the basis of type of blood flow, involvement of anatomical site, soft tissue defect and availability of donor site tissue. Incision site was infiltrated with epinephrine (1:100,000) dilution in all patients. Feeding vessels were identified and ligated as indicated by the CT angiography before excision of the primary lesions in patients with high flow vascular malformations. Compression dressings were applied in all cases. Dressings were removed on second day in cases of primary closure and on 5th day if graft was applied. Excised tissue was sent for histopathology to confirm the diagnosis. Patients were followed at 2 weeks, 1 month, 3 months and 1 year post operatively and results of surgery and recurrence of lesions were recorded.

RESULTS

Sixty four patients with vascular malformations were operated during this period. Thirty two patients had lesions in the head and neck region and were included in the study. Male to female ratio was 1:1.6 (Table 1). The patients' age ranged between 11 and 42 years (average. Majority of the patients (87.5%) were in the age group of 11 and 30 years (Table 2). Approximately 78% patients presented with slow flow malformation while 22% had high flow lesions (Table 1).

Ten patients (31.2%) had received treatment at some other institution before reporting at our institution with recurrent lesion. Two patients with high flow VM had been operated previously and selective embolization was attempted in one patient. Injection sclerotherapy was tried in 7 cases of slow flow VM with sodium tetradecyl sulphate, hypertonic saline or ethanol.

Average size of lesion was 10x7cm (range 2x2 cm to 18x12cm). Forehead was the most frequent site for high flow VM while cheek and lips were the most common sites for slow flow malformations. Ten patients (32%) had multiple lesions involving more than one anatomical site on the head and neck (Table 3).

Table 1: Number and percentage of vascular lesions.

Type of lesion	n=32	Percentage	Male (n=12)	Female (n=20)
Slow Flow VM	25	78.1%	7	18
Capillary	8	25.0%	3	6
Venous	6	18.7%	2	4
Lymphatic	4	12.5%	0	3
Mixed	7	21.9%	2	3
High flow VM	7	21.9%	5	2

Table 2: Type of vascular lesion in different age groups.

Age (Years)	Slow flow (n=25)	High flow (n=7)
11-20	9	2
21-30	12	4
31-40	3	1
41-50	1	0

Three-Dimentional CT angiography with contrast was performed in all the 7 patients with clinical diagnosis of high flow VM while it was carried out in 6 patients with slow flow VM.

Complete excision with primary closure (Fig.1) was performed in 12 cases (37.5%); (Table 4). Staged debulking and serial excision was performed in 10 cases with complete removal of lesions in 4 cases and partial removal of tumor in 6 patients. Full thickness skin grafting after removal of primary lesion was performed in 6 patients. The residual raw area after excision was reconstructed with local or regional flaps in 4 patients (Fig.2).

The mean follow up was 22 months with minimum follow up of 7 months and maximum 55 months. Overall complication rate was approximately 22%. Two patients had increased blood loss during surgery and required two pints of whole blood per operatively whereas in other patients blood loss was less than 400 ml. Two

Table 2: Site of vascular malformations.

Type of MF	Forehead	Scalp	Peri auricular	Peri orbital	Cheek	Intraoral mucosa	Nose	Lips	Neck	Total
A: Capillary	1	0	1	2	4	0	2	3	0	13
B: Venous	1	0	0	2	2	2	0		0	7
C: Lymphatic	0	0	1	0	1	0	2	1	0	5
D: Mixed	1	1	1	1	2	2	1	2	1	12
High flow VM	3	1	2	2	0	0	0	2	0	10
Total	6	2	5	7	9	4	5	8	1	47

Table 3: Different surgical procedures performed.

Type of MF	Primary closure	Debulking complete	Debulking partial	Flap cover	FTSG	Total
Slow flow VM						n=25
A: Capillary	1	1	3	0	3	8
B: Venous	1	1	0	3	1	6
C: Lymphatic	2	0	2	0	0	4
D: Mixed	2	2	1		2	7
High flow VM	6	0	0	1	0	n=7
Total	12	4	6	4	6	32

patients had partial graft loss of less than 2 cm and did not require further surgery. One patient developed hyper pigmentation of the skin graft.

Two patients developed recurrence of the lesion. The first patient, a 22 years male, presented with a high flow malformation on the forehead. Adequate resection was achieved after ligation of the feeding vessels, as seen on CT angiography. The patient again presented with recurrence in the forehead as well as lesion on right temporal region fourteen months after surgery. The 3-D CT scan revealed intra cranial extensions through the supra trochlear and supra orbital vessels. His surgery is under consideration in collaboration with departments of neurosurgery and radiology. Second patient, a 16 years old female, had a microcystic lymphatic malformation in right pre auricular region. She developed a recurrent lesion about 2x2cm distal to the previously excised and grafted lesion 15 months later. Re excision and grafting was done. The patient is disease free for last 18 months.

DISCUSSION

Congenital vascular anomalies are common lesions with variable natural history, clinical presentation and management requirements. Vascular malformations are comprised of abnormally formed channels that are lined by quiescent endothelium. Although congenital, they are not always obvious at birth. They never regress and often expand. Vascular malformations are subcategorized according to channel morphology and rheology: *slow-flow* for capillary, lymphatic, and venous anomalies, and *fast-flow* for arterial and arteriovenous anomalies[4].

In this study slow flow VM were 3.5 times more common than high flow lesions. These results are similar to the results shown by Wharton and Nishikowa[6], but totally in contrast to the study published by AbdulrahmanY El-Kayali [7] where they found that high flow VM were 4 times more common. Male to female ratio in our study was 1:1.6. This is different from the figures quoted by Wharton and Nishikawa [6] where the male to female ratio was 1.5:1, but similar to the observations by Tingting. Leng et al [3] which are 1:1.3.

Almost 85% patients were in the age group of 11 to 30 years. This may be due to the rapid change in the size of the lesion due to hormonal changes [8], compelling them to seek treatment. This age group is also conscious about cosmetic outlook. Similar

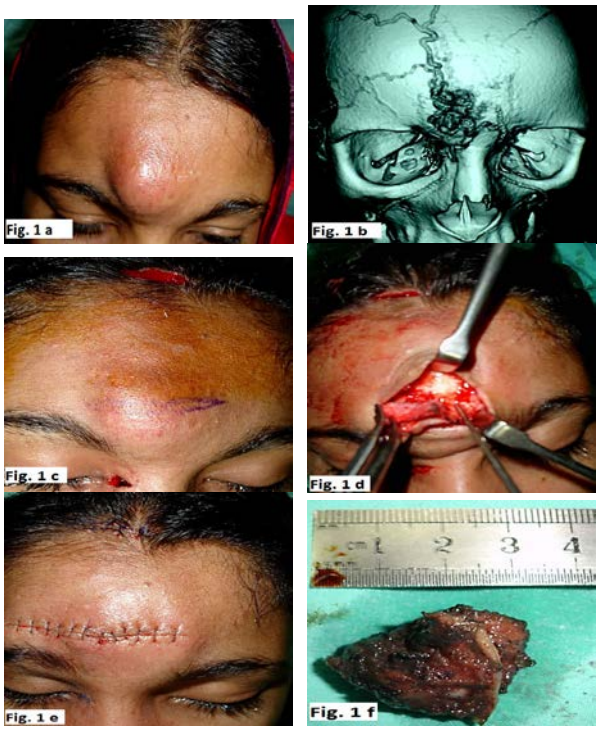

Fig. 1: A 23 years old female with High flow VM on the forehead. Fig. 1a: pre operative. Fig 1b: 3-D CT scan shows the feeding vessels. Fig. 1c: the feeders have been ligated. Fig. 1d: excision of the AV malformation. Fig. 1e: immediate post op picture. Fig. 1 f: specimen of the excised tissue.

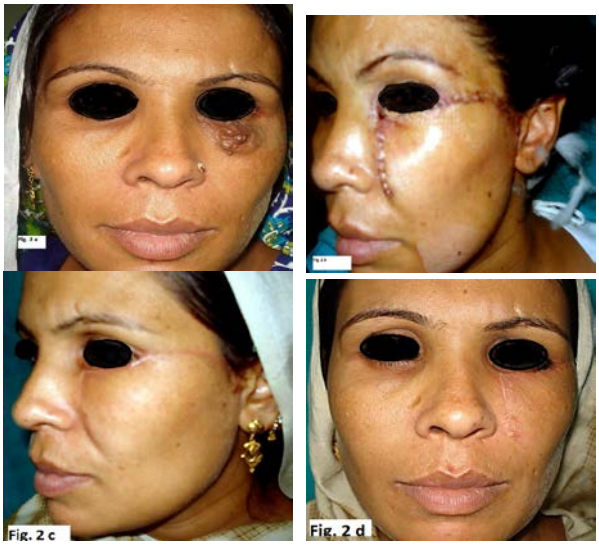

Fig. 2: A 26 years old female with Slow flow VM on left infra orbital region. Fig. 2b: 3rd post op day. Fig. 2 c: six months after surgery, lateral view. Fig. 2d: six months after surgery, frontal view.

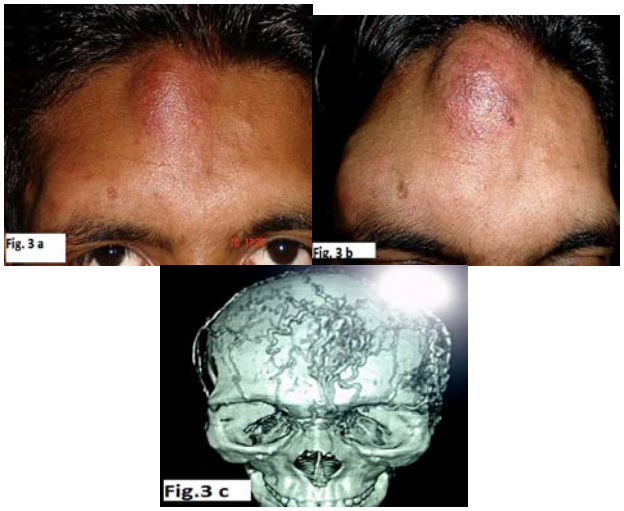

Fig. 3: A 21 years old male with recurrence of High flow VM on the forehead. Fig. 1 a: Pre op picture before surgery. Fig. 3 b: Fourteen months after surgery with increase in the size of the lesion and involvement of right temporal region. Fig. 3 c: CT angiography shows multiple feeding channels including supra trochlear and supra orbital channels.

observations were recorded by Wharton[6] who noted that in 62% patients the cause for surgery was concern for appearance.

We have found that 3D-CT angiography is a very effective tool in planning and executing surgical excision in high flow lesions. The anatomy of the feeding vessels can be accurately located and their ligation prior to surgical excision can significantly control intra operative hemorrhage. Similar conclusion was made by other observers[2]. However CT scan has potential risk of extra radiation to the head and neck area. Therefore, magnetic resonance imaging is advocated by some authors[9,10]. In our opinion the benefits seem to outweigh the risk of radiation exposure.

High flow vascular malformations have a high incidence of recurrence and unpredictable behavior. Despite embolization, sclerotherapy, and increasingly radical surgery with free tissue transfer, recurrence is possible[11]. Five to fifty percent recurrence rate has been mentioned in the literature[12-14]. The recurrence rate was 3.2% which is comparable to the international reports. Excessive hemorrhage can lead to serious consequences. One patient in our series bled

profusely during excision of the lesion but we were able to control hemorrhage by compartmentalization technique [12] and complete the resection.

Many slow flow vascular anomalies contain multiple loculations, and complete resection is usually difficult to achieve. In this series, in approximately 19% patients complete removal of slow flow lesion could not be achieved. More than one anatomical region and large size of the lesions did not make total excision feasible. Results after skin grafting were satisfactory in more than 80% of the grafted lesions. This is in spite of the fact that majority of our population falls in the type IV and V skin according to the Fitzpatrick[15] skin classification where chances of hyper pigmentation are increased.

CONCLUSION

Vascular malformations are developmental lesions that can cause functional and cosmetic deficit. Their treatment can present a considerable challenge. Accurate diagnosis of the type of vascular abnormality by clinical assessment, Doppler studies and 3-D CT angiography is necessary. Surgery in experienced hands, knowledge and expertise with different reconstructive options provides satisfactory results for coping with these difficult disfiguring lesions.

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REFERENCES

1. Donnelly LF, Adams DM. and Bisset GS. III. Vascular malformations and hemangiomas: A practical approach in a multidisciplinary clinic. A.J.R. Am. J. Roentgenol. 2000; 174: 597.
2. Chiller KG, Frieden IJ. and Arbiser JL. Molecular pathogenesis of vascular anomalies: Classification into three categories based upon clinical and biochemical characteristics. Lymphat. Res. Biol. 2003; 1: 267.
3. Tingting Leng, M.M. Ximing Wang, Ran Huo. The value of three-dimensional computed tomographic angiography in the diagnosis and treatment of vascular lesions. Plast. Reconstr. Surg. 2008; 122: 1417.
4. John B. Mulliken. Vascular Anomalies: Grabb and Smith's Plastic Surgery; Sixth Edition; 191-200: 2007.
5. Enjolras O, and Mulliken JB. Vascular tumors and vascular malformations (new issues). Adv. Dermatol. 1997; 13: 375.
6. S. M. Wharton H. Nishikawa Congenital vascular anomalies of the head and neck: interventional management in children. Eur J Plast Surg. 2003; 26: 67–71.
7. Abdulrahman Y, Massaad M. Vascular anomalies-diagnosis and therapy. Saudi Med J. 2002; 23: 272.
8. Hovius SER, Borg DH, Paans PR, et al. The diagnostic value of magnetic resonance imaging in combination with angiography in patients with vascular malformations: A prospective study. Ann. Plast. Surg. 1996; 37: 278.
9. Abernethy LJ. Classification and imaging of vascular malformations in children. Eur. Radiol. 2003; 13: 2483.
10. Dubois J. and Garel L. Imaging and therapeutic approach of hemangiomas and vascular malformations in the pediatric age group. Pediatr. Radiol. 1999; 29: 879.
11. Ian T. Jackson. The challenge of large vascular malformations: Eur J Plast Surg. 2009; 32:1–9.
12. Ian T. Jackson, Mustafa Keskin, Reha Yavuzer, and Christopher P. Kelly, Compartmentalization of massive vascular malformations. Plast. Reconstr. Surg. 2005; 115: 10.
13. Norberto Anduluz, John S. Myseros, Sameer Sathi. Recurrence of cerebral arteriovenous malformations in children: Report of two cases and review of the literature. Surg. Neuro. 2004; 62: 324-30.
14. Kelly J, Alvarez RD, Roland PY. Arteriovenous malformation presenting as a complex pelvic mass with ureteral obstruction: a case report. J Reprod Med; 1998; 43:916–18.

15. Fitzpatrick TB. The validity and practicality of sun-reactive skin types I through VI. Arch Dermatol; 1988; 124:869.

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