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Anatomy

A RARE AV MALFORMATION IN THE SUBCUTANEOUS TISSUE OF THE RIGHT FOREARM IN AN 80-YEAR-OLD ADULT MALE EMBALMED CADAVER: A CASE REPORT.

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ABSTRACT Arteriovenous malformations (AVMs) in the subcutaneous tissue are rare, and they are most frequently found in the head and neck regions. This case report highlights the significance of post-mortem anatomical studies by presenting the unusual finding of an AVM in the subcutaneous tissue of the upper limb of an 80-year-old adult male embalmed cadaver during anatomical dissection.

KEYWORDS : Arteriovenous malformation(AVM), Subcutaneous tissue

INTRODUCTION

AVMs are vascular malformations that often bypass the capillary system and are defined by direct connections between arteries and veins. It is rare to find these anomalies in the subcutaneous tissue, particularly in the setting of embalmed cadaveric dissections. They might be congenital or developed later in life.

AVM can occur anywhere in the body. However, it is more usually seen intracranially in the central nervous system. Extracranial AVMs (EAVMs) are most usually found in the head and neck region, which accounts for 50% of all EAVMs[1]. Other regions or organs involved are liver, lower extremities, lungs, heart, and gastrointestinal tract. Given the surrounding anatomy, the complexity of the abnormalities can be a significant challenge[1,2]. After ganglion cyst, giant cell tumor of the hand, and epidermoid inclusion cyst, congenital vascular formations are the fourth most common type of mass in the hand and wrist region[3].

Hemangiomas and vascular malformations are the two most prevalent types of vascular anomalies, and they must be distinguished. In clinical practice, they are frequently confusing. Hemangiomas are relatively common lesions distinguished by biphasic growth and delayed spontaneous involution over time, whereas vascular malformations are uncommon but continue to expand proportionally with the growth of the individual. Vascular malformations are caused by inborn abnormalities in the vascular tree development. They are classified according to whether they have a venous, lymphatic, capillary, or arterial component. They can also be classified as low-flow (venous, lymphatic, capillary) or high-flow (i.e., arteriovenous) lesions based on their hemodynamic condition[3].

Case Report

During routine cadaveric dissection for students, an unusual brownish spongy lesion while exposing subcutaneous tissue in the extensor aspect of the right forearm of an 80-year-old adult male embalmed cadaver was noticed. This lesion was present throughout the dorsal aspect of the forearm without any extension into superficial skin or the underlying muscle tissue. It could separate along with subcutaneous tissue from the deeper muscle layer (Figures-1,2,3,4).

As morphologically similar to muscle tissue, we suspected it as remnants of panniculus carnosus and did hematoxylin and eosin (H & E) staining (Figures-5,7,8,9) and van Gieson staining (Figures–6) of specimen taken from that region. The findings were multiple thickened vessels and in which some vessels were surrounded by an unusually thick bundle of smooth muscles (Figure-9). We didn't notice similar lesions in any other regions after the complete dissection of that cadaver.

DISCUSSION:

Since intraosseous hemangiomas have been found in dinosaur vertebrae, vascular lesions have been referred to as the "oldest tumor." Yet even now, they still provide diagnostic and treatment difficulties for both doctors and histopathologists, resulting in prolonged suffering for the patients who occasionally shuffled between doctors seeking help[4].

First to publish a classification based on pathological traits were Virchow and Wagner in 1863. The International Society for the Study of Vascular Abnormalities (ISSVA) brought a generally accepted classification for vascular abnormalities in 1996, according to Mulliken and Glowacki's publications. The ISSVA expanded its classification in 2014 by adding combined variety and vascular malformations associated with syndromes (Table-1). Syndromes with Vascular malformations include Rendu-Osler-Weber syndrome, Proteus syndrome, Maffucci syndrome, and Klippel-Trénaunay syndrome[5].

For Vascular malformations, the prevalence is between 1.5% and 4.5% [5]. The majority of them appear at birth, expand proportionally with age, and then continue to increase until adulthood. There is no spontaneous regression documented, but there is significant morbidity. Trauma, pregnancy, or other hormonal changes can all have an impact on the growth of vascular malformations. These trauma and hormone-dependent lesions are more prevalent, single, and larger than the less common hereditary lesions, which are typically multifocal and small[5,6,7].

Table - 1: ISSVA classification of vascular anomalies (2014)[5]

VASCULAR ANOMALIES				
Vascular Tumors			Vascular Malformations	
Benign	Locally Aggressive	Malignant	Simple	Combined
Infantile Hemangioma	Kaposiform Hemangioendothelioma	Angiosarcoma	Capillary Malformation (CM)	CVM, CLM
Congenital Hemangioma	Retiform Hemangioendothelioma	Epitheloid Hemangioendothelioma	Lymphatic Malformation (LM)	LVM, CLVM
Tufted Hemangioma	PILA, Dabska Tumor		Venous Malformation (VM)	CAVM
Spindle-Cell Hemangioma	Composite Hemangioendothelioma		Arteriovenous Malformation (AVM)	CLAVM
Epithelioid Hemangioma	Kaposi Sarcoma		Arteriovenous Fistula	
Pyogenic Granuloma				

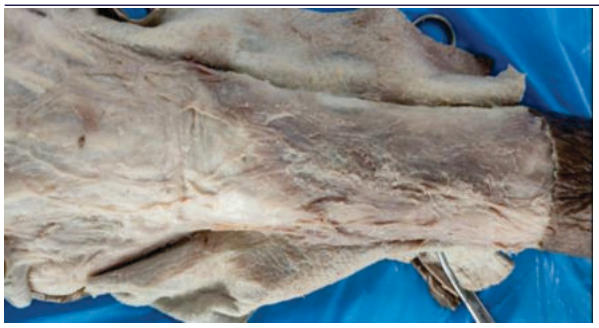

Fig – 1 Subcutaneous tissue after reflecting skin from dorsum of forearm

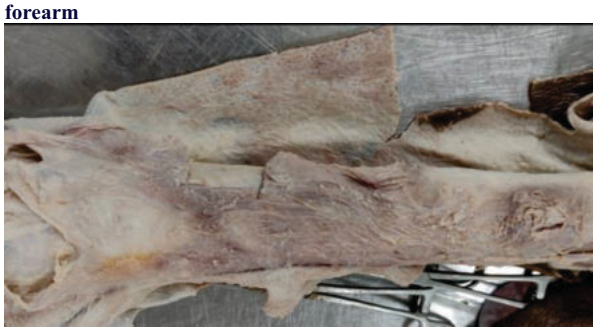

Fig – 2 [arrow <-> section taken for the staining purpose], the lesion is seen in the entire dorsum of the forearm

Fig – 3 Subcutaneous tissue with lesion easily separated from the underlying deep fascia

Fig – 4 Subcutaneous tissue with lesion easily separated from the underlying deep fascia. No invasion into deeper tissue

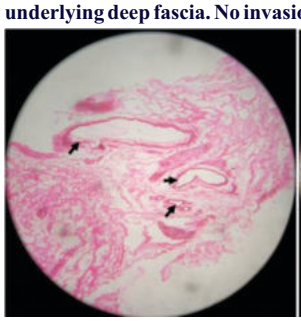

Fig – 5 (H & E staining) multiple vessels (➹)

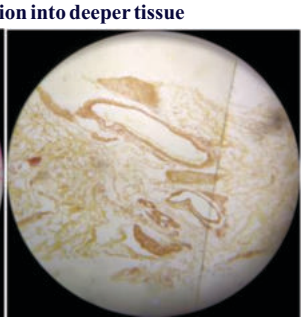

Fig – 6 (Van- Gieson staining)

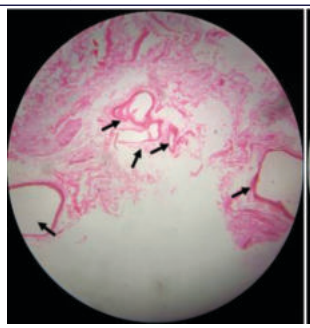

Fig – 7 (H & E staining) multiple vessels (➹)

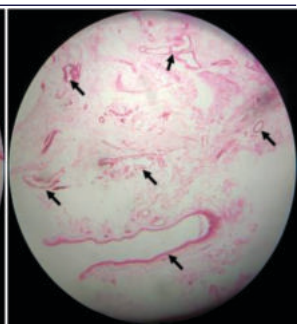

Fig – 8 (H & E staining) multiple vessels(➹)

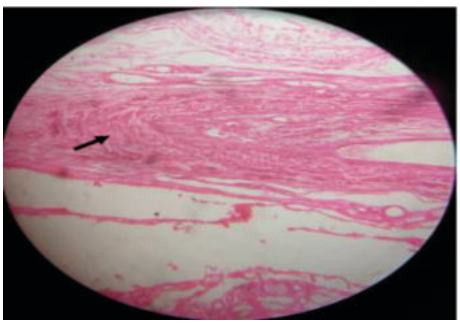

Fig - 9: Vessel surrounded by thick smooth muscle bundles (➹)

Basic differences between hemangiomas and AVMs are found to be [4]
(1) the timing of their clinical appearance
(2) their growth patterns
(3) the biological behavior or growth characteristics of their endothelial lining in cell culture
(4) the stromal cellular and extracellular matrix compositions
(5) the response of the lesions to pharmacotherapeutic agents

Histochemical Elastic stains (Movat pentichrome stain) and S100 (an immunohistochemistry stain for neuron and nerve fibres) to study the various tissue components present in these lesions can be done to further identify the histomorphologic differences between hemangioma and AVM[4].

The clinical appearance and symptoms differ in the different types of malformations and large lesions are mostly associated with secondary effects like high cardiac output, arterial steal phenomenon, distal ischemia, venous stasis dermatitis, ulceration, or gangrene caused by venous hypertension[5].

Moreover, the majority of lesions occurring in visible areas of the body create various social and functional disabilities that will lead to poor socioeconomic life quality. Despite significant advances in the treatment of vascular malformations, the majority of them remain a lifetime issue requiring multiple treatments. A multidisciplinary approach to upper and lower extremity peripheral vascular malformations, beginning with embolization/sclerotherapy or both, followed by surgical excision and soft tissue repair if necessary.

Limitations in this study
1) Unable to collect the disease history of the individual
2) Because of greying, drying, and stiffening due to embalming, difficult to access skin changes
3) As it was a long-preserved body after embalming, didn't get good results in immunostaining.

Therefore, even in an embalmed cadaver, the finding of an AVM in the upper limb's subcutaneous tissue raises several intriguing queries. The significance of post-mortem anatomical examinations and its potential to reveal uncommon anatomical variations are highlighted by this study. AVMs in this site may present with pain, edema, or other symptoms in clinical practice, which makes diagnosis and treatment crucial.

Clinical Implications:
The clinical implications of the AVM found in the embalmed cadaver are significant even though it is not a clinical case. When such

deformities go untreated in living people, it might result in very dangerous consequences such as limb ischemia, ulcerations, and other secondary effects [5]. Clinicians and anatomists need to be aware that AVMs can develop in unexpected places, such as subcutaneous tissues.

CONCLUSION:

Vascular malformations are usually identified at birth, unlike hemangiomas, although they do not involute and regress. Identification and handling are mostly determined by the category of the vascular abnormality. Vessel malformations (VMs) can affect a single tissue, multiple tissues, or all tissues in the extremities (skin, tendon, muscle, nerve, subcutaneous fat, or bone) and can even cross tissue planes[7]. It is uncommon and rare to identify an AVM in the upper limb's subcutaneous tissue in an embalmed cadaver, particularly in an elderly person. This case study emphasizes the value of anatomical research and the possibility of finding peculiar anatomical variants. It also highlights how crucial clinical knowledge of AVMs, their diagnosis, and treatment is.

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