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Angiosome Origins and Concept

Jesus Francisco Balderrama Conde[1], Karla Verónica Peña Quintero[2], Luis Fernando Pacheco Córdova[3], Carlos Eduardo Astorga Haro[4], Jared Rolando Laborin Dominguez[5]

[1,2,3,4,5] General surgery, IMSS Hospital General de Zona No. 5, Nogales, Sonora.

ABSTRACT

An angiosome is a composite block of tissue fed by a primary source artery. The term angiosome is derived from the Greek words *angeion*, which means channel, and *somite*, which means segment or sector of the body derived from soma, body. Angiosomes can be further differentiated into individual skin perforators or into matching venosomes (venous regions) and arteriosomes (arterial territories). The concept of angiosomes plays a pivotal role in surgical procedures involving tissue transplantation and composite flap formation. The secure anatomic borders defined by angiosomes enable the precise identification and isolation of tissues at various layers, facilitating the transplantation of individual components or the creation of composite flaps.

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INTRODUCTION

An angiosome is a composite block of tissue fed by a primary source artery [1]. The term angiosome is derived from the Greek words *angeion*, which means channel, and *somite*, which means segment or sector of the body derived from soma, body [2]. The arteries that feed these tissue blocks, known as segmental or distributing arteries, supply blood to the epidermis and the deeper tissues underneath it. They make up the body's three-dimensional vascular regions when put together like a jigsaw puzzle [3]. The anatomical investigations that form the basis of the angiosome concept are presented in this section.

Salmon's angiographic examinations involving lead oxide, gelatin, and water were remarkable, but further improvements to the method have yielded even better findings [4]. Particularly, computed tomographic (CT) angiographic anatomic investigations have improved with a decrease in lead oxide content [5]. A study of vascular injection techniques reveals the vast range of methodologies accessible for research [6].

Intra-arterial injections with radiopaque (barium sulfate or lead oxide) or visible (latex and ink) substances were initially used in cadaver injection experiments to investigate the vascular architecture of the human integument and other components. After that, the tissue of interest was dissected and radiographed, depending on the particular investigation. Little blood vessel images got better as the quality of the radiographic film increased. However, CT methods have essentially supplanted investigations that used basic radiographs. These studies were carried out on recently deceased cadavers [3, 5].

The first step in the investigations was to identify potential donor locations for free skin flap transfer by analyzing different body regions. Later research turned to other tissues, including the anatomical underpinnings of bone, nerve, and specific muscle transfer. The success of some of the ensuing clinical operations encouraged the authors to extend their investigation into the study of composite tissue units supplied by a single circulatory system. Skin and tendon units, muscle and nerve units, and skin, muscle, and bone units were examined. This work served as the inspiration for the angiosome idea. The anterior abdominal wall, anterior thorax, lower limb, and upper limb were among the areas that were examined. The findings provided credence to the angiosome theory of blood supply and demonstrated the relationships—which are present throughout the body—between neighboring vascular regions at all levels [7].

The region of interest in cadaver vascular research can be found and studied using a variety of methods. Lead beads were used to identify the locations of emergence of the prominent cutaneous perforators (0.5 mm diameter or greater) on the surface of the deep fascia in the past, after the integument (skin and subcutaneous tissue) was removed. At now, CT angiography (CTA) makes it simple to identify specific perforators. Every person was found to have an average of 400 cutaneous perforators [8].

THE CONCEPT OF ANGIOSOMES

After reviewing the writings of Manchot and Salmon, and considering the findings of our whole body investigations of the blood supply to the epidermis and deeper tissues underneath, it is now conceivable to physically split the body into three-dimensional vascular regions called angiosomes. These three-dimensional angiosomes are fed by one or more segmental or distributing arteries, together with the vein(s) that accompany them [4].

Angiosomes can be further differentiated into individual skin perforators or into matching venosomes (venous regions) and arteriosomes (arterial territories). Of these territories, forty were originally characterized; however, recent research has shown that several of these territories do not reach the skin surface, and many of these territories have been further fragmented into smaller composite units. Subsequent research found 61 vascular regions. The idea of an angiosome suggests that a large source artery and its associated vein(s) supply the three-dimensional block of tissue; nevertheless, it's crucial to remember that the angiosome itself may be divided based on the source vessel's branching pattern [9].

The vascular supply of the body is composed of these composite blocks of skin, bone, muscle, and other soft tissues that fit together like parts of a jigsaw puzzle. A substantial superficial cutaneous area and a very small deep tissue region are seen in certain angiosomes; in others, the opposite pattern is seen. Every angiosome is connected to its neighbor at every level of the tissue, either by a reduced-caliber choke anastomosis or a real (simple) anastomotic arterial connection without altering the vessel's caliber. Adjacent venosomes are connected by a similar network of avalvular (bidirectional or oscillating) veins on the venous side [3,4].

There are several significant clinical ramifications of the angiosome concept.

1. Each angiosome designates the secure anatomic border of tissue in each layer, such as skin and muscle or muscle and bone, that can be transplanted individually or joined to form a composite flap on the underlying source vessels. Additionally, when a flap design is based on one of the source arteries, the anatomic territory of each tissue in the nearby angiosome may typically be caught safely [10].

2. In the event that the primary source artery or vein is clogged, these muscles offer a crucial anastomotic detour (bypass shunt) as the junctional zone between neighboring angiosomes often lies within the deep tissue muscles rather than between them [11].

3. One can seize the skin island from one angiosome by using muscles provided in the neighboring territory, as most muscles span two or more angiosomes and are supplied from each territory. This knowledge serves as the foundation for the construction of numerous musculocutaneous flaps, as we will see later [12].

CONCLUSION

The concept of angiosomes plays a pivotal role in surgical procedures involving tissue transplantation and composite flap formation. The secure anatomic borders defined by angiosomes enable the precise identification and isolation of tissues at various layers, facilitating the transplantation of individual components or the creation of composite flaps. The strategic use of muscles in neighboring territories proves instrumental, particularly in scenarios where the primary source artery or vein is obstructed, as these muscles provide crucial anastomotic pathways. Furthermore, the ability to extract a skin island from one angiosome using muscles from adjacent territories forms the basis for constructing musculocutaneous flaps. This comprehensive understanding of angiosomes and their interconnections serves as a cornerstone for advancing surgical techniques and optimizing outcomes in tissue transplantation procedures.

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