Review Article

Blood Vessels

Marium Ahsan[1], Muhammad Akram[2], Momina Iftikhar[2], Tansif Ur Rehman[3], Francisco Garcia-Sierra[4], Riadh S Al-Malki[5], Fethi Ahmet Ozdemir[6], Gaweł Sołowski[6], Najmiatul Fitria[7], Marcos Altable[8], Adonis Sfera[9]

Corresponding authors:
Muhammad Akram, Department of Eastern Medicine, Government College University Faisalabad-Pakistan.

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Abstract

One of the primary target tissues for inflammatory and allergy mediators is the blood vessel, and cytokines have a variety of impacts on it. We describe the usefulness of isolated blood vessels immersed in organ baths as a valuable source of pharmacological data. Contractility assays provide strong potency and selectivity data on agonists, partial agonists, and competitive or noncompetitive antagonists; however, their use in the bioassay of vasoactive drugs is gradually being replaced by more advanced analytical techniques. The human umbilical vein, for instance, has been widely utilized to identify bradykinin B2 receptor ligands. Isolated segments of vascular tissue are highly reactive living tissues, particularly in terms of regulating gene products associated with inflammation (e.g., kinin B1 receptor). The venule's extremely thin walls have the potential to burst due to their high volume. Venules allow blood to move into larger veins. Both veins and arteries have three layers in their walls. On the other hand, venous pressure is modest. Veins are less elastic and have thin walls, allowing them to maintain a high blood circulation rate. The venous system's high capacitance enables it to store a significant amount of blood at comparatively low pressures, containing around 75% of the circulating blood at any given time. The veins' one-way valves permit blood to move forward toward the heart through muscle contractions.

Keywords: Blood Vessel Wall; Transmural Pressure; Strain Energy Function; Stretch Ratio; Uniaxial Test

Introduction

The body's major organs are connected by an elaborate network of hollow tubes called blood vessels, which begin and end at the heart. These vessels are part of the circulatory system that supplies all the body's cells with oxygen, nutrients, and water. The three layers that make up all blood vessels—adventitia, tunica media, and tunica intima—are directed outward from the luminal side [1]. However, depending on intravascular pressure, the exact architecture of the vascular wall varies dramatically among veins of different sizes, with some or all layers being weaker or absent altogether. The entire circulatory system is lined with a thin layer of endothelial cells (ECs), known as the tunica intima, or intima for short. The blood vessel architecture significantly affects their physiological function [2]. The middle layer of an artery is visibly thicker than that of a vein. Veins have a valve structure to prevent reflux, while the intima is composed of squamous endothelial cells (EC) entangled in a polysaccharide intercellular matrix to form the lumen for blood transfer [3]. The outside of the intima, made up of elastic bands and subendothelial tissues, is surrounded by the internal elastic lamina. Vascular smooth muscle cells (SMCs), elastic fibers, connective tissues, and polysaccharides make up the intermediate layer of the arteries. Hemodynamics can be altered because SMCs regulate blood vessel expansion and contraction. The endothelium is a thin layer of cells that lines the inside of every blood vessel [4]. The extracellular matrix known as the basal lamina, which separates the endothelium from the rough outer layers of the vessel, is made up of surrounding epithelial cells. Controlling the flow of materials into and out of the blood,

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including nutrients and waste products, is one of the endothelium's main functions. Angiogenesis is the process by which tissues can occasionally produce new blood vessels [5]. Angiogenesis occurs in abnormal contexts, such as the initiation and spread of cancers, and plays a significant role in the regeneration of injured tissue. Numerous illnesses and disorders can impact a person's blood vessel anatomy and function. Examples include inflammation, hypertension (an abnormally high blood pressure caused by arteriole constriction), and atherosclerosis (fat deposits in the artery endothelium) [6]. Given that blood vessels are widely dispersed throughout all organs, they might be among the most crucial tissues to research. The three primary categories of blood vessels are capillaries, veins, and arteries. Blood is pumped through arteries and arterioles by the heart. The veins and venules carry blood to the heart [7]. For the portal veins, which transport blood between organs, such as the hepatic portal vein, which transports blood from the intestine to the liver, this is typically not the case. The tiniest blood vessels, called capillaries, are where nutrients, waste products, and oxygen are exchanged between blood and tissues. The three layers that comprise the walls of veins and arteries are the media, intima, and adventitia [8]. The subendothelial layer of the tunica intima is made up of endothelial cells on a basement membrane and collagen and elastic fibers. The collagen and elasticity-rich smooth muscle fibers make up the tunica media. Elastic fibers and collagen make up the tunica adventitia. Depending on the type of vessel, these components have different proportional amounts [9].

Arteries

These strong, muscular blood vessels carry oxygen-rich blood from the heart to the body. Although they don't have large blood reserves, they are strong enough to withstand high blood pressure and force. At any one time, just 10 to 15 percent of the blood in the body is in the arteries [10].

Arterioles

Smaller vessels known as arterioles form when arteries divide. Arterioles and arteries are incredibly flexible. They enlarge or contract to help regulate blood pressure [11].

Capillaries

These tiny blood vessels have thin walls. Through their walls, organs and tissues can take in nutrients and oxygen from the blood. Furthermore, the capillaries eliminate waste from the tissues. In capillaries, waste and carbon dioxide are exchanged for nutrients and oxygen [12].

Venules

Venules, the small blood vessels that make up veins, gradually get bigger as they get closer to the heart. Venules get blood from capillaries [13].

Veins

Unlike arteries, veins are not required for blood transfer under high pressure, even though they must return a significant amount of deoxygenated blood to the heart. They can tolerate low pressure and large volumes because their walls are less elastic and thinner [14]. The majority of venous valves may open and close. Blood flow in one direction is maintained and controlled by the valves. Approximately 75% of blood is kept in veins [15].

Conclusion

Blood vessels are essential for distributing blood from the heart throughout the body and supplying organs and tissues with the necessary oxygen and nutrients to sustain their health. Blockages or enlargements of blood vessels can be problematic. Certain blood vessel conditions can be harmful and need to be treated immediately. However, by leading a healthy lifestyle, blood vessel diseases can be mitigated.

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