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Anatomy & Physiology: Current Research

Perspective

A Short Note on Angiogenesis

Chaoyong Jang*

Department of Internal Medicine, University of Milan, Milano, Italy

DESCRIPTION

Angiogenesis is the physiological process through which new blood vessels form pre-existing vessels that were produced earlier in the Vasculogenesis process. By sprouting and splitting, angiogenesis maintains the vasculature growing. Vasculogenesis refers to the embryonic production of endothelial cells from mesoderm cell progenitors and neovascularization, but interpretations differ. Vasculogenesis is responsible for the formation of the initial blood vessels in the developing embryo, followed by angiogenesis, which is responsible for the majority, if not all, blood vessel growth during development and illness.

Angiogenesis inhibitors can produce a variety of adverse effects such as high blood pressure, a rash or dry, itchy skin, and hand-foot syndrome. Rough, thickened regions develop on the palms and soles as a result of this. Blisters, diarrhoea, fatigue, low blood levels, problems with wound healing, and healing injuries are all possible side effects.

TYPES OF ANGIOGENESIS

Sprouting angiogenesis

Sprouting angiogenesis was the first type of angiogenesis to be discovered, and as a result, it is more characterized than based drug discovery angiogenesis. It progresses through a number of stages that are well-defined. The first signal is produced by tissue that is devoid of blood vessels. The hypoxia in these places leads the tissues to require nutrients and oxygen in order to perform metabolic functions. As a result, parenchymal cells release the proangiogenic growth factor Vascular Endothelial Growth Factor (VEGF-A). Endothelial cells in pre-existing blood arteries activate receptors activated by these biological signals.

Second, active endothelial cells, also known as apex cells, release proteases, which dissolve the basement membrane, allowing endothelial cells to exit the original (parent) vessel walls. Endothelial cells then multiply in the surrounding matrix, forming solid sprouts that join adjacent vessels. The proliferating cells are known as stem cells and are found behind the tip cells. These cells proliferate, allowing the capillary sprout to increase in length at the same time.

Endothelial cells migrate in conjunction with sprouts toward the source of the antigenic stimulation, employing adhesion molecules called integrins. As cells move to the angiogenesis site, these sprouts form loops and eventually produce a full-fledged vessel lumen. Sprouting allows new vessels to develop over gaps in the vasculature at a frequency of several millimeters each day. It differs from splitting angiogenesis in that it creates entirely new vessels rather than dividing old ones.

Intussusceptive angiogenesis

The development of a new blood vessel by dividing an existing blood vessel into two is known as intussusceptive angiogenesis, also known as splitting angiogenesis. The capillary wall extends into the lumen to split a single vessel in two in this kind of vessel creation. Intussusceptive angiogenesis is divided into four stages. The two opposing capillary walls first create a contact zone. Second, the endothelial cell connections are rearranged, and the bilayer of the vessel is perforated, allowing growth factors and cells to pass into the lumen. Third, at the point of contact, a core of pericytes and my fibroblasts forms between the two new vessels.

These cells start laying collagen fibres into the core to provide an extracellular matrix for vessel lumen development. Finally, the core is developed out but the basic framework remains unchanged. Because it involves a restructuring of existing cells, intussusception is crucial. It allows for a massive increase in capillary number without a related increase in endothelial cell number. This is especially critical during embryonic development since there aren't enough resources to build a rich microvasculature with new cells every time a new vessel forms.

Correspondence to: Chaoyong Jang, Department of Internal Medicine, University of Milan, Milano, Italy, E-mail: jangyoung5@ yahoo.it

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