

Difference Between Ischemia and Infarction

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Key Difference - Ischemia vs Infarction

There are vital factors such as [oxygen](#) and [glucose](#) required by cells for their survival. When these [metabolites](#) are not adequately supplied pathological cellular changes start to happen within the cells and if not corrected cellular death ensues. Ischemia and infarction are two such processes that are due to the lack of supply of these vital factors into the cells. Mechanical obstruction of an [artery](#) resulting in [hypoxia](#) which is the basis for ischemia. An impairment of the venous drainage can also cause ischemic [tissue](#) damages. Infarction is the process by which an area of ischemic [necrosis](#) is produced either due to an arterial occlusion or an obstruction to the venous drainage. The **key difference** between ischemia and infarction is **necrosis happens only in infarction and not in ischemia**.

What is Ischemia?

Ischemia is the commonest form of cell injury in [medicine](#). Mechanical obstruction of an artery resulting in hypoxia is the basis for ischemia. An impairment of the venous drainage can also cause ischemic tissue damages. Unlike in hypoxia where the energy production can take place via [anaerobic respiration](#), in ischemia the supply of substrates for [glycolysis](#) does not happen. Consequently, there is not only an oxygen deficiency but also an energy deficiency. Therefore there is a rapid cell injury in ischemia than in hypoxia which is not associated with ischemia.

Mechanism

Due to the lack of oxygen, [oxidative phosphorylation](#) does not occur. At the same time, glycolysis is inhibited by the lack of substrates. As a result, there is not enough [ATP](#) for the maintenance of cellular ion pumps. This gives rise to an [electrolyte](#) imbalance within the cell.

Cellular changes associated with ischemia

- Dispersion of cytoskeleton and the formation of blebs

- Appearance of myelin figures within the cells from the degenerating cellular membranes
- Swelling of [mitochondria](#)
- Dilation of ER

These changes are reversible if the hypoxia is corrected within 30-40 minutes from the onset of ischemia.



Figure 01: Ischemia in Lower Limbs

Cell death in ischemia mainly occurs through the activation of apoptotic pathway and necrosis. Cellular [organelles](#) progressively degenerate, and there is an efflux of cellular [enzymes](#) into the extracellular space. Extracellular macromolecules start entering the cell. Ultimately dead cell masses are replaced by myelin figures which are composed of [phospholipids](#).

What is Infarction?

Infarction is the process by which an area of ischemic necrosis is produced either due to an arterial occlusion or an obstruction to the venous drainage.

Causes

- Arterial [thrombosis and embolism](#)

- [Hemorrhage](#) into an atheromatous plaque
- Compression of an artery by a [tumor](#)
- Vascular torsion
- Although venous obstruction can cause infraction, it most often ends up as congestion particularly affecting the vessels with only one efferent vein.

Red Infarcts

Occur with venous occlusion in loose, spongy tissues, in tissues with a double circulation and in tissues that have a congested network of veins.

White Infarcts

These occur due to the arterial occlusion in solid organs with an end arterial supply.

Septic Infarcts

The [colonization](#) of microbes in necrosed tissues forms Septic infarcts.

Factors Affecting the Formation of Infarcts

- Anatomy of the vascular supply of the affected region
- Rate of occlusion
- Tissue vulnerability to hypoxia
- hypoxemia

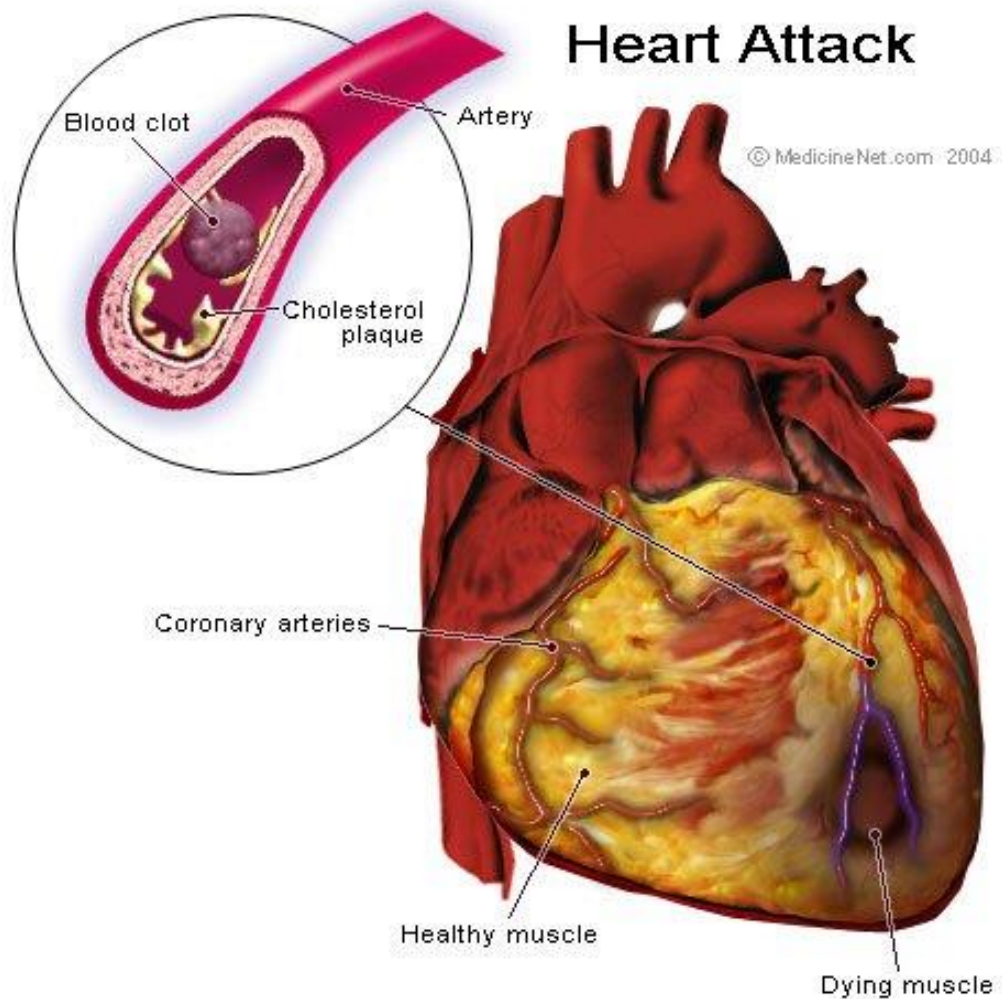


Figure 02: Infarction

Infarctions in almost all the organs of the body except in the brain result in coagulative necrosis. In the brain, infarction gives rise to liquefactive necrosis.

What are the Similarities Between Ischemia and Infarction?

- Tissue damage occurs on both occasions
- Hypoxia is the underlying cause of both ischemia and infarction

What is the Difference Between Ischemia and Infarction?

| Ischemia vs Infarction | |
|---|---|
| Ischemia is the commonest form of cell injury in medicine. Mechanical obstruction of an artery resulting in hypoxia is the basis for ischemia. An impairment of the venous drainage can also cause ischemic tissue damages. | Infarction is the process by which an area of ischemic necrosis is produced either due to an arterial occlusion or an obstruction to the venous drainage. |
| Necrosis | |
| Necrosis does not take place. | Necrosis takes place. |

Summary - Ischemia vs Infarction

Ischemia is the commonest form of cell injury in medicine. Mechanical obstruction of an artery resulting in hypoxia is the basis for ischemia. An impairment of the venous drainage can also cause ischemic tissue damages. On the other hand, infarction can be defined as the process by which an area of ischemic necrosis is produced either due to an arterial occlusion or an obstruction to the venous drainage. The difference between these two pathological processes is tissue necrosis occurs only in infarction and not in ischemia.

Reference:

1. Kumar, Vinay, Stanley Leonard Robbins, Ramzi S. Cotran, Abul K. Abbas, and Nelson Fausto. Robbins and Cotran pathologic basis of disease. 9th ed. Philadelphia, Pa: Elsevier Saunders, 2010. Print.

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APA: Difference Between Ischemia and Infarction .(2017 December 30). Retrieved (date), from [http://differencebetween.com/difference-between-ischemia-and-vs-infarction /](http://differencebetween.com/difference-between-ischemia-and-vs-infarction/)

MLA: "Difference Between Ischemia and Infarction" Difference Between.Com. 30 December 2017. Web.

Chicago: "Difference Between Ischemia and Infarction". Difference Between.Com. <http://differencebetween.com/difference-between-ischemia-and-vs-infarction/> accessed (accessed [date]).



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