I. CONTEXT AND INTRODUCTION

- The term Stroke or cerebrovascular accident refers to the sudden death of a cerebral tissue area due to lack of oxygen when the blood flow to the brain is impaired by blockage or rupture of a cerebral artery.
- According to the World Health Organization data, stroke is the second cause of death worldwide, being responsible approximately of the 12% of worldwide deaths every year.
- In Pathology field, different types of stroke are defined according to its causes or consequences:
  - Hemorrhagic stroke: Vessel rupture inside the Central Nervous System.
  - Ischaemic stroke: Blockage of cerebral blood flow or oxygen supply to the brain. Ischemic stroke subtypes are summarized in the following schema:

![Ischaemic Stroke Classification](image)

- Neurovascular unit (NVU) concept: derives of a big number of observations which reported how vascular elements, supporting compounds and neuronal cells work together in order to achieve the complete protection and metabolic regulation that brain needs at any time.

   - Neuron
   - Tight junction
   - Astrocyte
   - Blood vessel
   - Pericyte
   - Extracellular matrix
   - Immunological system

![Characteristics of cerebral microvessels under normal conditions](image)

The diagram below illustrates different cellular elements interacting with endothelium in the normal NVU.

![Schematic representation of cell interaction in the neurovascular unit](image)

Every one of those elements is capable of regulating endothelium physiology in the NVU by releasing a wide range of metabolic mediators, even though in normal conditions only astrocyte and pericyte influences are remarkable.

IV. NEUROVASCULAR UNIT AND ITS RESPONSE TO ISCHAEMIA

The NVU suffers changes and find its physiology perturbed from the very onset of ischemic situation. As a result of the research that has been done, all changes that NVU suffers due to ischaemia can be classified under the next four main titles:

1. Loss of endothelial permeability barrier leading to perivascular edema establishment.
2. Loss, by enzymatic digestion, of the vessel basal lamina and extracellular matrix, leading to haemorrhagic transformation process.
3. Alterations in cell-matrix signaling systems, which would start a wide range of cytological changes as initiating apoptosis-like cell death pathways.
4. Leukocyte adhesion receptors expression in endothelial surface, leading to neuroinflammation processes.

Neurovascular chronology after ischaemia onset

As a result of the present study, a graphic representation of the chronology of neurovascular unit processes promoted by ischaemia has been made:

![Graphical representation of ischaemia chronology in the neurovascular unit](image)

CONCLUDING REMARKS

- Neurovascular unit experiments alterations from the very instant that ischaemia is established.
- The neurovascular unit disengaging is the most clear red line in ischemic stroke, leading to the start of infarction and irreversible tissue injury.
- New pharmacological strategies should target the basal lamina of cerebral capillaries in order to protect it from digestion.

CREDITS FROM FIGURES:

- Figure 1: Del Zoppo, G. J., & Hamann, G. F. (2011). The Cerebral Microvasculature and Responses to Ischemia. Stroke, 42(4), 987-992. doi:10.1161/STROKEAHA.110.569034
- Figure 2 and 3: Infograph by the author.