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Primena hipotermije u cilju neuroprotekcije kod ishemijskog moždanog udara

Application of hypothermia for neuroprotection in ischemic stroke

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Apstrakt

Uvod: Neuroprotekcija je terapijski postupak čiji je cilj svaki pokušaj da se cerebralno tkivo sačuva od ireverzibilnog oštećenja nakon moždanog udara. Brojna istraživanja vršena na polju farmakološke protekcije (STAIR) nisu dala očekivane rezultate, te su pretkliničke i kliničke studije svoje interesovanje usmerile ka nefarmakološkim postupcima neuroprotekcije. Nefarmakološki postupak od koga se mnogo očekuje je upravo primena hipotermije. Hipotermija se definiše kao telesna temperatura manja od 36 °C bez obzira na uzrok. Sa aspekta neuroprotekcije govori se o indukovanoj (terapijskoj) hipotermiji koja se najjednostavnije može definisati kao ciljano upravljanje (snižavanje) temperature zarad terapijskih benefita. Indukovana hipotermija može biti blaga, umerena, teška i duboka hipotermija. Metode i tehnike pomoću kojih se postiže indukovna hipotermija mogu biti invanzivne i neinvanzivne. Metode spoljašnjeg hlađenja pacijenta (neinvanzivni postupak) imaju svoje prednosti u smislu korišćenja u prehospitalnom nivou, ali i u nastavku kontinuirane primene po smeštaju u jedinici intenzivne nege, mogućnosti defibrilacije kroz oblogu, kontrolisanog hlađenja, zatim dostupnosti, jednostavnoj primeni, ne zahtevaju dodatnu sofisticiranu opremu.

Cilj: Prikazati benefite indukovane hipotermije u poboljšanju neurološkog ishoda kod pacijenata kod kojih je došlo do cerebralne globalne hipoksije.

Materijal i metode: Komparativna analiza dosadašnjih iskustava u primeni indukovane hipotermije u cilju neuroprotekcije.

Zaključak: Hipotermija se u dosadašnjim istraživanjima neuroprotekcije pokazala kao izuzetno efikasan postupak, posebno kada je reč o srčanom zastoju. Mehanizam neuroprotektivnog delovanja hipotermije je smanjenje metaboličkih potreba neurona, smanjenje otpuštanja slobodnih radikala i redukcija ulaska kalcijuma u ćelije, te u tom smislu smanjenje cerebralog edema.

Abstract

Introduction: Neuroprotection is a therapeutic procedure and its goal is to protect cerebral tissue from irreversible damage after a stroke. Numerous studies conducted in the field of pharmacological protection (STAIR) did not give the expected results, and preclinical and clinical studies have focused their interest on non-pharmacological neuroprotection procedures. The non-pharmacological procedure from which much is expected is the application of hypothermia.

Hypothermia is defined as a body temperature of less than 36 °C regardless of the cause. From the aspect of neuroprotection, we are talking about induced (therapeutic) hypothermia, which can be most simply defined as targeted management (lowering) of temperature for the sake of therapeutic benefits. Induced hypothermia can be mild, moderate, severe, and deep hypothermia. The methods and techniques used to achieve induced hypothermia can be invasive or non-invasive. Methods of external cooling of the patient (non-invasive procedure) have their advantages in terms of use in the prehospital level, but also the continuation of continuous application after placement in the intensive care unit, the possibility of defibrillation through the lining, controlled cooling, then availability, simple application, does not require additional sophisticated equipment.

Objective: To present the benefits of induced hypothermia in improving neurological outcomes in patients with cerebral global hypoxia.

Material and methods: Comparative analysis of previous experiences in the application of induced hypothermia for neuroprotection.

Conclusion: Hypothermia has so far been shown to be an extremely effective procedure in neuroprotection research, especially when it comes to cardiac arrest. The mechanism of the neuroprotective effect of hypothermia is a reduction in the metabolic needs of neurons, a reduction in the release of free radicals, and a reduction in the entry of calcium into cells, and in that sense a reduction in cerebral edema.