BRAIN IMAGING IN RABBITS: PRELIMINARY RESULTS ON CBF VARIATION BY DIFFERENT ANAESTETHIC DRUGS

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In the last decades the animal model has been usually considered as a research tool, especially for functional studies and brain imaging. Although general anesthesia and sedation are fundamental requirements to perform nuclear imaging in veterinary patients, very few studies have been published on the effect of anesthesia itself, on brain perfusion. Brain SPECT in humans is widely applied to assess brain perfusion mainly in awake patients. The aim of the study was to evaluate general brain perfusion in rabbits through a non-invasive nuclear medicine technique, before and after the administration of different anesthetic protocols commonly used for veterinary patients.

Ten male New Zeland White rabbits of 6 months of age were enrolled in the prospective study. Before SPECT examinations, the rabbits underwent CT studies of the skull in order to exclude any gross malformations or lesions and to acquire images for CT/SPECT fusion. 99mTc-HMPAO brain SPECT scans were acquired with a single head gamma camera: circular orbit, continuos rotation 10 seconds/step and 120 steps. During the first session 99mTc-HMPAO was IV injected in two groups of five awake rabbits, with a randomized selection. The first one was subsequently anesthetized with propofol and the other with dexmedetomidine. The same procedure was repeated three weeks later when the injection of the radiopharmaceutical was performed after the induction of general anaesthesia. The brain perfusion uptake index (BPUi%) was calculated as the percentage ratio between total counts in the brain and injected activity.

Rabbits anesthetized with propofol showed exactly the same tracer distribution in both injection condition: awake or asleep. The radiopharmaceutical was concentrated in the brain but a generalized distribution was observed also in the facial muscles. On the contrary when dexmedetomidine was used, rabbits anesthetized after the 99mTc-HMPAO injection showed a distribution similar to propofol group, while when the radiotracer was injected after the anesthetic drug, a generalized reduction of the uptake was observed especially in extra-encephalic tissues.
The average BPUi% values were about 1.6% for all rabbits anesthetized with propofol and for rabbits injected with 99mTc-HMPAO before dexmedetomidine administration. Animals injected with 99mTc-HMPAO after dexmedetomidine administration showed a lower value of BPUi% equal to about 1.25 %.

Although the major limitation of our study is the small number of subjects analyzed, our results showed that when propofol is used as anesthetic drug, any difference in brain perfusion occurred if the radiotracer was injected prior or before anesthesia.
On the contrary the vasocostriction of dexmedetomidine is responsible of a mild reduction of the IRU in the brain and a good inhibition of tracer uptake in other tissues.

These preliminary data suggest that the use of propofol in uncooperative patients, that need sedation before brain perfusion studies, could not influence the CBF. On the other hand the results of the CBF in rabbits medicated with dexmedetomidine before tracer injection, suggest a possible neuronal protective proprieties of this drug.