

Scintigraphic radioisotope counting in superior frontal part of cat's brain

Gholamreza Assadnassab^{1*}, Shahram Dabiri Oskoei², Babak Mahmoudian², Davoud Kazemi¹, Mohammadreza Valilou³, Hossain Jodeiri¹, Solmaz Rahmanie Barouji⁴

1- Department of Clinical Science, Faculty of Veterinary Medicine, Tabriz Branch, Islamic Azad University, Tabriz, Iran

2- Department of Nuclear Medicine, Tabriz University of Medical sciences and Health Services, Tabriz, Iran.

3- Department of Pathology Science, Faculty of Veterinary Medicine, Shabestar Branch, Islamic Azad University, Shabestar, Iran

4- MD

Corresponding author: Gholamreza Assadnassab, assadnassabgh@iaut.ac.ir, assadnassabgh@gmail.com

Abstract: The aim of recent study was to describe counting the radiopharmaceutical ^{99m}Tc-ECD uptake in the left and right superior frontal regions of cat's brain and show the symmetry between of them. One of diagnostic imaging technique is nuclear medicine that is used in animals. Brain scintigraphy is important in nuclear medicine. In this survey, scintigraphy has done in 20 healthy cats and amount of radioactive materials in necessary scans at special regions has counted. Scintigraphic scans are obtained 20 minutes after injection of 2milliCurie, ^{99m}Tc- ECD from femoral vein in anaesthetized cats. In this research, we study accumulation of radioisotopes in superior frontal part of brain by drawing regions outlines interest (ROI). Average count of this radioisotope in right and left side superior frontal parts of brain were 38.4±2.70 and 38.2±2.74 Kcount respectively that show the symmetry between of them.

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1. Introduction

Brain scintigraphy is important in nuclear medicine. One of diagnostic imaging technique is nuclear medicine that also is used in animals. In this method in addition to recognizing anatomical structures; physiological function can be understood too. By this technique we can distinguish ill states from healthy (Chow et al., 2006; Henkink et al., 1996; Nakamura, 2001; Sutton, 1998). Nuclear medicine has been rapid progress in recent decades. In this method, the administration of radioisotopes to the body and accumulation of these substances in the tissues, specific imaging is obtained, which is based on distribution of Gamma radiations exposed from these radioisotopes and recording of them. Scintigraphic images all show the spatial distribution of the radiopharmaceutical agents (Auwawanne, 1995; Henkink et al., 1996; Mettler, 1998).

In this study we aimed to assess the counting the radiopharmaceutical ^{99m}Tc-ECD uptake in the left and right superior frontal regions of cat's brain and show the symmetry between of them until the results presented for use in future studies.

2. Materials and Methods

In this survey, scintigraphy has done in 20 healthy cats (2-4kg weight) and amount of radioactive materials in necessary scans at special regions has counted. For doing brain scintigraphy, radioisotope (^{99m}Tc) has milked from Technetium – Molybdenum generator and then this added to ECD (Ethylen

Cystein Dimer) kit. After mixing the kit have ^{99m}Tc – ECD, 2mCi from this material measured by dosimeter machine in insulin syringe and then this injected from femoral vein in anaesthetized cats.

Scintigraphic scans are obtained 20 minutes after injection of ^{99m}Tc- ECD. Then the animal was positioned on the scan table.

In this research, we study accumulation of radioisotopes in superior frontal part of brain by drawing regions outlines interest (ROI) on both the right and left brain sides by computer in special program of machine.

After setting the device brain scintigraphy ADAC machine program in both sides of body were prepared. By focusing of detector in brain area, scintigraphic scans were started. In this survey we used of double-detector ADAC apparatuses model Vertex. These apparatuses were calibrated and special software was designed. Mie was the name of dosimeter machine. In this study the quality (visual) and also quantitative evaluating studies were performed by Gamma camera program software.

For scintigraphy, animals were taken under anesthetic condition and were recumbency on back. During the action, one person was careful to constantly move that the animal does not carry out operations to disrupt the scan. Animals were anesthetized by Ketamine at the 10 mg/kg as main drug and Acepromazine at the 0.05 mg/kg respectively as pre-anesthetic drug (Hall et al., 1998). For Better to count on the animal's foot injection area

was considered as a lead shell. In first scans were determined the basic outline of the brain. And different views will be the imaging in many special layers (Figure 1). A suitable the layer image in a convenient location of brain scans is selected. Then by drawing automatically ROI on the front of the brain in right and left sides, the amount of radioisotope will be counted (Figure 2).

Finally, data of right and left superior frontal part of brain were compared by T-test.

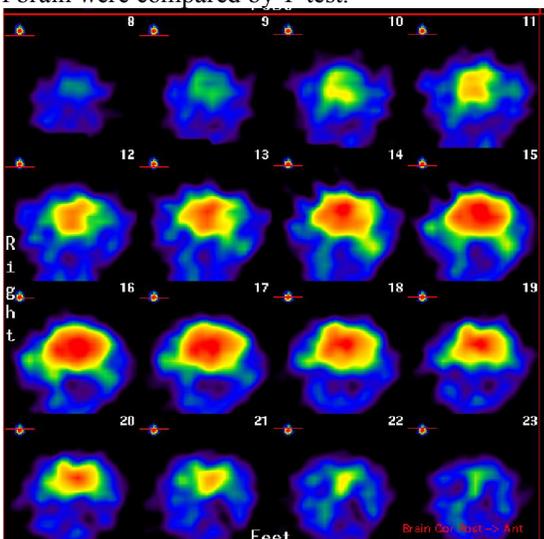


Fig 1: Layers of different sections of the brain in cats during the sweeping from the back to forward

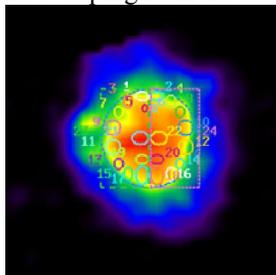


Fig.2: Drawn automatically ROIs on both the right and left sides of the brain area in selected layer

3. Results

Average count of this radioisotope in right side and left superior frontal parts of brain were 38.4 ± 2.70 and 38.2 ± 2.74 count respectively (table 1).

There is no significant difference in superior frontal parts of brain obtained from right and left.

Table 1: Data obtained from count of radioisotope in right and left superior frontal parts of brain (in kilocount)

Brain	Mean	Standard deviation
Right	58.21	2.28
Left	61.23	2.09

4. Discussion

This study showed that cat's brain scintigraphy can be easily done with radiodrug which is useful in diagnosing of brain and also research studies related to this field (Awuawanne, 1995; Kuge et al., 2000a; Peremans et al., 2003).

Size, shape and position of the brain are possible by radionuclide imaging. Scintigraphy has been proposed and used in evaluating the functional and physiological activities (Annet et al., 2004; Henkink et al., 1996; Mettler, 1998; Takami et al., 2000). Scintigraphy is used in the animals (Ertay et al., 2005; Chow et al., 2006; Kuge et al., 2000a; Kuge et al., 2000b) especially on cat (Annet et al., 2004; Dahlager and Bilde, 1980; Ertay et al., 2005; Peremans et al., 2001). Brain Scintigraphy is done for many purposes. Our results, also confirmed reports, conducted scintigraphy of brain know that is consistent with reports by other researchers in this field (Dahlager and Bilde, 1980; Kuge et al., 2000b; Nakamura, 2001; Peremans et al., 2003). ^{99m}Tc -ECD can be used in the brain scintigraphy (Peremans et al., 2001; Awuawanne, 1995; Henkink et al., 1996). In the cat study also revealed that this drug can be used in scintigraphy of the other animals, which compatible with the findings of other researchers (Peremans et al., 2003; Peremans et al., 2001; Nakamura, 2001). The use of this drug, reports of side effects like brain failure to respond to this medication, allergic and fatal side effects not being observed. Results, shows the means counts of brain in right and left superior frontal part are not significant different with them (T-test) ($P > 0.05$).

Scintigraphy reveal the anatomical structure and physiological functions of brain which is reported previously (Annet et al., 2004; Ertay et al., 2005; Sutton, 1998). Even with assessment of the scanned images it seems that scintigraphy can identify certain diseases of the brain which is supplementary in accurate diagnosis and is compatible with reports by other researchers (Kuge et al., 2000b; Mettler, 1998; Takami et al., 2000). The investigation revealed, scintigraphy of cat brain many similarities with human brain scintigraphy (Henkink et al., 1996; Mettler, 1998) and computer programs such as scanning and collecting imaging and drawing ROI in this animal also applied to be a particular and does not problem created. In assessment of obtained scans it revealed that accounting the radioactive agents is achievable and is done easily by computer programs of Gamma camera machine. This study revealed that the radiopharmaceutical ^{99m}TC as in humans (Henkink et al., 1996; Sutton, 1998) and animals (Dahlager and Bilde, 1980; Ertay et al., 2005; Kuge et al., 2000a; Kuge et al., 2000b) are used in cats can also be used and brain scintigraphy can be performed

easily with this radiodrug. Brain scintigraphy studies in dog has been conducted by Peremans and colleagues in 2001 (Peremans et al., 2003; Peremans et al., 2001). Also in 2006 the cat drug Barthez and colleague's ^{99m}Tc -pertechnetate scintigraphy studies have reported (Barthez et al., 2006) but there is no similar study of radioisotope counting in superior frontal part of cat's brain. In addition, drawing of cat's ROI is performable by computer programs and applications of this technique in cats are possible and have no problem and this like human (Henkink et al., 1996; Sutton, 1998) brain scintigraphy and is done by the ROI method is applicable and available. The first criterion is used to assess the symmetry of brain images. In general, the most important point is that the asymmetry is defined as abnormal findings.

Scintigraphy considers as a method useful in diagnostic imaging of veterinary medicine and animal science. Animals like cats as a specific animal model can be used in nuclear medical research.

The use of medicine techniques in animals can be very useful in medical researches.

Finally, scintigraphy was a comfortable utility in diagnostic imaging of brain and can be used in this way.

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