Medical Solutions

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Background information: Nuclear medicine diagnostics

General information regarding nuclear medicine

A number of pathologies cause damage to the body before their effects become apparent. This is usually not the case with tumors. An increase in tumor size is quite often not visible before the late stages of a particular illness. Changes in metabolism or blood circulation may occur in the early stages of cancer, cardio-vascular problems or diseases of the nervous system before it is possible to proof structural changes.
Nuclear medical diagnostics are able to display changes in functional procedures with the help of scintigraphic methods. As compared to nuclear medicine, radiological imaging methods such as X-ray or ultrasound examinations provide primarily structural information about organs and bones. The earliest possible diagnosis is instrumental for effective therapeutic results.

In nuclear medicine, a small dose of a low radioactive substance with a short half life is intravenously injected into the patient prior to the examination. The substance concentrates in the organ to be examined or certain tissue types. The radioactive irradiation emitted during the decay is recorded by a detector and used as the basis for the image. Depending on the physical characteristics of the substance used, a short-wave X-ray radiation (gamma radiation) or a so-called positron radiation is emitted. The latter is the basis for positron emission tomography (PET). With gamma rays, data acquisition is performed with a single photon emission computed tomography camera. A computer transforms the radiation measurement values into a graphic display that shows the concentration of these substances at different points in time in the body. The physician can use the display to detect certain

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pathological changes. The radiopharmaceuticals administered are metabolized and processed by the body similar to molecules inherent in it.

Positron Emission Tomography (PET)

A PET scanner displays multiple metabolic processes at high spatial resolution of three to five millimeter in the body. The test substance used most frequently with PET is radioactively tagged sugar (glucose). The glucose administered to the patient concentrates in particular in tumor cells, since the rapid growth of tumor cells requires more glucose than normal tissue. In this way malignant growth is displayed at an early stage.

Positron Emission Tomography/Computed Tomography (PET/CT)

Diagnostics in nuclear medicine can be optimized by combining the image information provided by different modalities. The PET/CT system is one of these kinds of hybrids. An additional computed tomograph (CT) is integrated at the PET scanner to obtain both functional (PET) as well as structural information (CT) in the image. Within clinical routine, this allows for comprehensive cardiac images in a single process. And these new hybrid systems enable whole-body imaging in oncology in as little as seven to 15 minutes. The fused images greatly facilitate diagnosis and improve integration into therapy planning and controlling. As a result, hybrid imaging systems are steadily gaining in importance in nuclear medicine.

Single Photon Emission Computed Tomography (SPECT)

Frequently known as “conventional nuclear medicine“, SPECT technology displays metabolic processes as well. Commercially, there are many more radiopharmaceuticals available for SPECT than for PET examinations, greatly widening the range of possible SPECT examinations. The main indications are – depending on regional differences – skeletal examinations, thyroid, lung, heart and kidney examinations.

Single Photon Emission Computed Tomography – Computed Tomography (SPECT·CT)

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SPECT·CT technology combines molecular imaging with computed tomography, that is, it combines specific molecular information with precise anatomical details. Using this rather new technology, physicians are able to exactly locate pathological foci within the body and analyze their size, type, and extent. First results indicate improved diagnostic accuracy by adding anatomical information obtained with computed tomography as well as improved image quality. In addition, the positive effect on the internal workflow of the hospital (only one appointment, shorter wait time for results) is very promising. But most important, the patient is spared the terrible feeling of uncertainty by receiving an immediate and accurate diagnosis. SPECT CT has the potential of revolutionizing both diagnosis and treatment of cancer as well as cardiac and neurological pathologies.

Siemens Medical Solutions is one of the world's largest suppliers to the healthcare industry. The company is known for bringing together innovative medical technologies, healthcare information systems, management consulting, and support services, to help customers achieve tangible, sustainable, clinical and financial outcomes. From imaging systems for diagnosis, to therapy equipment for treatment, to molecular medicine to hearing instruments and beyond, Siemens innovations contribute to the health and well-being of people across the globe, while improving operational efficiencies and optimizing workflow in hospitals, clinics, home health agencies, and doctors' offices. Recent acquisitions in the area of in-vitro diagnostics – such as Diagnostic Products Corporation – mark a significant milestone for Siemens as it becomes the first full service diagnostics company. Employing approximately 36,000 people worldwide and operating in more than 130 countries, Siemens Medical Solutions reported sales of 8.23 billion EUR, orders of 9.33 billion EUR and group profit of 1,06 billion EUR for fiscal 2006 (preliminary figures). Further information can be found under: http://www.siemens.com/medical

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