

Use of a Mini-PACS in a Nuclear Medicine department or practice

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Aim

Due to high investment costs only a few Nuclear Medicine departments or practices are equipped with a digital image archive or PACS. Nuclear medicine modalities are not sufficiently supported by the available radiological DICOM PACS systems in our experience.

Therefore we developed, based on windows PCs, a cost-effective system, which can be used as „Mini-PACS“ in the nuclear medicine environment. This system must be DICOM conform, but it should integrate proprietary image data as well; first of all, it should provide an optimal display of the nuclear medicine modalities (planar scintigraphy, SPET, PET) on windows PCs.

This system should replace the conventional report presentation with hardcopies/films and lightboxes.

Methods

Software: With „Delphi“ for Windows a software system („TomoMagine“) was developed for archiving and presentation of nuclear medicine studies. DICOM services (DICOM SCP and DICOM send) were implemented using a toolkit of the Offis Institute Oldenburg, Germany.

In order to integrate data from older equipment without DICOM interface we implemented an FTP interface, which is able to transfer and import image data from Siemens and Philips gamma cameras.

Text- or image documents, which are not available in the DICOM format (z.B. text files, JPG, BMP or TIF files), can be imported, assigned to a patient and archived.

The archiving, as well as the selection of patient/study is supported by relational database (Borland database engine/ Paradox), where queries are possible concerning not only patient name, birthday or study date, but also concerning specific study descriptions or archives (fig. 1).

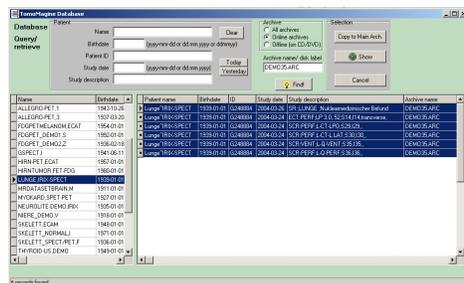


fig. 1: Database query form

For data backup we integrated a CD burner module, which enables archiving the image data onto low-cost CDROM/DVD burners.

The long-term archiving of all DICOM data (also SPET raw data) is done additionally in our clinical PACS system (manufacturer: Image Devices), located in the radiological department. If older examinations of a patients are available in the central PACS, which are not registered in the TomoMagine system, they are automatically loaded during archiving of new studies.

Image data of the TomoMagine system can be viewed on many windows stations simultaneously. An image viewer is provided, which can be started over the network without installation.

Tomographic studies (PET or SPET) are displayed in 3 reformatted planes (transaxial/ coronal/ sagittal) and as animated MIP projections (fig. 2). Each plane can be shown separately as series of images as well.

Screen shot documents are shown as seen on the generating workstation (fig. 3); all original data can be viewed in black and white or with a selectable colorable. Contrast levels (percent upper/ lower level) can be selected as well.

All clinical reports of our department are automatically converted to the DICOM SR (structured report) format and are stored in the PACS archive. The report text can be displayed together with the images in TomoMagine.

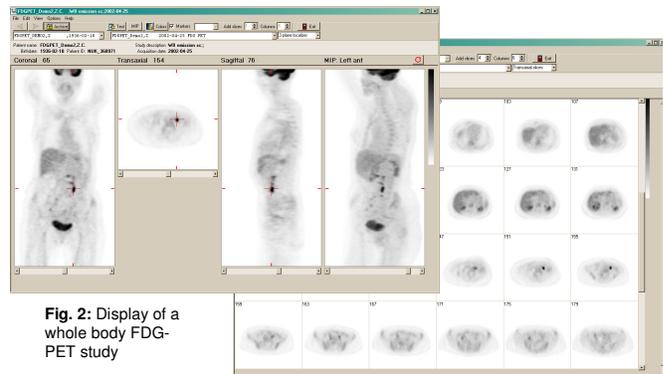


Fig. 2: Display of a whole body FDG-PET study

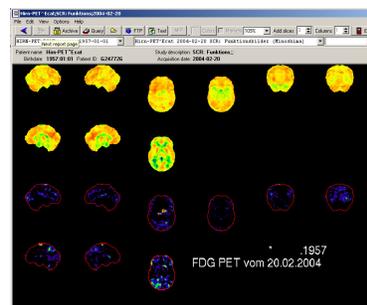


Fig. 3: Display of a screen capture document (image imported from SUN raster format)

Data sources: In our TomoMagine system image data of the following systems are integrated:

Gamma cameras: Ecam, Orbiter, Bodyscan (Siemens); Irix, DDC, CX250 (Philips)

PET: Ecat Exact (Siemens)

Workstations: ICON, Esoft, Ecat (Siemens), Odyssey (Philips), Gamma-AT (Intermedical)

Ultrasound: Hitachi US with video connection to PC with Framegrabber and DICOM Software (Convis)

Results

In a test phase of about 1 year all result images in DICOM format of 3 gamma cameras of Siemens und 2 of Philips, DICOM Ultrasound images, proprietary PET data (Siemens Ecat) und Screenshots (SUN Raster, Windows BMP) were imported und archived.

The program was used first successfully for presentation of SPET and PET data only.

Because of the good acceptance of the program it was used finally for viewing of all kinds of nuclear studies and for all clinical conferences, where nuclear studies were presented. The support of a relational database enables a fast access to all online data as well as a good access to offline data; moreover we can search for patients with specific examinations, which is a valuable feature for scientific purposes. The long-term archiving is done in our department now onto DVD media (about 1 DVD per month); after a 1 year test period we had no problems to read data from the media back.

The required amount of disk space is in the order of 10 MB per patient, if only result data (screen shots) and reconstructed tomograms are stored (no raw data). To have these data available on line for 10 years, we would need about 600 GB disk space, which is no problem with a state-of-the-art raid system.

Conclusions

The described software is well suited for archiving, viewing and presentation of images in a nuclear medicine department of a hospital or practice. In smaller departments or practices a fully functional nuclear medicine PACS can be implemented with relatively low cost for hard- and software. In larger hospitals such a system is useful for viewing and presentation in clinical conferences as well as for research and teaching.

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