Clinical Experience with the ClearPEM tomograph developed in Portugal

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on the behalf of the ClearPEM collaboration

Introduction

- The ClearPEM project aimed at developing a scanner for Positron Emission Mammography and prove the technique useful

- Two prototypes built for clinical trials
  - ClearPEM scanner installed at ICNAS, Coimbra, Portugal
  - ClearPEM-SONIC, installed at Hospital Nord, France

ClearPEM @ ICNAS

ClearPEM-SONIC @ Hospital Nord
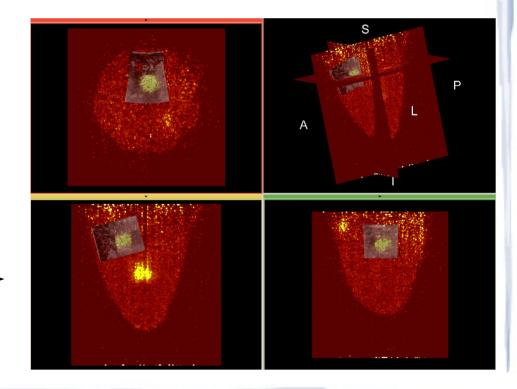With the Aixplorer 3D UltraSound probe

ClearPEM-SONIC multi-modal imagins system

A PET acquisition is performed
and then a US acquisition in for a region of interest

Images are then co-registered

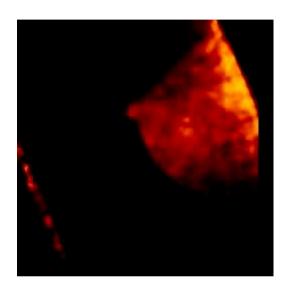# Clinical Trials

ClearPEM Exam Conditions:

- The patient does PET/CT 40 min after FDG injection

- The PET/CT is 25 to 30 minutes long

- The ClearPEM exams are performed 1 hour and 10 minutes after de FDG administration

- No extra dose is required for the ClearPEM exam

- Patients perform a complete ClearPEM exam: breast (left and right) and axilla (left and right), starting with the side where the lesion was detected (in the clinical report file).

- Acquisition times:
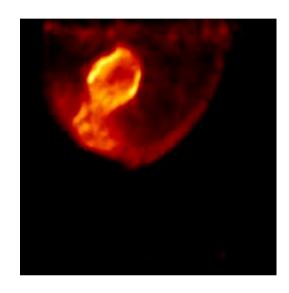 - 20 min for each breast (4 angles);
  - 12 min for each axilla (3 angles)

Clinical exams performed up to now:

#	Date	Age (yr)	Weight (kg)	FDG [mCi]	Detector Heads Distance (mm)			
					Breast-R	Breast-L	Axilla-R	Axilla-L
1	2011.11.25	39	73.5	9.30	160	160	450	460
2	2011.12.09	65	82	10.03	200	200	530	530
3	2011.12.27	39	54	6.65	130	130	430	400
4	2012.01.13	36	74	9.30	150	160	440	410
5	2012.02.10	76	81	10.20	--	170	--	480
6	2012.03.09	62	74	9.30	170	165	480	485
7	2012.03.09	77	64	8.60	150	130	450	430

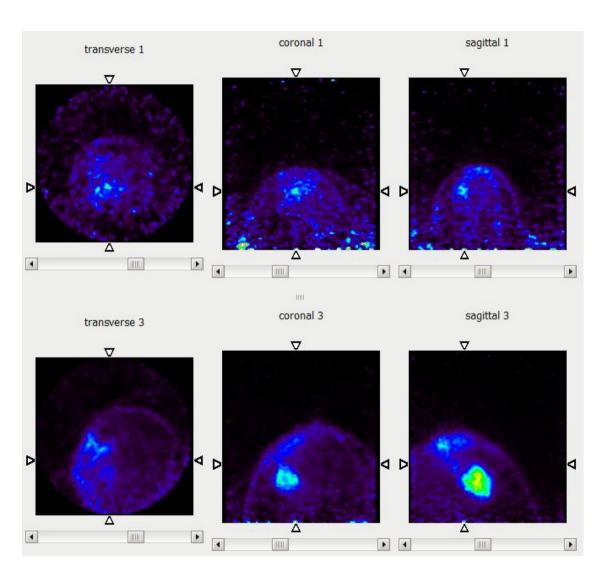# Patient #1 : First Reconstruted Images (LM)

Left breast   Right breast

Volume rendering of the left and right breasts, reconstructed with list-mode MLEM (Liji Cao, version Dez 2011), 8 iterations, voxel size 2x2x1.3 mm3, gaussian filter with FWHM of 1.5 mm. No randoms & attenuation corrections.
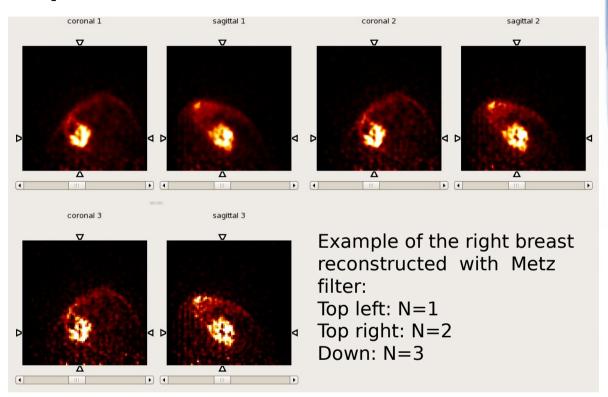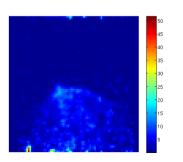
Patient #1 : First Reconstructed Images (STIR)

Reconstructed images of the left (up) and right (down) breasts, with STIR (OSMAPOSL), 5 iterations, voxel size 2x2x1.3 mm3, gaussian filter with FWHM of 1 mm. No attenuation corrections.
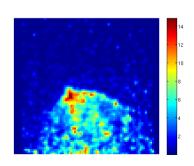
Patient #1 : Optimizing reconstruction parameters with LM

- Voxel size (1x1 or 2x2 mm2)
- Gaussian filter with FWHM of 1, 1.5 or 2 mm
- Metz filter Power N=1,2,3
- Number of iterations (up to 20)

- New updated versions of the list mode reconstruction software released by Liji Cao

Example of the right breast reconstructed with Metz filter:
Top left: N=1
Top right: N=2
Down: N=3

On going work

- In the meantime:

  – Reconstructed images of the 7 exams were evaluated

  – Updated versions of the reconstructed software were tested

  – Attenuation corrections were implemented (by F. Rodrigues)

  – Statistical noise reduction of the images (randoms correction) is being studied and implemented (by Liji Cao)

- ClearPEM reconstructed images need clinical interpretation (meeting on April 26th)