SPECT VQ with Krypton

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Introduction

- Local development of SPECT VQ technique with Kr-81m gas since June 2010
- Inspired by
  - EANM SPECT V/Q guidelines
  - Gutte et al (Denmark) using Kr-81m gas

- We present this technique today

[1] Gutte et al, JNM Vol. 50, No 12, Dec 2009

[2] Scrine R et al, NMC 2011; 32(1): 76(05)

Patient Setup

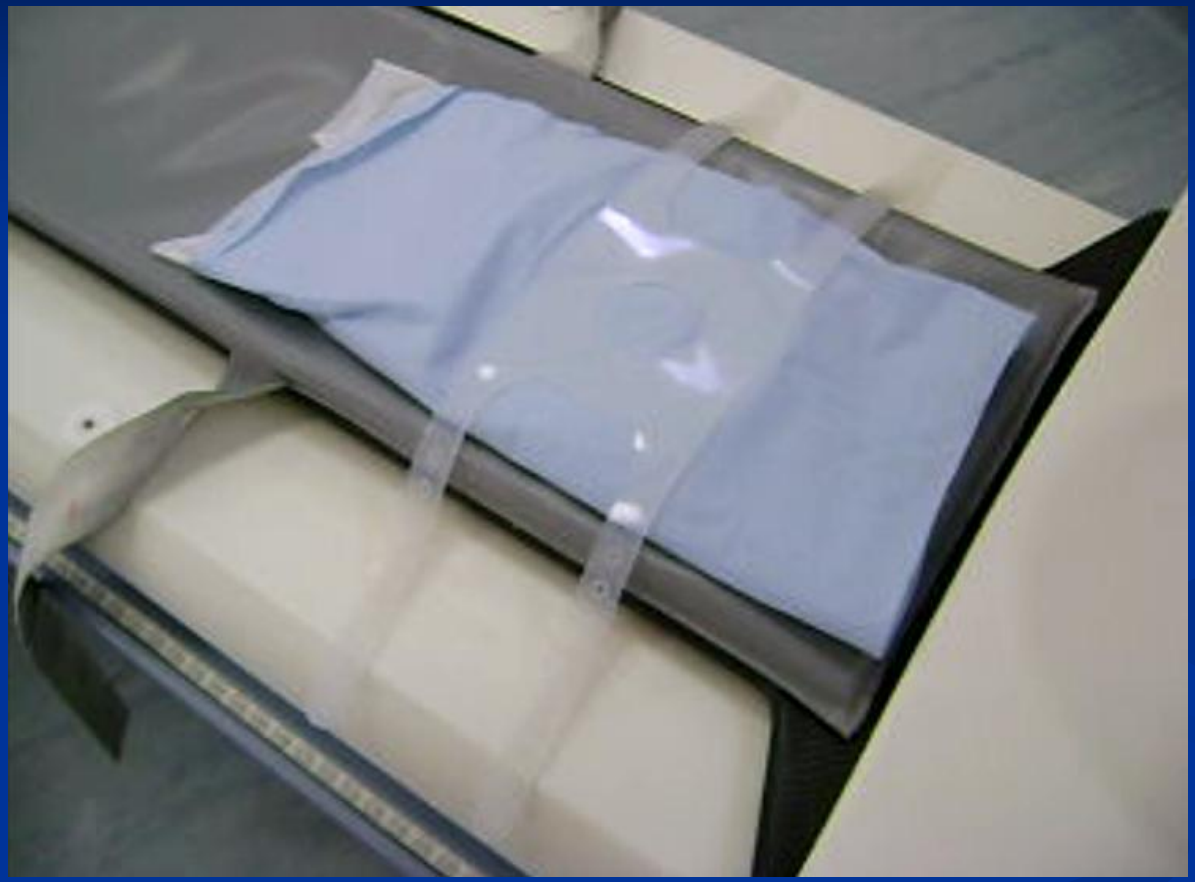
- Standard IRMER checks
- Explain test to patient
  - 15 minutes
  - Mask
  - Normal breathing
- Inject supine with 200 MBq Tc99m MAA
  - 100 MBq for pregnant patients and pulmonary hypertension
- Lie patient down on imaging couch

Video 1 – Placing patient on couch

- Mask strap ready
- Small pillow
- Patient flat on couch
- Knee rest
- Raise arms ok?
- Couch straps to retain clothes

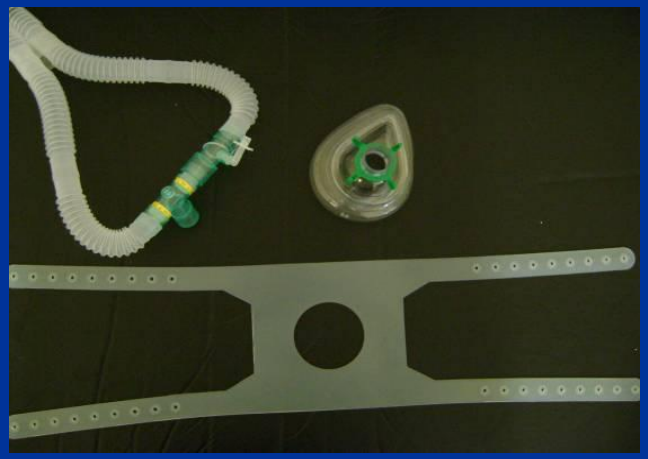
See movie 1.wmv on CD ROM

Mask and Strap Setup



Strap placed on imaging couch ready for fitting

Mask and Strap Setup



Multi-use strap supplied by Dialco-Valmy
Single use reservoir & mask supplied by Intersurgical Supplies

Attaching the Mask

- Place mask on face
- Cushioned seal so not too tight
- Attach straps to mask
- Arms above head
- Hang-up resevoir
- Place patient under detectors

See movie 2.wmv on CD ROM

Acquisition Setup

- GE Infinia preferred
  - ELEGP collimators
  - Autocontour mechanism saves setup time
  - Ability to visualise both energy windows in PScope
  - Convenient space for generator
- Setup dual energy SPECT acquisition
  - Tc99m 140keV 10 %
  - Kr81m 190keV 10 %
  - 25 seconds per step
  - 30 steps per head (60 total)
  - Total scan time 13 minutes
  - Matrix 128x128, Zoom 1.0 (4.4mm pixel size)

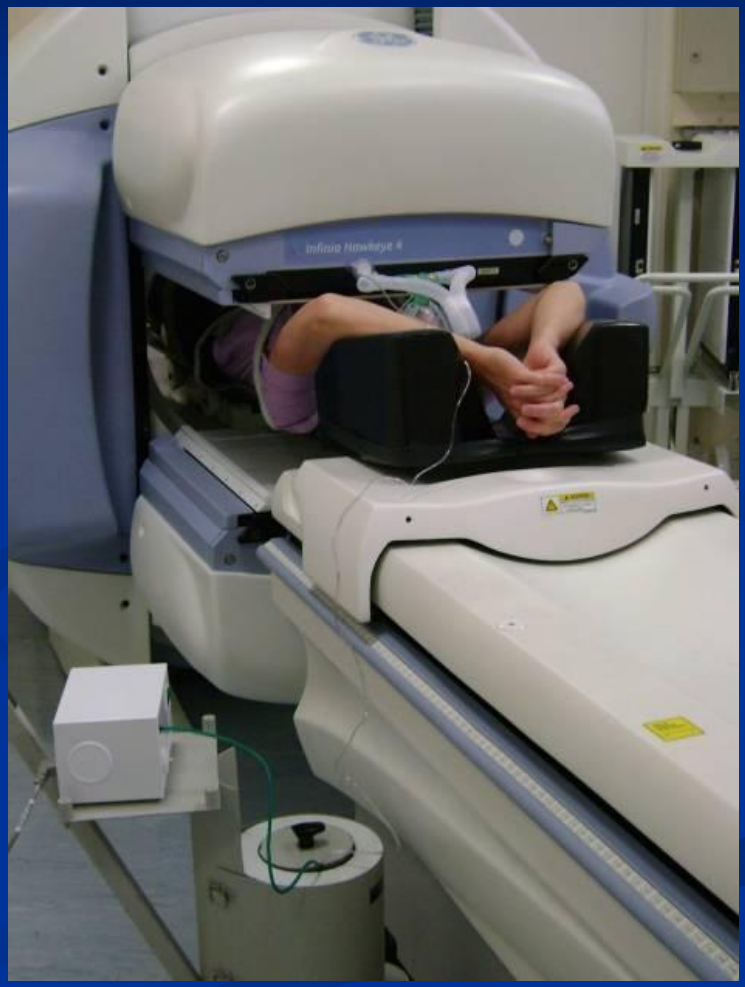
Patient positioning

Administer Gas

- Turn on generator
- Kr bolus delivered to patient
- Wait 6 to 8 seconds for gas to enter and mix
- Start SPECT acquisition

During scan

- Be vigilant
  - Observe movement
  - Ensure Kr administered continuosly (no gas leakage)
  - Patients condition
- Count rate expectations (A-P)
  - Tc99m 10 to 15 kcps
  - Kr81m 12-18 kcps



Downscatter Test

- Performed on 1st VQ patient of the day on;y
- Place injected patient under detectors
- Record Tc99m count rate from Pscope – e.g. 12 kcps
- Give bolus of Kr81m
- Record Tc99m count rate – e.g. 15 kcps
- Calculate downscatter percentage (DS)

$$DS = \frac{15-12}{12} x100\%$$

Downscatter Lookup Table

25% Downscatter Tolerance	
Tc99m	Tc99m+Kr81m
6	7.5
8	10
10	12.5
12	15
14	17.5
16	20
18	22.5
20	25

Problems

- Calustrophobic patient
  - Explain 15 mins only
  - Remain with patient
  - This test could mean no CTPA test
- Gas leakage
  - Check mask
  - Try different/better mask size
- Contouring poorly
  - Arms in best position
  - Clothes/bed sheets affecting contour mechanism

Summary

- SPECT with Krypton 81-m ventilation straightforward
- Dual isotope SPECT is diagnostic
- Mask needs to be fitted correctly to prevent gas leakage