Renal Cortical Scintigraphy (DMSA) – British Nuclear Medicine Society

Renal Cortical Scintigraphy (DMSA)

1. Purpose
This guideline must be read in conjunction with the BNMS Generic Guidelines. The purpose of this guideline is to assist specialists in Nuclear medicine and Radionuclide Radiology in recommending, performing, interpreting and reporting the results of renal cortical scintigraphy (DMSA). This guideline will assist individual departments in the formulation of their own local protocols.

2. Background
2.1 $^{99}$Tc$^{m}$ DMSA is injected iv, it is bound to the proximal tubules of the kidney and has an extraction efficiency of 6-8% (2). There is a 6-8% extraction efficiency by the kidney and imaging occurs some hours following injection.

3. Common Indications.
3.1 Detection of focal renal parenchymal abnormalities
3.1.1 Assessment of the kidney in the acute phase of a Urinary Tract Infection (UTI) (Acute pyelonephritis) (3,4,5,6).
3.1.2 Assessment of the kidney for detection of scar in the late phase following a UTI (5,7,8).
3.1.3 Assessment of the Horseshoe, solitary or ectopic kidney (9).
3.1.4 Localisation of the poor or very poorly functioning kidney (9).
3.1.5 Assessment of renal function in the presence of an abdominal mass.

3.2 Differential renal function estimation

3.3 Contraindications
Nil

4. Procedure
4.1 Patient preparation
4.1.1 No specific preparation is required
4.1.2 Date of last UTI should be recorded if relevant.
4.1.3 For paediatric studies, refer to www.eanm.org.
4.1.4 Sedation is almost never required in children (10) (cf. generic guidelines for children).

4.2 Injection Technique
See generic guidelines for children

4.3 Special precautions

With an ectopic kidney anterior views are required (see 6.4.2).

5. Radiopharmaceutical

$^{99}$Tc$^m$ DMSA (dimercaptosuccinic acid).
Dose schedule should follow diagnostic reference levels (11).
Adult dose of 80 MBq with scaling on a body surface area basis for children.
A minimum dose of 15 MBq is recommended (12).
Adequate quality images will allow differentiation of the renal cortex from the medulla with clear renal outlines (13).

6. Image acquisition

6.1 Camera

6.1.1. Gamma camera

6.2 Collimator

6.2.1 The emphasis is on high resolution images. The choice of collimator should optimise for the highest resolution possible.

6.3 Patient Position

6.3.1 Supine and the patient should be as close to the camera face as possible.

6.4 Views

6.4.1 The minimum data set are posterior and both posterior oblique views
6.4.2 An additional anterior view should be acquired when there is an ectopic kidney, when spinal abnormalities with a scoliosis is present, tumours and / or an abdominal mass is present (5). (See processing).

6.5 Computer Acquisition

6.5.1 Matrix used should ensure a pixel size of +/- 2 mm that can be achieved either with a 256 x 256 or 128 x 128 matrix with zoom.
6.5.2 Image acquisition should start 2-4 hours post injection
6.5.3 Posterior image of both kidneys are obtained for a total of 300,000 to 500,000 counts.
6.5.4 Both left and right posterior oblique images should be obtained each for approximately 150,000 – 200,000 counts
6.5.5 If an anterior view is required, this should be for a total of 150,000 to 200,000 counts
6.6 Interventions

Nil

7. Data Analysis

7.1 For estimation of percent differential function (DRF), regions of interest (ROI's) of each kidney and background ROIs should be drawn on the posterior image.

7.2 When an anterior view has been obtained (see above), the DRF should be calculated using the Geometric mean. ROIs on both anterior and posterior images are required. The calculation is the square root of each kidney's background subtracted ROI counts in the Anterior x Posterior views.

7.1.3 Output should include images in the posterior and both posterior oblique projections. Each image labelled for projection and side. DRF should also be stated.

8. Interpretation

8.1 Reporting format:

8.1.1 Description

8.1.1.1 The position, size and overall morphology of the functioning renal tissue should be noted.

8.1.1.2 The number, size and location of areas of cortical loss should be noted.

8.1.1.3 Diffuse reduced uptake may be seen in a kidney with a UTI.

8.1.1.4 The DRF should be stated

9. Pitfalls

9.1 Acute and chronic pyelonephritis cannot be distinguished on the cortical scan. If a defect is present 6 months after the last UTI then this is a scar (14).

9.2 A recent UTI may cause temporary reduced uptake / focal defect and a follow-up DMSA scan should be undertaken (14)

9.3 The diagnosis of renal scars is difficult in the infant under 3-6 months of age because of renal immaturity. If appropriate the scan should be delayed.

9.4 There is a wide range of normal variants which should be recognised (see www.eanm.org and reference 13)

10. Controversies

10.1 To obtain the highest resolution, some centres recommend the use of a pin hole collimator, however many institutions obtain high resolution images with clear definition between cortex and
Renal Cortical Scintigraphy (DMSA) – British Nuclear Medicine Society

medulla without the use of pin-hole collimation.

10.2 Currently there is no evidence to support the routine use of SPECT in children to delineate focal defects (15, 16).

11. References

2. Taylor DMSA extraction fraction
14. Jakobsson B, Svensson L, Lavocat MP, Granjon D, Allard D, Gray C, Freycon MT, Dubois F. Transient pyelonephritic changes on Tc 99m DMSA scan for at
least 5 months after infection. Acta Paediatr 1997;86: 803-807
16. Howman Giles DMSA SPECT

12. Date Agreed/Approved
April 2001

13. Date for Review/Update
April 2005

<table>
<thead>
<tr>
<th>Initial draft first posted</th>
<th>July 1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revised</td>
<td>February 2001</td>
</tr>
<tr>
<td>Revised</td>
<td>April 2001</td>
</tr>
<tr>
<td>Last revised</td>
<td>February 2003</td>
</tr>
</tbody>
</table>

These guidelines are not supposed to constitute a formal protocol but rather the protocol in your department should fit within these guidelines. They are meant to highlight the aspects of a study where variation in practice may significantly affect the quality of outcome of the study.