Role of intravenous urogram in investigation of urinary tract infection: an observational study

B Padmakumar, H M Carty, D A Hughes, B A Judd

PATIENTS AND METHODS
A total of 520 patients (age 0–19 years) underwent DMSA scanning over a two year period after presenting to nephrology and urology clinics at the Royal Liverpool Children’s Hospital Alder Hey. The doses of 99mTc DMSA were calculated according to the child’s surface area using the adult standard of 80 MBq. Both posterior and posterior oblique images were obtained two hours after administration of the radiopharmaceutical isotope. Forty patients (7.7%) were identified over a two year period in whom the differential renal uptake was >10%, who had smooth renal outlines, and had no evidence of scarring. All patients had an ultrasound examination. Two had marked urological abnormalities on ultrasound and eight had a duplex system in the kidney with greater DMSA uptake. In 18 patients where no explanation was apparent for the discrepant DMSA uptake, an IVU was performed.

RESULTS
Eight patients had a normal IVU. In the remaining 10 patients, six had duplex systems without scarring and four had appearances of scarring in the kidney with reduced DMSA uptake.

Conclusions: In this small selected group an IVU will identify a significant number of patients with normal kidneys, unrecognised simple duplex systems, or scarring where the DMSA scan has been inconclusive. This will help in planning long term follow up.

RESULTS
Eighteen patients had an IVU (13 girls, five boys, age range 1–10 years, median 4 years). Four had scars (see table 1); all four were girls ages 1–7.

Six patients had simple duplex systems without scarring. One had a bilateral duplex system, four had unilateral duplex systems with greater DMSA uptake on the side of the duplex system, and one had a bifid collecting system on the side of the lesser DMSA uptake. The DMSA divided function in these patients ranged between 37%/63% and 44%/56%.

Eight patients had structurally normal kidneys (five boys, three girls). The divided function ranged from right 39%/61% to 44%/56%.

DISCUSSION
Many children with urinary tract infection have anatomical and functional abnormalities. DMSA has been shown to be the most sensitive method of detecting renal scars but has some shortcomings.

The accepted normal range for differential DMSA uptake is 10%. Uncomplicated simple duplex kidneys may have greater uptake in the duplex kidneys or cause an erroneous impression of a small poorly grown contralateral kidney. Duplex systems are not always recognisable on DMSA scans. A pelonephritic kidney rarely may have peripheral scarring and appear as a small smooth kidney on DMSA scanning. Ultrasound is an excellent modality for detecting structural renal abnormalities. Uncomplicated duplex systems may be identified by observing splitting of the renal sinus echoes but this finding is not invariably present. The sensitivity of

Abbreviations: DMSA, 99mTc dimercaptosuccinic acid; IVU, intravenous urogram
ultrasound for detecting scarring is very variable and hence its use in the detection of scarring remains controversial. This study shows that an IVU may provide further structural information of the urinary tract and identifies patients with previously undetected scars (four out of 18 IVUs) and is a useful supplement to ultrasound and DMSA. Previous studies support this. The extent of the divided function is no guide to discriminating between normal, scarring, or duplex systems. Scarring in our group was always on the side of poorest function. There are no studies looking at the risk of hypertension in patients with normal IVUs. However it would seem reasonable in keeping with previous practice that those patients with normal IVUs, including those who showed simple duplex kidneys on the side of greater function, could be safely discharged. Clearly those with identified scarring would need long term surveillance for hypertension.

CONCLUSION

An IVU will identify a significant number of patients with normal kidneys, unrecognised duplex systems, or scarring where DMSA has been inconclusive. This will help in planning long term follow up. We suggest that the indication for an IVU should be a discrepancy in DMSA uptake greater than 10%, with no evidence of scars and where ultrasound is normal.

Authors’ affiliations

B Paddakumar, D A Hughes, B A Judd, Renal Unit, Royal Liverpool Children’s Hospital, Liverpool, UK

H M Carty, Department of Radiology, Royal Liverpool Children’s Hospital, Liverpool, UK

REFERENCES


<table>
<thead>
<tr>
<th>Age/sex</th>
<th>Ultrasound</th>
<th>DMSA</th>
<th>IVU</th>
</tr>
</thead>
<tbody>
<tr>
<td>7F</td>
<td>Normal</td>
<td>Left 57%, right 43%</td>
<td>Right kidney: duplex collecting system; scar in right upper pole</td>
</tr>
<tr>
<td>8F</td>
<td>Right kidney: simple cyst in upper pole</td>
<td>Left 61%, right 39%</td>
<td>Right upper pole scar</td>
</tr>
<tr>
<td>6F</td>
<td>Normal</td>
<td>Left 60%, right 40%</td>
<td>Right upper pole scar</td>
</tr>
<tr>
<td>1F</td>
<td>Normal</td>
<td>Left 42%, right 58%</td>
<td>Bilateral duplex systems, no function in left upper pole</td>
</tr>
</tbody>
</table>
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