The pattern of radionuclide scrotal scan in torsion of testicular appendages

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Abstract. The aim of this study was to define the radionuclide scrotal imaging (RSI) pattern in cases of torsion of testicular appendages and to correlate it with the duration of symptoms. Two hundred and seventeen patients with acute scrotal pain were evaluated prospectively during the past 13 years. Two groups of patients were defined according to the interval between the onset of symptoms and the performance of RSI: group A comprised patients in whom RSI was performed within 5 h after the onset of symptoms, while group B comprised patients in whom RSI was performed between 5 and 24 h after the onset of symptoms. An SPX-4 Elscint or an Apex 405 gamma camera with a parallel hole or converging collimator was used. Between 5 and 15 mCi of technetium-99m pertechnetate was injected as a bolus intravenously. The radionuclide angiogram consisted of six to eight consecutive 5-s frames. The scrotal static scan was obtained immediately following the radionuclide angiogram. The "hot dot" sign, which is a small spot of increased tracer perfusion and uptake on RSI, was not present during the first hours after the onset of symptoms. Therefore, RSI is inaccurate and is not indicated for the diagnosis of torsion of testicular appendages of less than 4-5 h duration. The hot dot sign was, however, demonstrated on the RSI in 45% of the patients with scrotal pain lasting between 5 and 24 h. The overall sensitivity and accuracy of RSI in diagnosing torsion of testicular appendages in this group of patients were 68% and 79%, respectively. In all the patients with a positive hot dot sign, torsion of testicular appendages was found at exploration (specificity 100%). Therefore, the hot dot sign was found to be pathognomonic of torsion of testicular appendages.

Key words: Torsion of testicular appendages – Testicular torsion – Acute scrotal pain – Radionuclide scrotal imaging

Introduction

The testicular appendages are minute stalked embryonal remnants situated at the upper pole of the testis. Torsion of testicular appendages generally presents with acute scrotal pain and represents a common cause of acute scrotum in children [1]. On examination of the symptomatic scrotum, a tender extratesticular nodule and a blue dot on transillumination are considered suggestive of torsion of testicular appendages. The treatment is with analgesic and anti-inflammatory drugs, alleviation of symptoms occurring within a few days. In a minority of patients in whom the symptoms are severe and unremitting, surgical excision of the necrotic testicular appendage is indicated. There is as yet no consensus as to the radionuclide pattern of torsion of testicular appendages. Radionuclide imaging is considered to be non-specific in diagnosing torsion of testicular appendages [2–4]. In the majority of the reported cases the static scrotal scan was interpreted as normal [2–4]. Some authors noted, in certain cases, increased perfusion to the affected side [5–7] and interpreted this finding as focal epididymitis [7]. Radionuclide scrotal imaging (RSI) is a functional study and cannot detect minor anatomical variants or minor changes in the scrotal blood flow. Moreover, the inflammatory reaction to the torsed testicular appendages is a dynamic process, and the results of any imaging method in respect of the scrotum should be interpreted in correlation with the time lapsed since the onset of symptoms.

Our initial experience with RSI in fact showed that the radionuclide angiogram and the static scrotal scan had no specific pattern in cases of torsion of testicular appendages [7]. Recently, we have been able to improve the rate of detection of torsion of testicular appendages by paying meticulous attention to technical details. The present study was undertaken to evaluate our results and to define the RSI pattern in cases of torsion of testicular appendages.
Materials and methods

The study population consisted of 217 patients who presented with acute scrotal pain to the emergency room between 1989 and 1994. All these patients underwent RSI. Two groups of patients were defined according to the interval between the onset of symptoms and the performance of RSI: group A comprised patients in whom RSI was performed within 5 h after the onset of symptoms, and group B comprised patients in whom RSI was performed between 5 and 24 h after the onset of symptoms. Their ages ranged between 5 years and 30 years (mean 22.4 years). Fifty-two patients were prepubertal boys. The results were evaluated prospectively.

Clinical evaluation was performed on every patient by two experienced staff urologists. Testicular scintigraphy was performed in most patients presenting with scrotal pain lasting for less than 24 h. The patients who presented with typical signs and symptoms of testicular torsion, such as a highly situated, fixed and rotated testis and an enlarged and tender cord, were operated on immediately without undergoing imaging studies and were not included in the study. In all such patients, testicular torsion was found at operation. In the assessment of acute scrotum the scintigraphic findings were correlated with the findings on physical examination in all patients. Therefore, no bias was introduced by operating immediately on those patients in whom the physical examination was pathognomonic of testicular torsion. Follow-up testicular examination was performed on every patient. The follow-up examinations were performed at 3- to 6-month intervals during the first year after presentation and yearly thereafter to assess testicular size and consistency.

Our nuclear medicine department provides a 24-h, 7-day service, and testicular scintigraphy was performed 20–40 min after admission in all patients, without any delay. The basic scintigraphic technique was similar to that previously described [2, 4]. Patients were positioned supine with the legs abducted. The scrotum was placed close to and parallel to the face of the low-energy converging collimator by a “tape sling” and towel support. The penis was taped back over the pubis, the penoscrotal junction being positioned underneath the centre of the collimator. The accuracy of RSI was improved by adherence to technical details such as correct positioning, zooming and short distance to the collimator.

An SPX-4 Elscint or Apex 405 gamma camera with a parallel hole or converging collimator was used. In adults, 370–555 MBq (10–15 mCi) technetium-99m pertechnetate was injected as a bolus intravenously. The minimum dose utilized in children was 185 MBq (5 mCi). The radionuclide angiogram (RNA) consisted of six to eight consecutive frames every 5 s, beginning with the first isotope appearance on the screen or after a 10-s delay, whichever was first.

The scrotal static scan was obtained immediately after the RNA images had been acquired. Two sequential static images of 700–800 kcounts were obtained. The RNA and initial static images were obtained with the use of a parallel hole or converging collimator. Static images in the paediatric patients were sometimes acquired with the use of a pinhole collimator to provide greater magnification.

The results in the two groups were compared by the chi-square test and the expected values were computed. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of RSI in diagnosing torsion of testicular appendages were calculated.

Results

The results are depicted in Table 1. In 41 patients the symptoms lasted for less than 4–5 h and a normal or mild increase in radionuclide perfusion and uptake was demonstrated on scrotal scan. On physical examination, the testis was not enlarged and only minimally tender. However, the difficulty in examining the tender scrotum, especially in children, rendered the results equivocal in most cases. Due to a high index of clinical suspicion, exploration was performed in these patients. Torsion of testicular appendages was found in 14 out of 41 patients. The necrotic appendages were excised and the patient

<table>
<thead>
<tr>
<th>Group</th>
<th>RSI (+)</th>
<th>RSI (–)</th>
<th>RSI (–)</th>
<th>RSI (–)</th>
<th>RSI (–)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>14 (10)</td>
<td>27 (15)</td>
<td>0 (1)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Group B</td>
<td>80 (65)</td>
<td>55 (67)</td>
<td>4 (3)</td>
<td>0 (0)</td>
<td></td>
</tr>
</tbody>
</table>

The frequency distributions of the two groups were compared by the chi-square test. P = 0.000. The sensitivity, specificity and accuracy of RSI in diagnosing torsion of testicular appendages were 0%, 100% and 66%, respectively, in group A. RSI had reduced accuracy and diagnostic value during the first 4–5 h following the onset of symptoms. The sensitivity, specificity and accuracy of RSI in diagnosing torsion of testicular appendages in group B were 68%, 100% and 79%, respectively. Group A, patients in whom RSI was performed less than 5 h following the onset of scrotal pain; group B, patients in whom RSI was performed 5–24 h following the onset of scrotal pain. RSI, radionuclide scrotal imaging; Clin., findings on physical examination; Surg., findings at operation; (+), suggestive of torsion of testicular appendage; (–), not suggestive of torsion of testicular appendage; TT, testicular torsion; N, normal.

a Of the 80 patients with RSI suggestive of torsion of testicular appendages only 22 underwent exploration and in all of these torsion of testicular appendages was found. In the remaining 58 patients, the epididymis and testicles were found to be of normal size and consistency on follow-up examinations.

b The values in parentheses are the expected values.