Acute scrotum in children: Role of nuclear testicular scanning in diagnosis

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Citation

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Abstract

Nuclear scanning with Tech 99m pertechnitate has evolved as a major diagnostic tool for evaluating the paediatric patients with acute scrotum. It is simple, quick and accurate for differentiating the patients with testicular torsion from other causes of acute scrotum.Between march 2001 and march 2007,we prospectively studied 148 patients with acute scrotum;out of whom 91 patients were subjected to nuclear scanning.10 patients(9.9%)were diagnosed as having testicular torsion which was confirmed on surgical exploration(accuracy 100%).one patient had epididymo orchitis and one patient had missed torsion..79 patients had normal scan;All the patients with normal scan were managed conservatively with no adverse sequelae on follow up.

INTRODUCTION

The acute scrotum occurs with 1/20th the frequency of acute abdominal pain and consequently a few clinicians can boast of a large personal experience in dealing with acute scrotum [1]. Torsion of testis or spermatic cord is undoubtedly the most serious of the conditions affecting the scrotum[2]. The principal challenge to the clinician is the prompt and accurate diagnosis. Despite sophisticated diagnostic techniques distinguishing testicular torsion from other causes of acute scrotum, it still remains a clinical challenge.

Nuclear scanning of the testes has become the investigation of choice for acute scrotal swellings.[2,3,5]. Rapid sequential imaging with technetium 99m pertechintate along with additional views employing a pinhole collimator provide the optimal results. In testicular torsion scintigraphic images show decreased flow-early phase (6 hrs); halo of mildly increased activity surrounding a cold centre - mid phase (18 hr) and a strongly emitting halo around a cold centre-late phase (missed torsion)[2,3]. Epididymitis is manifested by a markedly increased blood flow to affected side with no cold area of under perfusion. A similar pattern can be found with torsion of appendicular structures[2]. Careful application of this technique leads to high rates of accuracy in distinguishing testicular torsion from appendicular torsion and epididymoorchitis.

MATERIAL AND METHODS

This study was conducted over a period of 6 years from March 2001 to march 2007. The patients in the age group of 0-13 years, who presented with acute scrotal were included in the study. After detailed history and physical examination, routine examinations like hemogram, serum chemistry, urine examination were obtained in all patients. The patients presenting with unequivocal clinical picture of the torsion of testis were subjected to scrotal exploration without delay. All other patients with equivocal clinical presentation were subjected to radioisotope testicular scan.D oppler ultrasonography was performed whenever necessary.

TECHNIQUE

All the patients undergoing Tc99m scintigraphy were given potassium pertechnitate 0.1 mg/kg body weight orally two hours before the procedure to block thyroid uptake. After two hours the patients were positioned supine, with the scrotum elevated on tape sling and a towel between the legs. The penis is retracted cephalic with adhesive tape to avoid superimposition of its vascularity over the scrotal images. If marked asymmetry of scrotal halves was found due to unilateral enlargement of the scrotum, realignment of the median raphe of the scrotum was achieved by applying mild traction to the enlarged side using a paper adhesive and tucking it to ipsilateral thigh. Lead sheet was placed beneath scrotum to block underlying thigh activity. The gamma camera with a converging hole collimator was positioned over the scrotum. After checking the position of the gamma camera, with the help of syringe loaded with technetium, five Mcu of 99m tech pertechnitate was injected

intravenously. Sequential 5 sec flow images were obtained for the first 60 sec; followed by static images. All results were reviewed by experienced nuclear physicists. A typical study completed in 20 minutes. The character of scintigraphic images varies with the duration of ischemic insult and can be divided into three descriptive phases. The early phase (occurring within six hours) shows decreased flow as compared with symmetric contra lateral side. The mid phase (next eighteen hours) demonstrates a halo of mildly increased activity surrounding a cold centre. Late phase images (missed torsion) depict a strongly emitting halo around a cold centre.

Epididymitis is manifested by a markedly increased blood flow to the affected side, with no evidence of a cold area i.e., under perfusion. A similar pattern of perfusion can be seen with torsion of appendicular structures. Such a pattern of diffuse hyper perfusion rules out the diagnosis of testicular torsion.

Careful application of these techniques and guidelines leads to reasonably high rates of accuracy in distinguishing testicular torsion from appendicular torsion and epididymitis.

RESULTS

Out of 148 patients studied during six years study period, only 38 patients were subjected to surgical intervention. Mean age of patients was 5.3 years (range 1-15).27patients had torsion of testis, 10 patients were found to have torsion of appendix of testis and one patient had incarcerated inguino - scrotal hernia. (table 1).110 patients were managed conservatively; 4 had missed torsion. 6 patients had haematocoele,11 patients had idiopathic scrotal edema and 88 patients had non-specific scrotal pain and swelling.Onepatient had epididymo-orchitis.

100 patients underwent imaging studies viz., Ultrasonography, Doppler study and nuclear testicular scan. Ultrasonography(USG) was performed in 3 patients with clinical picture of torsion, which was reported as normal; however on scrotal exploration all the three patients were found to have torsion; indicating a positive predictive value of zero percent for scrotal USG. Four patients with clinical picture of torsion of testis were subjected to Doppler scan and torsion was reported in only one patient. On surgical exploration all the four patients had torsion of testis. (Positive predictive value of 25%).

Nuclear testicular scan was performed in 91patients (Table 2). Out of these ninety one patients, 5 patients had clinical picture of torsion, 5 had clinical picture of epididymoorchitis and 15 patients had suspicion of torsion, and the rest (69) presented with an equivocal clinical picture. In all the 5 patients with clinical diagnosis of torsion, nuclear scanning revealed torsion of testicle and the findings were confirmed on surgery. Out of 5 patients with clinical diagnosis of epididymoorchitis, testicular scan revealed missed torsion of testicle in 4 patients and epididymoorchitis in one patient (Fig.3).Of the fifteen patients with clinical suspicion, six (6) were found to have torsion on nuclear scan; subsequently confirmed on exploration and nine had a normal scan. In 69 patients with equivocal clinical picture five were found to have underlying torsion, rest (64) had a normal testicular scan and were managed conservatively.

Figure 1

Table 1- Clinical entities comprising “Acute Scrotum”(n=148)

Diagnosis	No. of cases	% age
Torsion of testis	27	18.24
Torsion of appendices testis	10	
Incarcerated Inguino scrotal	1	.67
Idiopathic scrotal edema	11	7.43
Haematocoele	6	4.05
Missed torsion	4	2.70
Epididymitis	1	.67
Miscellaneous*	88	59.45

*The patients not having the classical clinical triad of acute scrotum (pain, swelling, tenderness) were grouped in to the miscellaneous group.

Figure 2

TABLE 2 Results of Nuclear testicular scan (n=94)

Results of scan	No. of cases	%age	Diagnosis at operation	Follow up at 3 months
Torsion of testis	15	15.95	14/15*	Healthy symptom free
Epididymo-orchitis	1	1.06	-	Healthy
Normal	78	82.97	-	Healthy symptom free

*Of 4 patients with Missed Torsion,1 patient declined surgery

DISCUSSION

Classical symptomatology and physical findings in acute scrotum still leave the clinicians in a dilemma, especially in patients of pediatric age group. In our study routine base line investigations (haemogram, urine analysis, and urine culture) were not found to be of much value in diagnostic work up of patients with acute scrotum.

We did not find Doppler scanning a valuable tool for evaluation of pediatric patients with acute scrotum (positive predictive value of 25% only). Philip F. Nasrullah[6] has expressed similar views and has reported high false negative rate in boys. However, Burks et al[7] reported a 86% sensitivity and 100% specificity of the Doppler scanning. This discrepancy can be explained by the fact that size of the sample in Burk's study was high and most of the patient was adults. The size of testes in adults is bigger and patients are usually more cooperative, while as pediatric patients are not cooperative and the testicular size also limits the usefulness of the study. Middleton[8,9] also reports that Doppler testicular scanning is undoubtedly more difficult in children, is operator dependant and needs considerable expertise to be performed in children.

We performed scrotal ultrasound preoperatively only in three patients with clinical picture of testicular torsion .However the torsion could not be documented in any of the three patients. Scrotal exploration subsequently confirmed the clinical diagnosis. Thereafter, we abandoned the use of scrotal ultrasound in our patients.. Other authors are also of the opinion that scrotal USG is not useful in distinguishing torsion from other testicular lesions1[4,5,10,11,17].

We performed testicular scanning with technetium 99m pertechnitate in 91 patients, out of whom 5 had an unequivocal clinical picture of torsion of testes.,15 patients had a clinical suspicion of testicular torsion, three had a clinical picture of epididymoorchitis and 68 equivocal clinical picture. In all the 5 patients with clinical diagnosis of testicular torsion, the same was revealed by Tc99m scintigraphy and subsequently confirmed on scrotal exploration. Out of5 patients with clinical diagnosis of epididymoorchitis, in one clinical diagnosis was confirmed in scanning and 4 patient had the scan findings of missed torsion . Out of 15 patients with only suspicion of torsion ,6 were found to have testicular torsion on tech scanning and 9 had normal scans. Out of 69patients with equivocal presentation,five(5) were found to have testicular torsion on tech scanning and the rest(64) had normal scans. All these patients with normal testicular scan were managed conservatively and saved from unnecessary surgical explorations. All these patients were discharged from the hospital the next day (mean hospital stay 23.77 hrs). All these 78 patients were re-scanned after 3 weeks and the follow up scans were reported as normal.We believe that nuclear testicular scanning is very helpful in evaluating acute scrotum in pediatric patients and is very helpful in differentiating patients who need surgical intervention from those who can be managed conservatively.The method is rapid, non-invasive and operator independent. Riley and associates [12] opinion is in close agreement with our experience.. However, the problem [3, 5, 12, 13, 14] is that nuclear scan facilities are not available round the clock. But this limitation, should in no case delay surgical treatment. The nuclear scanning should only be used in those cases where the clinical diagnosis is doubtful[5,16]We found nuclear scanning very useful in equivocal cases as routine scrotal exploration in every patient is confidently avoided, thus reducing the morbidity of scrotal exploration in children. This is in conformity with published reports [17, 18,]. We conclude that nuclear scanning helps obviate unnecessary scrotal explorations and lowers surgical and hospitalization costs.

CONCLUSION

The most common clinical entities leading to acute scrotum in children are testicular torsion and torsion of appendices of testis, whereas epididymoorchitis is rare in pediatric age group. Non-specific scrotal pain and swelling without underlying pathology in the testicle itself is also very common in pediatric age group and needs evaluation with imaging studies like Tech99m pertechnitate testicular scintigraphy. Imaging modalities like scrotal USG and Doppler scanning are not helpful in pediatric patients with acute scrotum to confirm or exclude underlying testicular torsion. Nuclear testicular scintigraphy is the investigation of choice to confirm or exclude testicular torsion in pediatric patients with acute scrotum, especially in patients with equivocal clinical picture. thus avoiding unnecessary scrotal explorations and its associated morbidity in children.

References

1. Williamson REW. Torsion of testis and allied conditions. Br J Surg 1976;63:465-476
2. Aschroft, Holder. Pediatric Surgery 1993;50:595-601
3. John E Frcites et al. Diagnostic nuclear medicine 3rd ed. Sandler CotemenWacker 1986, 1233-1242.
4. Allen Terry D, Elder Jack S. Short comings of colour Doppler sonography in diagnosis of testicular torsion. J Urol 1995;154(4):1508-1510

5. Chen DC, Lawrence E Holder, Gerson N Kaplan. Correlation of radionuclide imaging and diagnostic USG in scrotal disease. J Nucl Med 1986;27:1774-
6. Philip K Nasrallah, D Manzone, Lowel R King. Falsely negative Doppler examination in testicular torsion. J of Urol 1977;118:194-195
7. Delrod D Burks, Brian J Markey, Thomas K Buchhand. Suspected testicular torsion and ischemia: Evaluation with colour Doppler sonography. Radiology 1990;175:815-821
8. Middleton WD, Thorne DA, Melson GC. Colour Doppler USG of normal testis. A J Rad 1989; 152:293-97.
9. Middleton WB. Scrotal sonography in 1991. Ultrasound Quarterly 1991, 9:61-89.
10. Krone KD, Caroll BA. Scrotal USG. Radiology Clinics of North America 1985; 23:121-139.
11. Middleton WB, Melson GL. Testicular ischemia: Colour Doppler findings in five patients. AJR 1987; 152:1237-1239.
12. Riley TW, Philip G Mosbangh et al. Use of radioisotope scan in evaluation of intrascrotal lesions. J Urol 1976; 116:472-474.
13. Holder LE, Martine JR, Holmes ER et al. Testicular radionuclide angiography and static imaging. Radiology 1977; 125:739-752.
14. Hahn LC, Nadel NS, Gitter MH et al. Testicular scanning a new modality for preoperative diagnosis of testicular torsion. J Urol 1975; 113:60.
15. Wu Hsi Chin, Sun Shug Shung, Kao Albert et al. Comparison of radionuclide imaging and ultrasonography in differentiation of acute testicular torsion and inflammatory testicular disease. Clinical Nuclear Medicine 2000; 27(7):490-493.
16. Adam Bruce K, Nath Visuwembhar. Tc99m blood pool imaging in torsion of epididymal appendix. Clinical Nuclear Medicine 2003; 28(6):526.
17. Does color Doppler sonography improve the clinical assessment of patients with acute scrotum .Eur J Radiology 2006;60(1):120-124.

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