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Ultrasonography of intratesticular lesions: its role in clinical management

P T Kennedy, J M Elliott, P F Rice, B E Kelly

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SUMMARY

Ultrasound is the primary imaging modality in the investigation of patients with symptoms related to the scrotum, and is pivotal to the diagnosis of suspected testicular malignancy. This retrospective study analysed the results of testicular ultrasound at a large teaching hospital over a five year period. We wished to examine the clinical consequences for patients in whom ultrasound findings were suspicious of testicular cancer, and the accuracy of the ultrasound diagnosis. Real time ultrasound examinations were performed, providing multiplanar imaging of the testis and para testicular tissues. Over a five year period 661 examinations were carried out. An intratesticular lesion was identified in 44 patients; nineteen of these patients were shown to have testicular malignancy following tissue diagnosis. When ultrasound was used to identify testicular malignancy in those patients with an intratesticular lesion, it had a sensitivity of 94.7% and a specificity of 59.1%. A tissue diagnosis was obtained in 93% of those patients thought likely to have a testicular malignancy on sonographic assessment, and in 40% of those in whom a diagnosis of malignancy was possible, but less likely. Our study shows that this modality can be used to aid the clinician in deciding which patients should undergo orchidectomy, invasive biopsy or clinical surveillance.

INTRODUCTION

Since scrotal ultrasound was first described in 1978, it has developed an increasing role in the management of scrotal pathology. It is sensitive in the detection of abnormalities within the scrotum, and is accurate in separating testicular from para testicular pathologies. However, it can not absolutely differentiate benign from malignant intratesticular lesions. We examined the consequences of a sonographic diagnosis of intratesticular pathology and the resulting diagnoses. We discuss the possible markers of benignity, and the range of management options that a likely benign diagnosis offers.

MATERIALS AND METHODS

The computerised reports of 661 consecutive scrotal ultrasound examinations performed at our institution during a five year period were scrutinised retrospectively. The degree of diagnostic certainty contained in the report, in cases where intratesticular lesions were described (44), was graded as follows:

Grade 1 - Probably Malignant.
Grade 2 - Probably Benign.

The examinations were performed using either a Diasonics (Bedford, United Kingdom) DRF400 with a 10MHz linear array probe with built in stand off, or an ATL (Advanced Technology Laboratory, California, U.S.A.) Ultramark 9 HDI with a 5-10MHz linear array probe without a stand off. All examinations were carried out by a consultant, or a radiology trainee under consultant supervision.

Department of Radiology, Royal Victoria Hospital, Grosvenor Road, Belfast BT12 6BA.

P T Kennedy, BM, BCh, FRCSI, FRCR, Specialist Registrar in Radiology.

J M Elliott, MB, BCh, MRCPI, FRCR, Specialist Registrar in Radiology.

P F Rice, MB, BCh, FRCSI, Specialist Registrar in Radiology.

B E Kelly, MD, FRCS, FRCR, FFRRCSI, Consultant Radiologist.

Correspondence to Dr Kelly.

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The medical notes of those patients in whom testicular malignancy was suspected were reviewed. In addition, the reports of all testicular tissue received by the departments of pathology in Belfast over the same period were also reviewed. It was therefore possible to obtain information on some patients whose medical notes could no longer be traced, and also to trace any patients whose initial ultrasound report was normal, but who subsequently reached a definitive diagnosis of malignancy by another route. To our knowledge, no patient who had a normal testicular sonogram subsequently presented with a testicular neoplasm.

The sonographic findings, when malignancy was suspected, were compared with the findings at pathology, or with the clinical findings in those patients who did not have a tissue diagnosis.

Details recorded for all examinations included patient age, sonographic diagnosis, referral source and the grade of the examining radiologist.

RESULTS

The age range of the patients examined was 12-89 years, with a mean 41.2 years. Of the patients with tissue proven testicular malignancy the range was 18-49 years, with a mean 23.8 years.

Forty four out of 661 examinations (6.7%) produced a report describing an intratesticular lesion. Of these, three were excluded from the analysis: two because of incomplete records, and one because the patient died, without post mortem examination, before a diagnosis was made. Thirty one of the 41 patients proceeded to histological diagnosis (Table I). This was via orchidectomy in 28 cases; fine needle aspiration of the testis was performed in two cases and one patient had the diagnosis established following fine needle aspiration of a retroperitoneal collection of lymph nodes. Nineteen of the 31 patients (61.3%) with a histological diagnosis were shown to have a testicular malignancy (Table II), whilst the remaining 12 patients (38.7%) had a benign condition (Table III). Those patients without a histological diagnosis (10 of the 41) were followed clinically, some with repeat scrotal ultrasound, and were all diagnosed as having a benign condition. To date none of these patients have returned with malignant disease.

TABLE I

Summary Table

Total number of examinations	661
Reports describing an untratesticular lesion	44(6.7%)
Subsequent tissue diagnosis	31(4.7%)
–Malignant disease	19(2.9%)
–Benign disease	12(1.8%)

TABLE II

Histological diagnosis of malignancy. N=19

Seminoma	9
Non seminomatous germ cell tumours	8
Lymphoma	2

TABLE III

Histological diagnosis of benign lesions. N=12

Epididymal cyst	3
Scar secondary to infarct	2
Tubular atrophy and fibrosis	1
Chronic inflamation	1
Acute inflamation	1
Testicular cyst	1
Necrosis	1
Sertoli cell nodule	1
Haematoma	1

The final diagnoses of all 41 patients with scrotal ultrasound findings describing an intratesticular lesion, were compared with the degree of certainty for malignancy expressed in the examination report: 66.7% of lesions graded by the radiologist as probably malignant (i.e. Grade 1) later proved to be malignant (Table IV); conversely when the index of suspicion was low (i.e. Grade 2), a malignancy was shown only on one occasion (7.1%).

The ultrasound report was correlated with subsequent patient management. When the ultrasound identified a likely malignancy the patient was significantly more likely to proceed to an invasive procedure than when it indicated that malignancy was less likely. (Table V) .

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TABLE IV
Sonographic diagnosis compared with histology

Sonographic diagnosis	*Number in group*	*Malignant lesion*	*Benign lesion*
Probably Malignant–Grade 1	27	18(66.7%)	9(33.3%)
Probably Benign–Grade 2	14	1(7.1%)	13(92.9%)

TABLE V
Sonographic diagnosis and whether an invasive procedure was carried out

Sonographic diagnosis	*Tissue obtained*	*Clinical follow up*
Probably Malignant–Grade 1	25	2
Probably Benign–Grade 2	6	8

DISCUSSION

Since its first description by Miskin and Bain in 1978,[1] ultrasound of the scrotum has been used by clinicians to clarify diagnosis and aid management.[2,3] It is highly sensitive in differentiating normal scrotal contents from abnormal.[3,4,5] Furthermore, the accuracy is 99% at separating testicular from paratesticular pathologies.[3,6,7,8,9] It is also a sensitive method for detection of testicular tumours.[5,9,10] In our series no patient who had a normal testicular sonogram (i.e. 617 out of 661: 93.3%) subsequently presented with a testicular neoplasm giving a negative predictive value for intratesticular lesions of 100%.

It is in distinguishing benign from malignant intratesticular disease that the greatest difficulty occurs. Testicular malignancy displays a range of sonographic appearances, but in general neoplasms are hypoechoic with marked disorganisation of texture;[9] pure seminoma and lymphoma are usually well defined, homogeneously hypoechoic areas with smooth or irregular margins[5] (Figure 1), whilst non seminomatous germ cell tumours often have a heterogeneous pattern with cysts and scattered

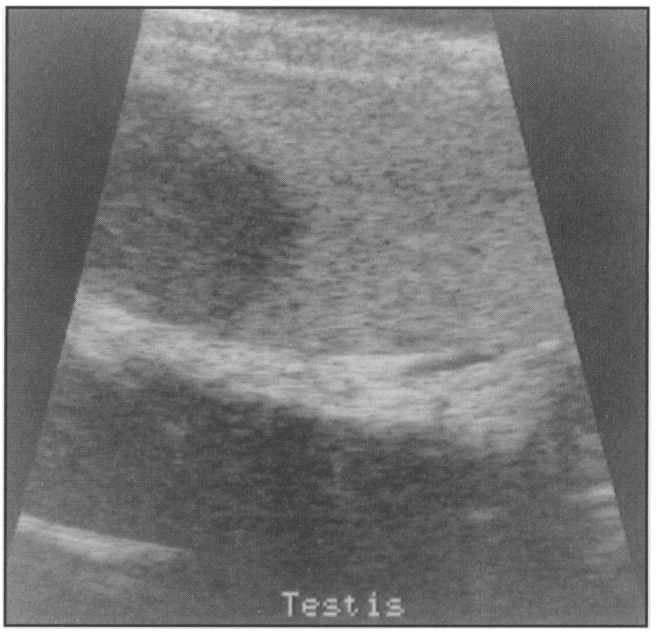

Fig 1. Ultrasound appearance of testicular seminoma.

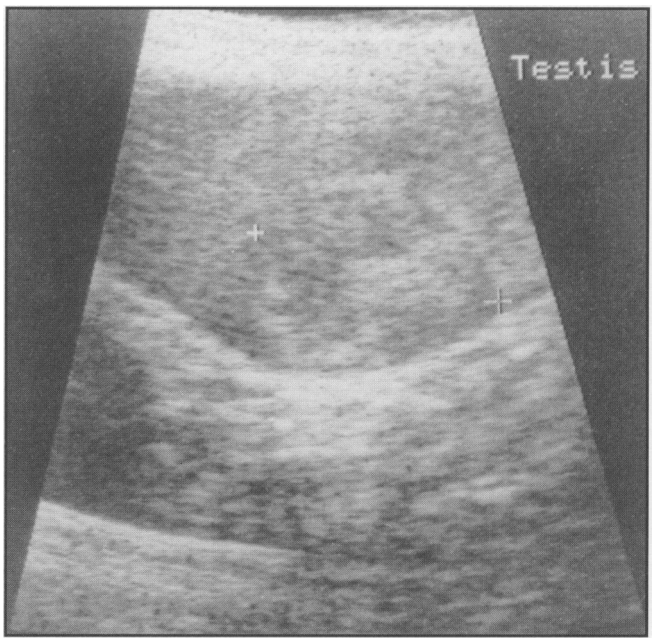

Fig 2. Ultrasound appearance of testicular teratoma.

areas of increased echogenicity,[5,11] (Figure 2). The final histological appearances of the benign lesions which led to orchidectomy in our series (Table III) are similar to those in other studies.[8,12]

Before Ultrasound was widely available, any patient with a scrotal mass which was deemed to be intratesticular by palpation underwent orchidectomy via an inguinal incision. This led to a high rate of orchidectomies for benign lesions,[13] and as scrotal ultrasound becomes more prevalent it is apparent that there are a greater number of benign intratesticular lesions than had been

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realised. Since scrotal ultrasound is not reliably able to differentiate between benign and malignant conditions, there is some scepticism about its role in identifying testicular malignancy.[10] An overall false positive rate for testicular malignancy in the presence of an intratesticular mass is typically 50%.[12, 14, 15] Many studies have endeavoured to find some sonographic features pathognomic of malignancy, but have failed. However some sonographic indicators of benign disease have been identified which make that diagnosis (of benign disease) more likely. When we reviewed sonographic reports of the 44 intratesticular lesions seen on ultrasound, such stratification was manifest by the varying diagnostic certainties indicated by the reports. Thus when the sonographic report was probably malignant (27 Patients/Grade 1) our false positive rate for malignancy was 33.3%; [9/27] when our report was probably benign (14 Patients/Grade 2) our false negative rate for malignancy was 7.1%.[1/14]

Twenty five out of 27 patients in the first group went on to have a tissue diagnosis (22 orchidectomies, 2 fine needle aspirations, and one excision biopsy), whilst in the second group only 6 out of 14 patients underwent orchidectomy, indicating that the management decision had been strongly influenced by the sonographic findings.

What are the possible indicators of benignity on ultrasonography? Lesions which are exclusively echogenic have always proved to be benign.[3, 8, 12, 16] Testicular cysts and haemangiomas can be diagnosed with certainty.[17] Cysts are echo-poor centrally and demonstrate through enhancement. Haemangiomas show echo-poor confluent vascular areas. An epidermoid cyst is suspected given a cystic lesion with a central echogenic focus,[18] or an echogenic rim.[17] An epididymal cyst compressing the testis can produce sonographic appearances suggestive of malignancy.[2, 3] Focal orchitis is often associated with swelling of the epididymis and overlying scrotal skin.[8, 17] Intratesticular haematoma often appears as an echolucent rim around tissue which has a similar echopattern to normal testicular parenchyma.[17] It may be associated with haematoma within the scrotal skin, and should show definite signs of resorption after one week.[19] A peripheral wedge shaped lesion is suggestive of an infarct.[7] These features helped during differentiation of probably benign from probably malignant lesions in our study.

Malignancy is usually manifest by a focal lesion.[3, 7] If the testis is diffusely involved by malignancy it tends to have a globular shape with a lobulated contour, whilst a benign process with diffuse involvement leaves the testis a smooth oval shape.[20]

Doppler ultrasound has not helped the sonographer make a definite diagnosis of malignancy, although a recent study did show a definite trend;[21] 95% of primary testicular tumours larger than 1.6cm in diameter showed increased vascularity, whilst 86% of those smaller than 1.6cm were hypovascular.

It must however be stressed that these are merely indicators, and there is a great deal of overlap in the appearance of benign and malignant processes.

When identified, these features can be relayed in the report to the clinician. However what are the clinician's options? In our series, orchidectomy was almost universally employed. During the last decade intraoperative examination of the testicle with frozen section histology has gained acceptance in a limited number of situations. This allows conservation of the testis if benign disease is confirmed. Follow up by clinical and sonographic examination may be used when the clinical features are strongly in favour of a benign diagnosis.

When an intratesticular mass is detected in a testis that is normal on clinical examination, then the chance of it being malignant is less than 20%.[22, 23] In this situation, excision biopsy of the lesion via an inguinal incision has been advocated.[22, 23] Frozen section at the time of excision allows orchidectomy to be carried out if malignancy is identified. The same management strategy could be employed if sonography indicates that a palpable lesion in a testicle is likely to be benign.[14, 17, 24] This approach may reduce the number of orchidectomies performed for benign disease, whilst ensuring that no malignancy will be missed. Orchidectomy is associated with significant psychological sequelae and therefore should be avoided if at all possible.

Further it is important that the radiologist should be aware of the possibility of a tissue diagnosis being obtainable without orchidectomy. Faced with an intratesticular lesion and believing that orchidectomy is the only means of excluding malignancy, then the tendency may be to emphasise the malignant features. If there is a

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lesser procedure which will provide a tissue diagnosis, then the radiologist should be able to indicate that there is an intratesticular lesion which sonographically has a low probability of being malignant. This may lead to fewer orchidectomies as other options, for example, excision biopsy or FNA or sonographic follow up, are available.

We believe that scrotal sonography has a major role to play in the management of an intratesticular lesion. In association with the clinical features it can help the surgeon decide whether to opt for orchidectomy, excisional biopsy if a malignant lesion is less likely, or follow up when a benign lesion is certain. This approach will reduce the number of orchidectomies carried out for benign disease.

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