**Original article**

# Scrotal and testicular masses evaluation by high resolution Ultrasonography

**[1]Dr Neeraj Prajapati , [2]Dr S K Rastogi , [3]Dr Chaitanya Tapasvi , [4]Dr.Vichi Taneja**

[1,2] Asst Professor, [3] Asso Professor , [4] JR II

Department of Radiology, SRMS IMS, Barielly UP, India

Corresponding author: Dr. Neeraj Prajapati

## Abstract

**Introduction:** Malignant testicular tumors are an important cause of morbidity and mortality among men. They are the fifth most common cause of death from neoplasia in men aged 15-34 years. Early detection is crucial for curative treatment.

**Methods:** This was a prospective study of 108 patients (Age range 1 Year to 80 Years ) who presented with complaints of scrotal pathology and was referred for Sonographic examination extended over a period of two years. 20 patients were found to have sonographic and subsequent clinico-histological evidence of testicular / scrotal masses. Clinical history was obtained along with physical examination.

**Results:** Of these 20 cases 12 were testicular tumors (08 non seminomatous germ cell tumors and 04 seminomas), 02 was scrotal wall malignancy, 04 were granulomatous lesion of the cord and 02 was benign epididymal cyst.

**Conclusion:** Our study shows that Scrotal and testicular masses present a diagnostic dilemma on clinical examination. High resolution sonographic is highly accurate and sensitive primary imaging modality for investigation of scrotal pathology

**Key words:** Testicular masses, Scrotal masses, High resolution ultrasonography, Germ cell tumors.

## Introduction

Scrotal and testicular masses present a diagnostic dilemma when presented to a surgeon. Clinical examination is often inadequate to delineate the exact cause of the mass lesion. Testicular malignancies may be life threatening if not diagnosed at an earlier stage because of their propensity for distant metastasis as it increases the mortality and morbidity associated with the disease process.

Malignant testicular tumors are an important cause of morbidity and mortality among men. They are the fifth most common cause of death from neoplasia in men aged 15-34 years. Early detection is crucial for curative treatment. Usually the tumor is discovered during a physical examination as a palpable testicular mass. Less frequently, the initial finding may be gynecomastia or metastases, and at times there is no palpable testicular abnormality. In some cases in which a germ cell has metastasized and there is no palpable testicular abnormality, the primary testicular tumor has undergone necrosis and regressed to a scar ("regressed germ-cell tumor" or "burned-out" primary testicular germ-cell tumor). Because careful physical examination may fail to detect small masses or subtle changes in the testis, Ultrasonography (US) of the



www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858

scrotum has become important. [1]Until mid 1970, clinical evaluation of scrotal contents was confined to palpation, transillumination, supplemented by investigative modalities like, thermography and venography, when in 1974 **Miskin and Bain** first published report about using diagnostic ultrasound as a modality of investigating scrotal pathologies [2].

In the clinical examination of the scrotal swelling, physical evaluation by itself may be inadequate due to tenderness, swelling or gross distortion of scrotal contents. It is often difficult to decide whether a palpable scrotal mass is arising from the testes itself or from the extra testicular elements. In addition, the normal examination may over look significant pathology and physical signs elicited may be improperly interpreted. Sonography played a vital role in the evaluation of testes obscured from palpation by large hydrocele and accurately separated intra testicular from extra testicular masses, even when the location is equivocal on physical examination [3].

The scrotum is a superficial structure separated by a midline septum, with each half of the scrotum containing testis, the epididymis and the lower part of the spermatic cord. The scrotal wall is composed of the following structures, listed from the superficial to the deep layers: rugated skin, superficial fascia, dartos muscle, external spermatic fascia, cremasteric fascia, and internal spermatic fascia. The tunica albuginea, covered by tunica vaginalis, consists of visceral and parietal layers normally separated by a few milliliters of fluid. The layer lining the scrotal wall is termed the parietal layer, and the layer extending over the testis and epididymis is referred to as the visceral layer. The parietal and visceral layers of the tunica join at the posterolateral aspect of the testis, where the tunica attaches to the scrotal wall. The tunica vaginalis covers the testis and epididymis except for a small posterior area. [4]

The development of high-frequency, real-time scanners have enhanced the diagnostic accuracy of scrotal sonographic examinations. The scrotum and its contents are best evaluated by using high-resolution transducers with frequencies of 5-10 MHz with a linear-array transducer. In addition, Doppler sonography, both duplex and color, can be used to evaluate blood flow in the scrotum in normal and pathologic states. In comparison to clinical examination, high frequency ultrasound is admirably accurate in solving the surgeon's dilemma. Ultrasound, effectively guide in determining the course of management and the approach to be used in surgery. The normal scan is equally important, as it provides great relief from anxiety for both the patient and the treating doctor. [4]

**Materials and methods**

This was a prospective study of 108 patients (Age range 1 Year to 80 Years ) who presented with complaints of scrotal pathology and was referred for Sonographic examination extended over a period of two years. 20 patients were found to have sonographic and subsequent clinico-histological evidence of testicular / scrotal masses.

Clinical history was obtained along with physical examination. The verbal informed consent was also taken before the examination. Patients were examined on – Logiq 500 GE Sonography



www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858

Machine. Gray scale sonography and color Doppler examination of testes and scrotum was carried out with linear array high frequency (6-7-9 MHz) probe

To detect abdominal lymphadenopathy or metastasis abdominal sonography was also performed.

**Results**

The patients presented with varied complaints of scrotal swelling, dragging sensation and occasional pain. Clinical examination revealed enlarged testis in some cases with negative trans-illumination test. In some cases it was difficult to determine the exact nature of the testicular swelling. To determine the cause of testicular swelling the patient were subjected for high frequency ultrasound.

Of these 20 cases 12 were testicular tumors (08 non seminomatous germ cell tumors and 04 seminomas), 02 was scrotal wall malignancy, 04 were granulomatous lesion of the cord and 02 was benign epididymal cyst.

**TABLE – 1** : **Masses of scrotum and its content**

| S.NO | Disease | No of cases |
|---|---|---|
| 1. | Non seminomatous germ cell tumors | 08 (40%) |
| 2. | Seminomas | 04 (20%) |
| 3. | Granulomatous lesion of the cord | 04 (20%) |
| 4. | Scrotal wall malignancy | 02 (10%) |
| 5. | Epididymal cyst | 02 (10%) |

In this study both seminomas and Non seminomatous germ cell tumors presented with increased size of testis. The Non seminomatous germ cell tumors were heterogeneously hyperechoic demonstrating cystic areas and echogenic foci within (Fig1 and 2). The margins of the lesion with the adjacent testis were ill defined at places. On color Doppler there was increase in the vascularity of the tumor (Fig 3).

The seminomas were predominantly homog-enously hypoechoic masses with no cystic component within them (Fig 4 and 5), however there margins with the adjacent testis were ill defined. On color Doppler there was increase in the vascularity of the tumor (Fig 6).



www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858

**TABLE – 2 : High frequency ultrasonographic appearance of testicular malignancies**

| | **Non seminomatous germ cell tumors** | **Seminomas** |
|---|---|---|
| Normal size | - | - |
| Increased size | 08 (100%) | 04 (100%) |
| Highly hypoechoic | - | 02 (50%) |
| Slightly hypoechoic | - | 02 (50%) |
| Isoechoic | - | - |
| Hyper echoic | 08 (100%) | - |
| Cystic component | 02 (25%) | - |
| Echogenic foci | 02 (25%) | 02 (50%) |
| Homogenous | - | 02 (50%) |
| Inhomogeneous | 08 (100%) | 02 (50%) |
| Well defined margin | 04 (50%) | - |
| Irregular poor margin | 04 (50%) | 04(100%) |

There were two cases of scrotal wall malignancy. The patient presented in an advanced stage and it was difficult on ultrasound to state that whether it is arising from scrotal wall or the testis. On ultrasound the diagnosis of testicular tumor was kept. Both cases showed inhomogeneous hyper echoic echo texture with increased vascularity (Fig 7). However on surgical resection also the tumor was not differentiated from the testis. There were four patients who presented with granulomatous lesions on the inguinal region. These were small sized uniformly hypoechoic lesions with minimal vascularity within (Fig 8 and 9). The diagnosis of cord granuloma was kept on USG which was confirmed on histopathology.There were two cases of benign epididymal cyst.The histopathology was correlated in 18 patients except that of benign epididymal cysts. The testicular tumors (NSGCT and seminomas) and Granulomatous lesions of the cord were consistent with the histopathological findings. In cases of two masses with undetermined organ of origin the diagnosis of myxofibrosarcoma of scrotal wall was given on histopathology. The tumor markers (alpha feto protein, beta hCG) were positive in 04 cases of testicular tumors.

**Discussion**:

The superficial location of the scrotal contents makes them ideally suited for sonographic examination. The development of high frequency, real time scanners has enhanced the diagnostic accuracy of scrotal sonographic examinations. Scrotal ultrasound has reached a level of maturity that allows the technique to be the first and only imaging examination necessary to evaluate the scrotal contents.

**Maurice Chevassu**, an internationally known French urologist published his famed thesis of 239 pages in 1906 in which **seminoma** was clearly described for the first time in a study of 90 cases. [5] It was **Brown-Sequard** who on



www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858

June 1, 1889, before the Société de Biologic in Paris, reported that he had increased his physical strength, mental abilities and appetite by self-injection with an extract derived from the testicles of dogs and guinea pigs.[6]

High resolution US of the scrotum is a useful means of evaluating the testis for the presence of a tumor. Because the testis normally has a homogeneous echo texture composed of medium-level echoes, changes in echogenicity can readily detect subtle intra testicular pathologic conditions. The sonognaphic features most helpful in tumor detection are mass, bright echogenic foci, and diffuse parenchymal texture change. [1]**Grantham et al** in their series of 28 patients, found 07 cases (25%) of seminomas, 09 cases (32.1%) of Non seminomatous germ cell tumor, 07 cases (25%) of regressed germ cell tumors, 03 cases (10.7%) of lymphoid and leukemic involvement of testis and 02 (07.1%) cases of Leydig cell tumors. [1] **Wolf et al**, in their series of 51 patients, found 20 cases (39.2%) of seminomas, 31 cases (60.8%) of Non seminomatous germ cell tumor.[7]The incidence of neoplastic disease is compared with the study of **Wolf et al and Grantham et al** and is depicted as below:-

**Table 3**

| **Neoplastic disease** | **Wolf et al (n=51)** | **Grantham et al (n=28)** | **Present study (n=14)** |
|---|---|---|---|
| Seminomas | 20 (39.2%) | 07 (25%) | 04 (28.5%) |
| Non seminomatous germ cell tumors | 31 (60.8%) | 09 (32.1%) | 08 (57.3%) |
| Scrotal wall malignancy | - | - | 02 (14.2%) |
| Regressed germ cell tumor | - | 07 (25%) | - |
| Lymphoid and leukemic tumors | - | 03 (10.7%) | - |
| Leydig cell tumors | - | 02 (07.1%) | - |

[ In comparison to the study of **Wolf et al and Grantham et al**, in this study there is almost same incidence of seminomatous and non seminomatous germ cell tumors. The characteristic of seminoma is compared with the study done by **Wolf et al** and is depicted in the following Table:-]



www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858

**Table 4 SEMINOMA OF TESTIS:**

| S.NO | Characteristic | Wolf et al (n=20) | Present study (n=04) |
|---|---|---|---|
| 1. | Highly hypoechoic | 17 (85%) | 02 (50%) |
| 2. | Slightly hypoechoic | 03 (15%) | 02 (50%) |
| 3. | Isoechoic | - | - |
| 4. | Hyper echoic | - | - |
| 5. | Cystic component | 02 (10%) | - |
| 6. | Echogenic foci | - | 02 (50%) |
| 7. | Homogenous | 14 (70%) | 02 (50%) |
| 8. | Inhomogeneous | 06 (30%) | 02 (50%) |
| 9. | Well defined margin | 13 (65%) | - |
| 10 | Irregular, poor margin | 07 (35%) | 04 (100%) |

The characteristic of non seminomatous germ cell tumor is compared with the study done by **Wolf et al** and is depicted in the following Table:-

**Table 5 NON SEMINOMATOUS GERM CELL TUMOR OF TESTIS:-**

| S.NO | Characteristic | Wolf et al (n=31) | Present study (n=8) |
|---|---|---|---|
| 1. | Highly hypoechoic | 14 (45%) | - |
| 2. | Slightly hypoechoic | 13 (31%) | - |
| 3. | Isoechoic | 02 (06%) | - |
| 4. | Hyper echoic | 02 (06%) | 08 (100%) |
| 5. | Cystic component | 19 (61%) | 02 (25%) |
| 6. | Echogenic foci | 11 (35%) | 02 (25%) |
| 7. | Homogenous | 09 (29%) | - |
| 8. | Inhomogeneous | 22 (71%) | 08 (100%) |
| 9. | Well defined margin | 17 (55%) | 04 (50%) |
| 10 | Irregular, poor margin | 14 (45%) | 04 (50%) |



www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858

The high frequency ultrasonographic findings in case of seminomatous tumors and non seminomatous germ cell tumors are similar to that of **Wolf et al** study.

A regressed germ cell tumor of the testis is an interesting phenomenon with a histologic pattern in which a scar and no viable tumor cells are found. It has been postulated that the tumor outgrows its blood supply or somehow undergoes auto infarction so that no viable cells remain in the testis. The affected testis tends to be normal or small so that if the tumor has already metastasized, the diagnosis at clinical presentation may erroneously be extragonadal germ-cell tumor (i.e., retroperitoneal on mediastinal where the tumor metastasized). [1]

Until the advent of US of the scrotum, the confirmation of testicular cancer in the extra gonadal disease depended on the aggressiveness of the operative approach. Castration had obvious physiologic and psychologic implications and random bilateral testicular biopsies did not ensure a correct diagnosis. In addition to the fact that correct US localization obviates removal of a normal testis, the testes have been speculated to be a "sanctuary organ," where therapeutic levels of chemotherapeutic agents are not attained so that identification of abnormalities are also important for malignant lesions such as those in leukemia. [8-10]

**Conclusion:**

Scrotal and testicular masses present a diagnostic dilemma on clinical examination. High resolution sonographic is highly accurate and sensitive primary imaging modality for investigation of scrotal pathology. It helps to determine the origin of the mass lesion and its further characterization into different etiologies which is helpful in deciding the management of the patients. Therefore in evaluation of scrotal and testicular masses high resolution ultrasound plays an indispensible role.

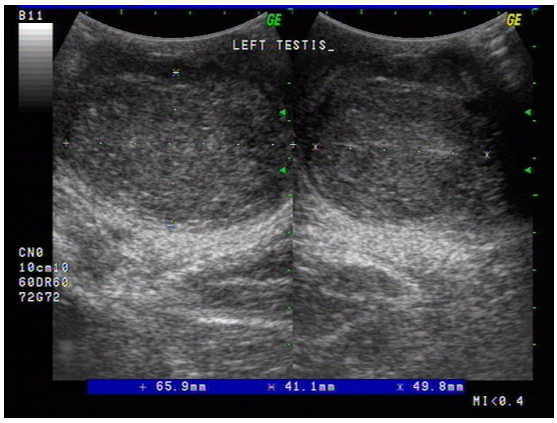


Fig 1 NSGCT enlarged testis with hypo and hyperechoic areas within

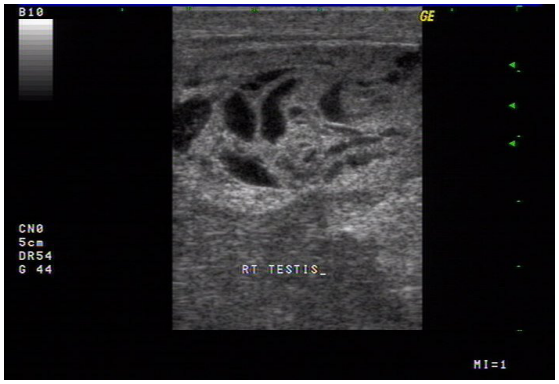


Fig 2 NSGCT Cystic areas within enlarged testis

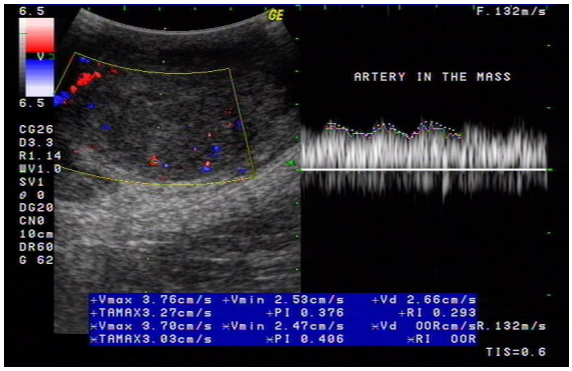


Fig 3 NSGCT Raised vascularity in mass

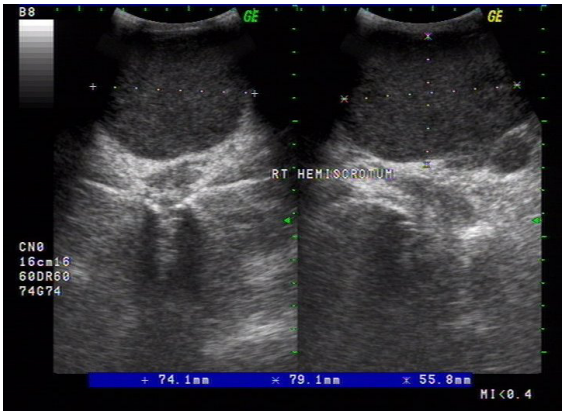


Fig 4 SEMINOMA Enlarged uniformly hypoechoic testis

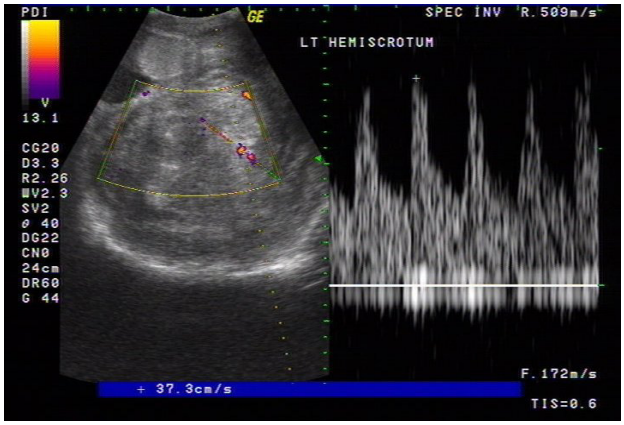


Fig 7 MYXOFIBROSARCOMA Testis and scrotal wall not seen separately

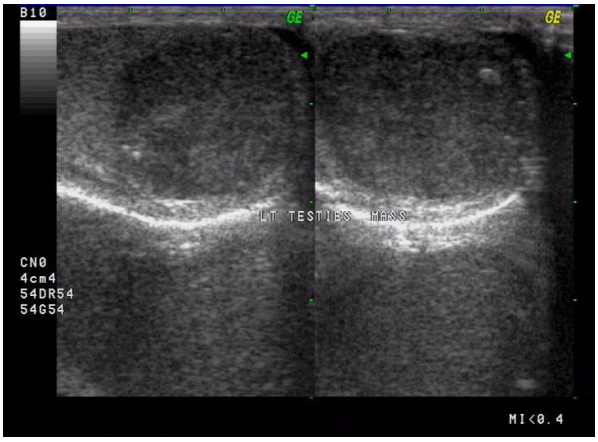


Fig 5 SEMINOMA Well defined hypoechoic lesion within testis

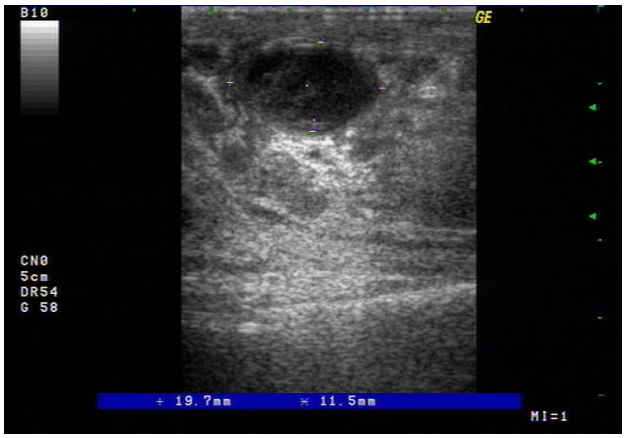


Fig 8 CORD GRANULOMA Hypoechoic lesion in cord

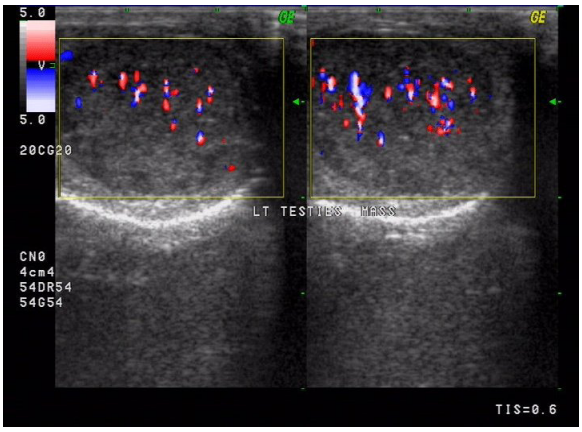


Fig 6 SEMINOMA Raised vascularity in the mass

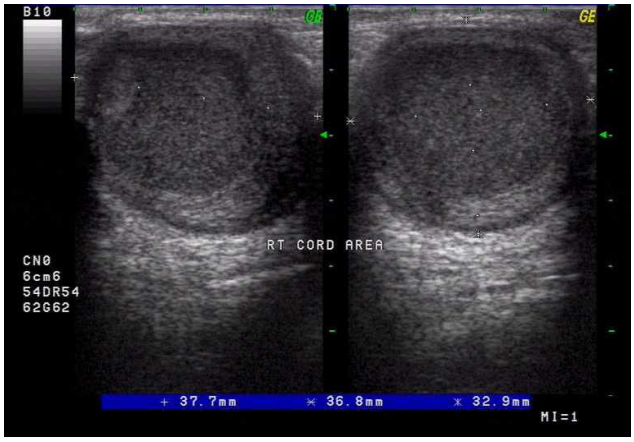


Fig 9 CORD GRANULOMA Iso to hypoechoic lesion in the cord



www.ijbamr.com P ISSN: 2250-284X , E ISSN : 2250-2858

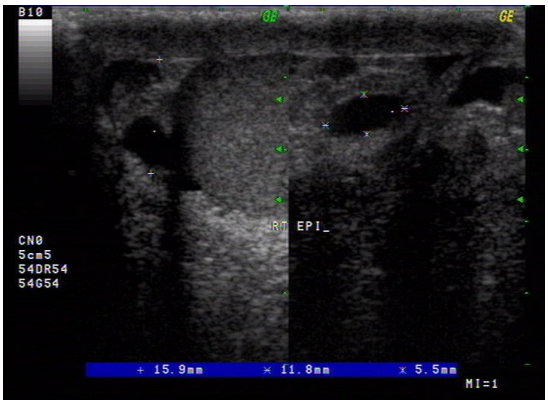


Fig 10 EPIDIDYMAL CYST Well defined hypoechoic lesion in the epididymis

**References**

1. J. Geary Grantham, M.D., J. William Charboneau, M.D., E. Meredith James, M.D., Ronnie J. Kirschling, M.D., Larry K. Kvols, M.D., Joseph W. Segura, M.D. and Lester E. Wold, M.D. Testicular Neoplasms: 29 Tumors Studied by High-Resolution US. Radiology 1985;157:775-780.
2. Miskin M and Bain J. B-mode ultrasonic examination of the testes. Journal of Clinical Ultrasound 1974;2:307-311.
3. Barbara A Carroll and David M Gross, High-Frequency Scrotal Sonography. AJR 1983;140:511-515
4. Prajapati N et al. High frequency and color Doppler evaluation of scrotal and testicular pathologies. IJRHS 2014; 2(1):153-61.
5. Robert H Young. A brief history of the pathology of the gonads. Modern Pathology 2005;18:3–17.
6. Erica R. Freeman, David A. Bloom and Edward J. Mcguire. A brief history of testosterone. The Journal of Urology 2001;165:371-373.
7. Wolf B. Schwerk, MD, Wolf N. Schwerk, MD and Gerhard Rodeck, MD. Testicular Tumors: Prospective Analysis of Real-Time US Patterns and Abdominal Staging. Radiology 1987;164:369-374.
8. Finklestein JZ, Dyment PG, Hammond GD. Leukemic infiltration of the testes during bone marrow remission. Pediatrics 1969; 43:1042-1045.
9. Askin FB, Land VJ, Sullivan MP, et al. Occult testicular leukemia: testicular biopsy at 3 years continous complete remission of childhood leukemia: a Southwest Oncology Group Study. Cancer 1981; 47:470-475.
10. Lupetin AR, King W. III, Rich P. Lederman RB. Ultrasound diagnosis of testicular leukemia. Radiology 1983; 146:171-172.