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Original Article

Is doppler ultrasonography reliable in the evaluation of solid testicular lesions?

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Abstract

Aim: Evaluation of using color Doppler ultrasonography in the diagnosis of testicular solid lesions. The aim of our study was to determine the rate of benign lesions in patients with hypervascularized solid intratesticular lesions.

Material and Methods: The data of 88 patients who underwent inguinal orchiectomy and who were diagnosed to have a scrotal mass in color Doppler ultrasound examination between March 2013 and March 2018 were retrospectively evaluated. All patients' age, complaints during their admission to hospital, size of solid lesions, preoperative tumor markers (AFP, bHCG and LDH) and post operative pathology results were evaluated. Two-tailed tests were used to determine the value of preoperative numerical parameters and Fisher's exact test to compare preoperative non-numerical parameters of both malignant and benign solid lesions, and $p<0.05$ was considered significant.

Results: The mean age of the patients was 38.54±19.09 years. The mean lesion size was 4.21±2.65 cm. The high levels of tumor markers (AFP, bHCG, LDH) were detected in 24 (27.2%) patients before the operation. In 72 patients, the size of the lesion was greater than 1 cm and in 16 patients it was less than 1 cm. As a result of the pathological evaluation of the testicular masses, it was found that 29 (32.9%) were malignant and 59 (67.1%) were benign. High levels of tumor markers, palpability and large solid lesion size were found as parameters predicting malignancy.

Conclusion: In the evaluation of testicular masses with scrotal USG and Doppler USG, the rate of benign mass detection is relatively higher. In small masses, non-palpable masses and in patients with no tumor marker elevation, testicular biopsy or testicular preventive surgery should be considered.

Keywords: Doppler; testis; tumour; ultrasound

INTRODUCTION

Testicular tumors are malignant masses that affect men worldwide, most commonly in the age range from 15 to 35 years (1). The incidence of testicular tumors has increased in recent years parallel to the industrialization. Testicular tumors are among the most curable cancers, with survival rates around 95% (2). Until recently, a considerable number of scrotal tumors had remained undiagnosed because neither self-examination techniques nor the use of radiological imaging tools was available adequately (3). The use of color-Doppler ultrasonography combined with high-resolution ultrasound has recently become the reference imaging method in the evaluation and diagnosis of testicular lesions (4). On the other hand, a significant number of benign masses unnecessarily end in surgery due to failures to differentiate them from malignant tumors (5). In our study, we aimed to evaluate the pathology results of patients who underwent Color Doppler ultrasonography due to a suspicious testicular mass in our clinic, and who were operated due to benign and malignant discrimination, and to reveal the specificity of Color Doppler ultrasonography in these lesions.

MATERIAL and METHODS

We retrospectively evaluated data from 88 patients; who were diagnosed with a scrotal mass with color-Doppler ultrasonography and subsequently underwent inguinal orchiectomy in the period from March 2013 to March 2018 in our clinic. Before the commencement of the study, approval was obtained from the local ethics committee (the non-interventional clinical research ethics committee of Inonu University Health Sciences; with the ethics committee approval number of 2018/16-28). All grey scale imaging and color-Doppler ultrasonography examinations were conducted with a Toshiba Aplio

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500 (Toshiba Medical Systems, Tokyo, Japan) device equipped with a high frequency (4-14 MHz) linear probe. The following parameters were evaluated including the age of study patients, the presenting complaints at the time of admission, size of the solid lesions, preoperative tumor marker levels (AFP, beta-HCG, and LDH), and findings of postoperative pathological examinations. We did not evaluate the following ultrasonography findings of solid lesions; including their hypo- or hyperechogenic nature, calcifications, irregularities of contours, and findings from elastography since these parameters had not been evaluated in all patients.

Statistical Analysis

The data were analyzed with SPSS software program version 16. The study data were summarized as mean±standard deviation. A two-tailed test was used for the evaluation of numerical preoperative parameters. Fisher's exact test was used for the comparison of the non-numerical preoperative parameters between malignant and benign solid lesions. A p-value of <0.05 was accepted to indicate a statistical significance.

RESULTS

The study included a total of 88 patients, who underwent inguinal orchiectomy due to a diagnosis of a testicular mass. The mean age of the patients was 38.54±19.09 years. The presenting complaints at the time of admission were pain in 9 patients, a lump in the groin in 3, a lump in the scrotum in 4, and testicular dislocation in 6 patients. Sixty-six patients presented with more than one complaint at the time of admission (Table 1).

Table 1. Recourse complaints of benign and malignant groups

	Benign Group (n=59)	Malign Group (n=29)
Pain	8	1
Swelling in the groin	1	2
Scrotal swelling	2	2
Undescended Testicle	2	4
Who have more than one complaint	46	20

The mean radiologically measured lesion size was 4.21 ± 2.65 cm. The lesion diameter was less than 1 cm in 72 patients but more than 1 cm in 16 patients. The testicular mass was non-palpable in 32 patients, while it was palpable in 56 patients. Pathological examination revealed that 29 of the 32 non-palpable masses (90.6%) and 30 of the 56 palpable masses (53.5%) were benign. In the preoperative period, 24 patients (27.2%) had elevated tumor marker levels (AFP, beta-HCG, and LDH). Of these patients with elevated levels of tumor markers, benign and malignant lesions were diagnosed in 2 and 22 patients, respectively (p<0.001). Fourteen patients were diagnosed with testicular atrophy. The demographic data of the patients with benign and malignant lesions and the properties of their lesions are presented in Table 2.

Table 2. Demographics associated with patients and lesions in the benign and malign groups

	All patient (n=88)	Benign group (n=59)	Malign group (n=29)	p value
Age (year) ± SD	38.54±19.09	34.51±8.87	40.52±22.28	0.166572
Lesion size (cm) ± SD	4.21 ± 2.65	2.26 ± 0.84	4.32 ± 2.71	0.0003
Tumor marker height	24	2	22	<0.001

As shown in the table, the malignant lesions were larger than the benign ones (4.32 ± 2.71 vs. 2.26 ± 0.84 cm). The mean age was not statistically significantly different between the groups. We considered that the elevations of tumor marker levels, the palpability of the tumor, and large solid tumor size were significant parameters in predicting malignancy. The pathological examination revealed 29 (32.9%) malignant lesions and 59 (67.1%) benign lesions. The pathologically confirmed diagnoses of the malignant lesions were as follows: seminoma (n = 20); immature teratoma, embryonal carcinoma, yolk sac tumor (n = 6); granulosa cell tumor (n = 1); and embryonal carcinoma (n = 2). The pathologically confirmed diagnosis in the benign lesion group were testicular atrophy (n = 14); Leydig cell hyperplasia (n = 14); necrotizing orchitis, abscess (n = 24); Sertoli cell-only syndrome (n = 2); tubular sclerosis (n = 3); and granulomatous orchitis (n = 2) (Table 3). All lesions smaller than 1 cm were diagnosed benign in the pathological examination.

Table 3. Pathological results of benign and malign groups

Benign Group (n=59)	Malign Group (n=29)
Atrophic Testis (n=14)	Seminoma (n=20)
Leydig Cell Hyperplasia (n=14)	Immature teratoma + embrional carcinoma + yolk sac tumor (n=6)
Necrotizing orchitis, abscess (n=24)	Granulosa cell tumor (n=1)
Sertoli cell only cell (n=2)	Embryonal carcinoma (n=2)
Tubular sclerosis (n=3)	
Granulomatous orchitis (n=2)	

DISCUSSION

The incidence of testicular tumors is 1% among all tumors diagnosed in men. These tumors most commonly affect men in the age range from 15 to 35 years (1,6,7). All solid testicular lesions should be considered malignant unless proven otherwise. Furthermore, they should be investigated with color-Doppler ultrasonography and the levels of testicular tumor markers should be tested (8). In our study, the mean age of the patients was 38.54±19.09 years. It was observed that all patients had undergone scrotal ultrasonography before surgery. It is considered that testicular masses are malignant in 90% of the cases (1). However, we found that only 32.9% of the masses were malignant in our study. We think that this discrepancy between our study findings and the information in the literature might have occurred due to our small sample size and exclusion of some malignancy-associated ultrasonographic findings from the analysis.

The most common presenting complaint at admission is the unilateral painless scrotal swelling in patients with testicular tumors. In the early stages, a feeling of heaviness is predominant in the testicle rather than actual pain. Any palpable hardness in the testicle is considered malignant until proven otherwise. Real pain starts when the tumor invades the tunica albuginea and/or the epididymis in later stages. Other findings include gynecomastia and pain in the groin and the abdomen (9,10). In our study, we observed that the majority of patients with either benign or malignant testicular masses had presented with multiple complaints.

Ultrasonographic examinations are used for differentiating testicular and paratesticular lesions from each other. An examination of the vascular system with Doppler ultrasonography aims to prevent unnecessary surgery in benign lesions of the testis by providing guiding findings. Several studies found no differences in the vascular characteristics of small mass lesions across benign and malignant tumors (11-15). Similarly; in our study, we did not find any significant differences in vascular characteristics between benign and malignant masses, whether they were small or large.

Magnetic Resonance Imaging (MRI) is an ancillary imaging method to be used if findings revealed in the ultrasonographic examination are inadequate to diagnose whether the lesion is benign or malignant (16). MRI is especially useful in the diagnosis of small masses. However; MRI, too, sometimes fails to provide findings adequate enough to differentiate malignant lesions from benign ones (17,18).

In our study; MRI was not detected in some patients. Moreover; in the study patients who had undergone an MRI examination, the MRI findings failed to determine whether the testicular mass was benign or malignant.

The only method to definitely determine whether the testicular mass is benign or malignant is a histopathological examination. The biopsy sample for the histopathological examination can be obtained in two ways (19); by either percutaneous biopsy or open surgery. Percutaneous biopsy is usually not preferred as it may cause tumor implantation in malignant masses. On the other hand; open surgery may result in unnecessary organ losses when radical orchiectomy is performed for the treatment of benign tumors (20). In our patient series, we found that 59 out of 88 patients received a histopathological diagnosis of a benign tumor.

Percutaneous biopsy from the testicular mass or testis-sparing surgery in selected cases should be considered as alternative interventions to prevent unnecessary organ losses (21). The European Association of Urology guidelines state that testis-sparing surgery can be performed for the treatment of small testicular tumors, bilateral synchronous tumours, contralateral metachronous tumors, and solitary testicular tumors; as well as being performed in patients with normal preoperative testosterone levels and in patients having tumor volumes 30% less than that of the testis (22). A review of the literature reveals that testis-sparing surgery in patients with no metastatic findings did not result in recurrence or metastasis in a long-term follow-up period (23). In our study, we found that a considerable number of radical orchiectomy patients had benign masses. Therefore, we think that testis-sparing surgery can be a preferable option especially for patients with small lesions and with no elevated tumour marker levels.

CONCLUSION

The likelihood of making a diagnosis of a benign lesion is high with scrotal ultrasound and Doppler ultrasonography examinations of testicular masses. Radical surgical methods that are used for the treatment of these masses cause unnecessary organ loss. Therefore, performing a testicular biopsy or testis-sparing surgery should be considered in patients with small and non-palpable masses and with no elevated tumor marker levels.

Competing interests: The authors declare that they have no competing interest.

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