

Brucella and non-Brucella epididymo-orchitis: comparison of ultrasound findings

Ali Haydar Baykan¹, Hakan Sezgin Sayiner², Ibrahim Inan³

¹Adiyaman University, Faculty of Medicine, Department of Radiology, ²Adiyaman University, Faculty of Medicine, Department of Infectious Diseases and Clinical Microbiology, ³Biruni University Hospital, Department of Radiology, Istanbul, Turkey

Abstract

Aim: In brucellosis the male genitourinary system can be affected in a small number of patients. In this study we aimed to identify, discuss and compare the radiologic findings of 24 cases with *Brucella* epididymo-orchitis (BEO) and 285 cases with non-*Brucella* epididymis orchitis (NBEO). **Material and methods:** The study had a retrospective design. The area of involvement, side of involvement (left, right or bilateral), presence of abscess, hydrocele and testicular involvement pattern were analyzed and compared between the BEO and NBEO cases. **Results:** The median age of the included cases was 33 years, with a minimum of 0 and maximum of 89. Epididymo-orchitis and isolated orchitis were more frequent in BEO cases while isolated epididymis involvement was more common in patients with non-BEO ($p=0.0117$). Bilateral involvement was present in 20.8% and 4.6% cases in the BEO and non-BEO groups, respectively ($p=0.008$). The frequency of abscess was significantly higher in BEO cases ($p=0.003$). **Conclusion:** Although the radiological indications of BEO are similar to those of other types of epididymo-orchitis, abscess formation, bilateral involvement and testicular involvement contribute significantly to diagnosis.

Keywords: *Brucella*; epididymo-orchitis; ultrasonography; testis

Introduction

Brucellosis is a zoonotic disease, transmitted by unpasteurized milk and contaminated dairy products. *Brucella melitensis* is the most common cause of the disease [1,2]. In brucellosis, the male genitourinary system is affected in a small number of patients; it is known that *Brucella* epididymo-orchitis (BEO) constitutes 2% to 20% of all brucellosis cases [3-5]. The most common symptoms of BEO are scrotal pain, scrotal swelling and fever [2,6].

Ultrasonography (US) is the most frequent imaging technique used for the confirmation of epididymo-orchitis and the exclusion of testicular torsion. In BEO the US findings are varied: abscess formation, increased vascularity or diffuse/focal hypoechoogenicity [2,7].

There are only a few published studies related to the imaging findings of BEO and the majority are case reports [8-12]. The number of radiological studies which compare BEO and non-BEO (NBEO) cases is very limited; in fact, to the best of our knowledge, only one such study is available in the literature [13].

Therefore, in the present study we aim to identify, discuss and compare the US findings of patients with BEO and NBEO diagnosed in our clinic.

Material and methods

This study has a retrospective design and the approval of the local Ethics Committee was obtained. Patients who

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Corresponding author: Ibrahim Inan

Department of Radiology, Biruni University
Hospital, 34295 Istanbul, Turkey

Phone: +90(506) 744 44 30

Fax: +90(212) 416 46 46

E-mail: ibrahimi@biruni.edu.tr

had received a diagnosis of brucellosis between January 2014 and January 2018 were retrospectively analyzed and a totally 263 cases were identified. We excluded female patients (n=134), those with non-testicular and epididymal involvement (n=98) and cases for which the US reports and archived images were not available (n=7). As a result, 24 male BEO patients were included in the study. Clinically, patients with scrotal pain, scrotal swelling or redness and *Brucella* serum agglutination titer $\geq 1/160$ were interpreted as BEO. The comparison was made with 285 male patients diagnosed with NBEO in the same period. Six patients with BEO and four patients with NBEO were evaluated also by magnetic resonance imaging (MRI). The treatment protocol and follow-up of the BEO patients were undertaken by an infectious disease specialist.

There was no preliminary preparation before the US evaluation. All cases were evaluated in supine position with both legs wide open using Toshiba Aplio 500 (Toshiba, Tokyo, Japan) linear probe with a frequency of 7.5–10 MHz. Philips Achieva 1.5 Tesla (Achieva; Philips Medical Systems, Best, Netherlands) device was used for MRI. Serial transvers and sagittal sonograms were obtained for each hemiscrotum. The presence of hydrocele in scrotum, swelling, heterogeneity, hypoechoic areas, abscess in testes and/or epididymis were noted. The presence of hypoechoic and/or heterogenic areas in the entire testis was considered as diffuse involvement. Testis with one small and limited hypoechoic lesion was considered to have focal involvement. More than one focal lesion

was interpreted as multifocal involvement. The tumor like lesions are considered as pseudomass. The evaluation was undertaken by two radiologists, with seven and twelve years of experience.

Statistical analysis

SPSS Statistics v. 21.0 (IBM Corporation, New York, USA) software was used for statistical analysis. The categorical data were expressed as number and percentages, and the numerical data without normal distribution were expressed as minimum, maximum, and median values. Pearson's chi-square and Fisher's exact tests were used for the comparison of categorical data, and the Mann-Whitney U test was used for the comparison of nonparametric data between the groups. The results were considered statistically significant if the "p" value was below 0.05.

Results

The age of patients included in the study ranged from 0 to 89 years and the median age was calculated to be 33 years. Twenty-four cases (7.8%) were diagnosed with BEO and 285 (92.2%) with NBEO. The mean age of the patients was 35.21 ± 17.55 and 35.12 ± 21.61 years for the BEO and NBEO groups, respectively, with no statistically significant difference between the groups ($p=0.806$).

The radiological findings such as involvement of epididymis and/or testes, involvement side (unilateral or bilateral) and involvement type of testicular parenchyma were summarized on Table I. The radiological findings of some cases are shown in figures 1 to 4.

Table I. The US findings in *Brucella non-Brucella* epididymis orchitis groups

| | BEO n (%) | NBEO n (%) | p value |
|--|-----------|------------|---------|
| Number of patients | 24 | 285 | |
| Age (range) | | | |
| Involved structures | | | 0.0117 |
| Epididymo-orchitis | 16 (66.7) | 153 (53.7) | |
| Isolated testicular involvement | 6 (25) | 32 (11.2) | |
| Isolated epididymal involvement | 2 (8.3) | 100 (35.1) | |
| Involvement side | | | 0.008 |
| Unilateral | 19 (79.2) | 272 (95.4) | |
| Bilateral | 5 (20.8) | 13 (4.6) | |
| Presence of abscess | 4 (16.7) | 5 (1.8) | 0.003 |
| Increase of intrascrotal fluid | 10 (41.7) | 147 (51.6) | 0.351 |
| Presence of septa | 2 (20) | 32 (21.8) | 0.628 |
| Involvement type of testicular parenchyma | | | 0.008 |
| Diffuse | 15 (71.4) | 163 (88.1) | |
| Multifocal | 3 (14.3) | 11 (5.9) | |
| Focal | 2 (9.5) | 11 (5.9) | |
| Pseudomass | 1 (4.8) | 0 (0) | |
| Total | 24 (7.8) | 285 (92.2) | - |

N, number of patients; BEO, *Brucella* epididymo-orchitis; NBEO, non-*Brucella* epididymis orchitis

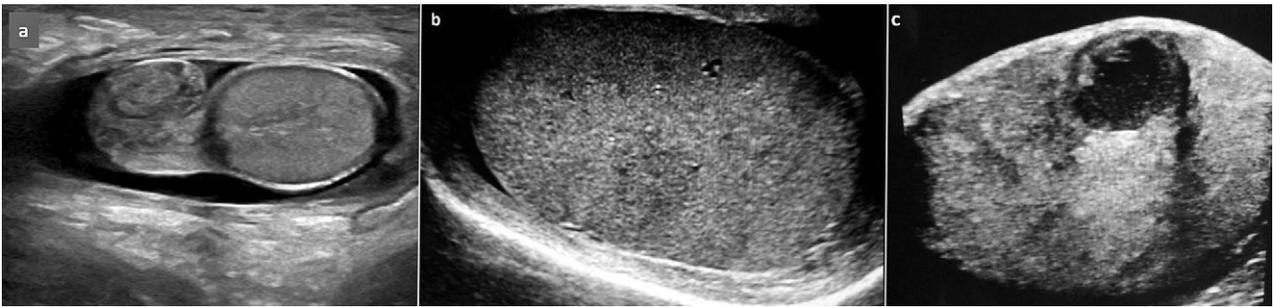


Fig 1. Ultrasonographic images of BEO cases: a) isolated epididymitis with enlarged, heterogeneous epididymis in a three-year-old patient; b) US image of a 24-year-old male demonstrates geographically, heterogeneous, hypoechoic areas related with orchitis; c) a thick-walled testicular abscess accompanied by a hypoechoic heterogeneous appearance of the neighboring testicular parenchyma in a 38-year-old case.

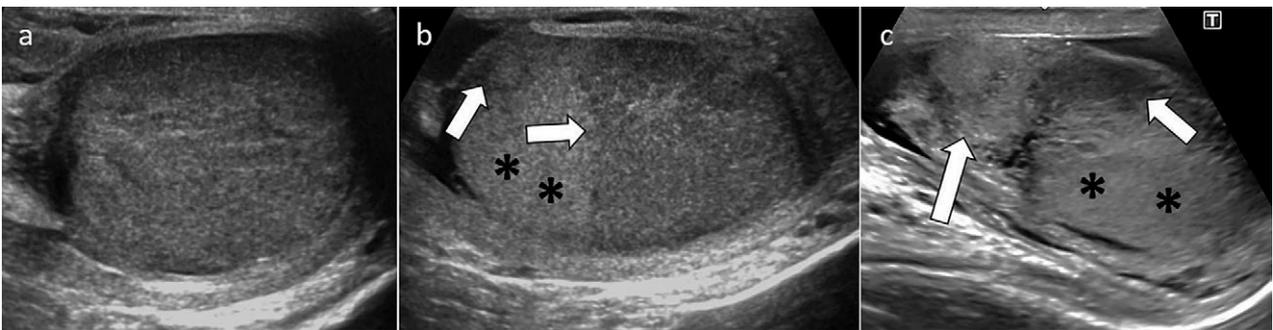


Fig 2. Three cases with BEO: a) diffuse enlarged testicle with heterogeneous parenchyma, diffuse involvement; b) two hypoechoic areas (arrows) and normal testicle parenchyma (asterisks) between two focal lesions, multifocal involvement; c) enlarged heterogeneous epididymis (long arrow) and focal hypoechoic area in testicle (short arrow). Normal testicular parenchyma (asterisks).

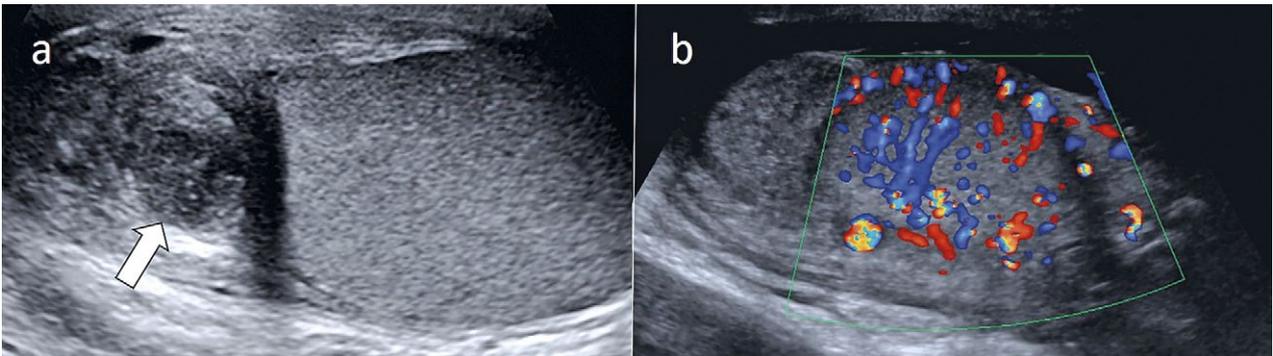


Fig 3. Enlarged heterogeneous epididymis (a). Vascularity of the testis (b).

Medical treatment was applied to all patients. In two cases with BEO, US-guided abscess drainage was also performed. Orchiectomy was performed in one case from each group due to unresponsiveness to the medical treatment.

Discussions

Early and accurate diagnosis of BEO is very important, otherwise BEO can cause morbidity and complications [6]. In a meta-analysis of 57 articles, it was observed

that 10% of men with brucellosis had BEO [14] with variations between 2% and 20% [1,3,5,15,16]. In our study 18.9% of men patients with brucellosis had BEO.

NBEO is more common than BEO, even in endemic areas for brucellosis. *Chlamydia trachomatis* and *Neisseria gonorrhoea* are the most common causes of epididymo-orchitis among sexually active males between 14 and 35 years [17]. For men, over 35 years of age, and prepubertal boys, the most common causes are *Escherichia coli* and *Proteus mirabilis* [18]. The serum agglutination test

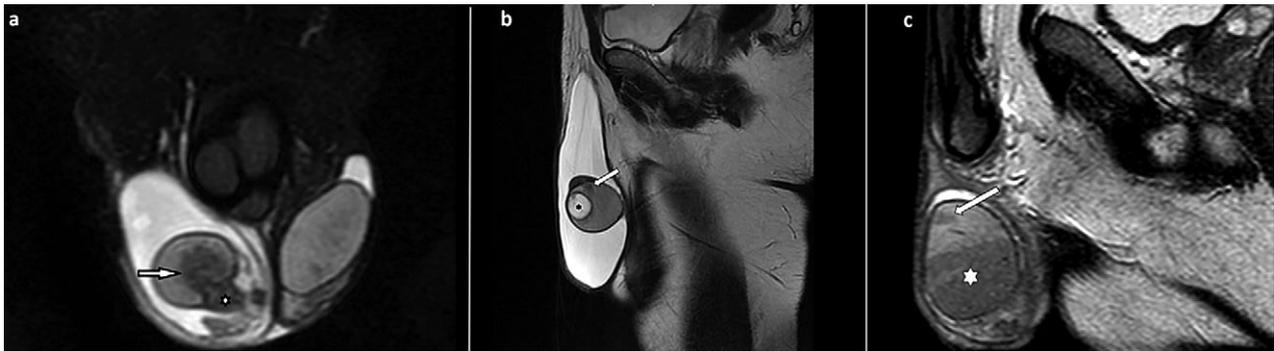


Fig 4. The coronal T2-weighted fat-suppressed image of a 13-year-old patient with BEO (a). The head of the epididymis (star) is swollen and hypointense. In the testicular parenchyma adjacent to the epididymis is a focal hypointense lesion (arrow) accompanied by a hydrocele. The sagittal T2-weighted fat-suppressed image of a 36-year-old patient with BEO (b), showing the presence of an abscess (star) and an adjacent hypointense focal lesion (arrow) accompanied by a hydrocele. The sagittal T2-weighted fat-suppressed image of a 24-year-old BEO patient (c), demonstrating the focal involvement of the right testis (star) and a second focal lesion (arrow).

is the most common adopted diagnostic tool for brucellosis. A titer ratio above 1:160 is considered a diagnostic criterion when accompanied by a coherent clinical presentation [19].

Most of the published studies regarding BEO are descriptive studies [1,6,8,20] or related to the clinical and laboratory findings of BEO and NBEO [3,4,15,21-25]. Although US is considered as the first-applied imaging technique for the diagnosis of scrotal disease, to the best of our knowledge, there is only one study that compares US findings of BEO and NBEO [13].

Testicular inflammation develops in 20% to 40% of cases with the direct spread of epididymitis [18,26]. We detected involvement of both epididymis and testes in more than half of the cases in each BEO and NBEO groups (66.7% and 53.7%, respectively). However, isolated epididymis involvement was detected significantly more frequently in the NBEO group (35.1%) compared with the BEO group (8.3%). The faster spread from epididymis to testis parenchyma in BEO cases may be an explanation for this phenomenon. Another explanation may be the later appearance of brucellosis findings in BEO cases. In fact, Günlüsoy et al emphasized that the insidious onset and longer duration are two main characteristics of BEO which differs from NBEO [27]. Bilateral involvement has been reported in less than 10% of BEO cases in the current literature [1,8,13,15,21-23]. We found a higher rate of bilateral involvement in the BEO group (n=5; 20.8%), significantly higher than in the NBEO group (n=13; 4.6%).

Papatsoris et al reported that abscesses developed in 8 of the 141 NBEO patients but was not present in any of the 17 BEO patients [20]. Buzgan et al reported that 3 of 35 cases with BEO, developed an abscess, all requiring orchiectomy [23]. Unlike previous studies, we

detected abscesses in 4 cases with BEO (16.7%) and 5 cases (1.8%) with NBEO and the frequency of abscess formation was found to be statistically significant higher in the BEO ($p = 0.003$).

Unlike previous studies [6,8,13], we evaluated cases with multiple lesions as multifocal lesions, where the rest of testicular parenchyma had a normal echotexture. Multifocal testicular involvement was observed in 14.3% of patients (n=3/24) in the BEO group and in 5.9% patients (n=11/285) in the NBEO group ($p < 0.05$). The identified multifocal areas can represent multiple abscess sites or areas of inflammation.

This study has certain limitations. The first concerns the retrospective design, which may have created bias due to the prior knowledge of diagnosis. Additionally, using US reports instead of US images may cause the use of unreliable data while evaluating US findings. Another limitation is the lack of an evaluation of the Doppler findings of the cases. Other limitations include the shortage of BEO cases, the presence of different and unidentified causative pathogens in NBEO cases and the absence of imaging findings of some cases during and after treatment. The time between disease onset and US examination was not considered, which could affect the US findings.

Conclusion

A careful US examination can prevent possible unnecessary orchiectomy, especially in regions with *Brucella* endemicity. The possibility of BEO should be considered, especially when one or more findings, such as isolated testicular involvement, bilateral testicular involvement, abscess formation and multifocal testicular lesions, were detected during US examination.

Conflict of interest: none

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