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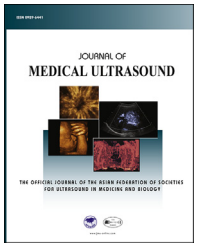

ORIGINAL ARTICLE

Evaluation of Pediatric Undescended Testes with Elastosonography

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KEYWORDS
elastosonography,
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Abstract *Background:* Undescended testes, which are defined as the failure of testes to descend to scrotum, are the most common developmental defect in male infants. Indirect evaluation of histologic damage can be performed with the help of palpation during operation. Hard texture of testes tissue is likely related with histological damage. Real-time elastography is an emerging technology of ultrasonic imaging of soft tissue strain and elasticity, it aims at providing information regarding the mechanical properties of tissues, such as their hardness or stiffness. This study aim was to investigate the changes in strain and elasticity of testes tissue by using elastography technique.
Materials and methods: A total of 32 patients, who had undescended testes were included in this study. Only two patients had bilateral undescended testes, other patients had unilateral. The age of the patients were recorded according to the time of ultrasonographic (USG) examination. The undescended testes was displayed in the elastographic box with the neighbouring subcutaneous fat tissues. The strain ratios were measured as the ratios of the elasticities of the subcutaneous fat tissue to the elasticities of the undescended testes.
Results: A total of 32 patients with 34 testes were included in the study. The mean age of the patients with undescended testes was 32.6 months (range 7–60 months). The mean strain ratios were 0.67 (range 0.12–1.41) for the undescended testes and there were no significant differences in undescended testes strain ratios related to patient age ($p = 0.453$).
Conclusion: This preliminary study showed that there were no significant fibrosis which can be demonstrated with elastosonography before the age of 5 years old. Additional studies with histopathological results are needed to identify sensitivity and specificity of elastosonography in undescended testis and in planning optimal operation time for these patients.

Conflicts of interest: The author has no conflict of interest to declare.

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Introduction

Undescended testes (UDT), which are defined as the failure of testes to descend to scrotum, are the most common developmental defect in male infants. It is recorded in 30% of preterm infants compared with 3% of term infants [1]. The failure of the testicular descent can occur anywhere along the pathway. Previous studies have shown that ultrasound (USG) is the best imaging method to localize nonpalpable testes and it has advantages of being noninvasive and without radiation exposure [2—4]. Most UDT will descend spontaneously with age, but surgery is the most accepted treatment for those testes that remain undescended after 9 months of age [5,6]. Histological changes in UDT may not be reversed by orchiopexy and result in infertility or cancer [7,8], Therefore, UDT requires early recognition due to the associated reduction in fertility and increased risk of malignancy [9]. Testicular biopsy is the gold-standard to show histological changes [10] but surgeons generally avoided biopsy in children, because of its safety risks [11,12]. Indirect estimation of histological changes can be made preoperatively by measuring testis volume using USG and intraoperative evaluation of testis hardness can be measured by palpation. Real-time elastosonography (EUS) is an emerging technology of USG imaging of soft tissue strain and elasticity which aims at providing information regarding the mechanical properties of tissues, such as their hardness or stiffness.

The aim of this study was to investigate the strain and elasticity changes of inguinal canal located UDT according to patient age by using EUS.

Materials and methods

All children with UDT who had USG between January 2015 and December 2015 in our radiology department were included in this study. The diagnosis of UDT and normal testis was determined with physical examination by experienced pediatrists on the week of USG. We excluded children with testicular mass, inguinal hernia, epididymo-orchitis, previous hormone treatment history, or other inflammatory lesion that could affect the testis elasticity.

The EUS examinations were performed by a radiologist with 15 years experience. The examinations were performed using a sonographic scanner (Aplio 500, Toshiba Medical Systems Corporation, Tokyo, Japan) with a 15-MHz linear probe on which real-time tissue elastography software had been installed. The B-mode USG and EUS were performed with patients lying in the supine position. Age at the time of USG was recorded. After detecting UDT, volumes of both testes were calculated by using the maximum length, width, and height measures obtained from the USG. The EUS was performed by applying slight compression to the testis with the ultrasound probe. The pressures and speeds of the manual compressions were adjusted to view the subcutaneous fat tissue as a mix of red and green. Both the B-mode and elastographic images were displayed on the screen during the EUS. The UDT was displayed in the elastographic box with the neighbouring subcutaneous fat tissues in all patients. At least five bars of the indicator should be active to indicate optimal compression. The strain ratios were calculated by measuring the ratios of elasticities of subcutaneous fat tissue to elasticities of UDT tissue. The diameter of the region of interest (ROI) was taken as the centre of the UDT (Figure 1). The strain ratio was automatically calculated by the USG device. Informed consent was taken from the participant's family.

Statistical analysis

All statistical analyses were performed using SPSS software, version 18.0 (SPSS Inc. Chicago, IL, USA). Descriptive data were given as means and standard deviations. Correlation between age (month) and strain ratio value was assessed with the Pearson coefficient for normally distributed data. A p value < 0.05 was considered statistically significant.

Results

A total of 32 patients with 34 testes (30 palpable, 4 nonpalpable) were included in the study. Two patients had bilateral and the others unilateral UDT. None of these testes were retractile. The mean age of the patients with UDT was 32.65 months (range 7—60 months). In unilateral cases the right side [$n = 16$ (53%)] was the most affected side compared with the left side [$n = 14$ (47%)]. Upon USG, testis volume ($p = 0.199$) was not statistically different between UDT and normal testis. The mean volume for UDT was 0.39 mm^3, the mean volume of the normal testes was 0.40 mm^3. The mean strain ratios were 0.67 (range 0.12—1.41) for the UDT and there were no significant differences between undescended testes strain ratios belonging to patient age (month) ($p = 0.453$).

Discussion

In this study, there was no significant differences in testicular volume between undescended and normal testis. Also there were no statistically difference detected in undescended testes strain ratios belonging to patient age (month).

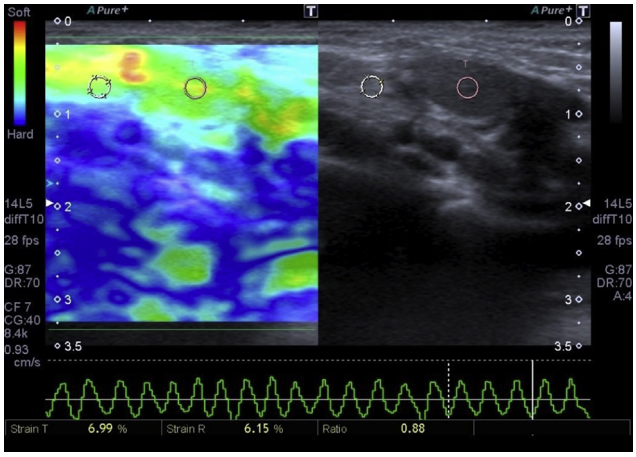

Figure 1 Strain elastosonographic image of 8-month-old boy with undescended testis. The strain ratio between testis and neighboring adipose tissue is 0.88, when the region of interest was placed.

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