Cover letter

Title: Value of contralateral testicular hypertrophy in predicting the status of the intra-abdominal testis?

Running title: contralateral testicular hypertrophy in intra-abdominal testis

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I have the honor to submit this original research article entitled "**Does the contralateral testicular volume decide the need for diagnostic laparoscopy in cases of unilateral impalpable undescended testis?**" for clinical registration aiming at your helpful review and hopefully your acceptance for registration.

This manuscript has not been published and is not under consideration for publication elsewhere. The investigators have no conflicts of interest to disclose and this manuscript has not received any financial funds. All of the co-authors, as well as the Alexandria University Scientific Committee, approved its publication and informed consent was signed by the parents explaining the study.

Thank you for your consideration! Waiting for your respectable reply.

Abstract

Background: This study aimed at the evaluation of the value of the estimated volume of a normal testis to predict the status of its contralateral impalpable side and hence decide the importance of laparoscopic exploration. **Methods:** Participants with unilateral impalpable maldescended testis – as confirmed by clinical and sonographic examination- were enrolled in this prospective interventional study between November 2018 and August 2022 at Elshatby University Hospital, Faculty of Medicine, Alexandria University. The volume and three-dimensional diameter of the normal contralateral testis were measured by the pre-operative US using the formula: Volume = L x W x H x $\pi/6$, where L is the length, W is the width, H is the height, and was correlated with the intra-operative laparoscopic findings.

Keywords: Impalpable testis; volume; ultrasound

Background

Maldescended testis or cryptorchidism is considered the most common congenital genito-urinary abnormality faced in male neonates with an incidence of 3% in full-term babies and increasing up to 30% in preterm males. However, this incidence declines to about 1% by the age of 3 months as it descends to its normal position in about 80% of cases. [1,2]

Only 20 % of maldescended testis is impalpable being either vanishing due to an intra-uterine accident, agenetic, intra-abdominal, or inguinal with different degrees of dysplasia and atrophy. [3]

The gold standard method for a definitive diagnosis and management of impalpable maldescended testis is laparoscopy and according to its findings; the procedure is planned whether nothing in case of vanishing or agenetic testis, inguinal exploration in case of passing through the DIR or traction, Fowler-Stevens (FS) or one stage laparoscopic assisted orchiopexy in case of the intra-abdominal testis. [3,4]

The size of the contralateral testis has been used to predict the condition of its contralateral impalpable one while being explored by laparoscopy by many researchers. [5] Ultrasound (US) is considered by many surgeons as being an accurate, reproducible, and objective in situ tool for the assessment of testicular dimensions and volume. [6]

This study aimed at the assessment of the ability of the three dimensional size as well as the volume of a normal testis as measured by ultrasonography in predicting the status of its contralateral impalpable counterpart and hence deciding the need for proceeding to laparoscopic exploration of this impalpable maldescended testis.

Methods

This prospective interventional study included children with unilateral impalpable maldescended testis presented to Elshatby University Hospital, Faculty of Medicine, Alexandria University from November 2018 to August 2022. Participants with bilateral impalpable maldescended testis and those with post-operative ascended testis were excluded from the study.

After approval of the ethics committee of Alexandria Faculty of Medicine, informed consent was obtained from all parents and legal guardians of the children included in the study. Careful collection of the demographic data of all of the studied participants was followed by careful clinical examination. US abdomen, pelvis, and the inguino-scrotal region performed by the same sonographer were done for:

1. Assessment of the three-dimension diameters as well as the volume of the normal-sided testis. It is measured by the formula: Volume= L x W x H x $\pi/6$, where L is the length, W is the width, and H is the height.
2. Searching for the impalpable testis at all its suspected sites; intra-abdominal, pelvic, or in inguinoscrotal region

All of the participants were subjected to laparoscopic exploration under general anesthesia with endotracheal intubation and the following data regarding the findings of the affected impalpable side was collected:

A. Testicular size in millimeters

B. Absent testis: Blind ending vas and vessels

C. Present intra-abdominal testis

D. Testis passing through the deep inguinal ring (DIR)

E. Patency of the DIR on the affected side (closed or open)

The procedure which was done according to the laparoscopic findings was also documented

A. Absent testis: Nothing

B. Present intra-abdominal testis: Traction 1, Fowler Stephens or laparoscopic assisted orchiopexy

C. Testis passing through the deep inguinal ring (DIR): Inguinal exploration and orchiopexy or excision in case of atrophied testis

Statistical Analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. **(**Armonk, NY: IBM Corp**).** The **Shapiro-Wilk** was used to verify the normality of the distribution of variables, Comparisons

between groups for non-parametric variables were assessed using the **Mann Whitney test** or **Kruskal Wallis test.** The significance of the obtained results was judged at the 5% level.