



# **The Diagnostic Value of Combined Conventional MRI and Diffusion Weighted MRI in Diagnosis of Non- Palpable Undescended Testes**

*Essay*

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in Radiodiagnosis

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## Abstract

**Introduction:** Undescended testis or cryptorchidism, a condition in which one or both testicles are not appropriately positioned in the scrotum at birth. It is the most common congenital genitourinary anomaly in boys and has an incidence of 1–3% in term and 15–30% in premature male infants. approximately 20% of undescended testes are nonpalpable and either located in the abdomen or the canaliculi, or atrophic or are completely absent. Cryptorchidism is associated with impaired fertility, inguinal hernia, and increased risk of testis cancer.

**Aim of the work:** The aim of the work is to assess the value of adding diffusion-weighted sequences (DWI) to routine magnetic resonance imaging (MRI) in identifying and locating nonpalpable undescended testes.

**Summary and conclusion:** Cryptorchidism is the absence of one or both testes in the scrotum. The term ‘non-palpable testes’ implies that the testes cannot be detected on physical examination; they are intra-abdominal, absent, vanishing or atrophic. Additional MRI assessments, as fat-suppressed T2WI and DWI are useful methods to improve the accuracy and sensitivity of diagnosis of non-palpable testes.

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**Keywords:** Conventional MRI, Diffusion Weighted MRI, Non-Palpable Undescended Testes

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سببناك لا علم لنا  
إلا ما علمتنا إنك أنت  
العليم العظيم

صدقة الله العظيم

سورة البقرة الآية: ٢٢



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## **Contents**

<b>Subjects</b>	<b>Page</b>
List of abbreviations.....	II
List of figures.....	IV
List of tables.....	VII
• <b>Introduction</b> .....	1
• <b>Aim of the work</b> .....	5
• <b>Chapter (1):</b> Embryology and Anatomy of the Male Genital Organs .....	6
• <b>Chapter (2):</b> Pathology of Cryptorchidism.....	25
• <b>Chapter (3):</b> Technique of MRI and DWI.....	44
• <b>Chapter (4):</b> Radiological Appearance of Undescended Testes by MRI and DWI.....	64
• <b>Illustrated Case</b> .....	68
• <b>Summary and Conclusion</b> .....	78
• <b>References</b> .....	80
• <b>Arabic Summary</b>	

## **List of Abbreviations**

<b>ADC map</b>	Apparent diffusion coefficient map
<b>AMH</b>	Anti-müllerian hormone
<b>CT</b>	Computed tomography
<b>DEHP</b>	Di-ethylhexyl phthalate
<b>DWI</b>	Diffusion weighted imaging
<b>EPI</b>	Echo planar imaging
<b>Fat supp. T2WI</b>	T2-weighted imaging with fat suppression sequence in magnetic resonance imaging
<b>FSH</b>	Follicle stimulating hormone
<b>GnRH</b>	Gonadotropin releasing hormone
<b>hCG</b>	Human chorionic gonadotropin
<b>HFS</b>	Head first supine (MRI position)
<b>IV</b>	Intravenous
<b>LH</b>	Luteinizing hormone
<b>MIS</b>	Müllerian inhibiting substance
<b>MRA</b>	Magnetic resonance angiography
<b>MRI</b>	Magnetic resonance imaging
<b>MRV</b>	Magnetic resonance venography
<b>S3</b>	Sacral nerve root 3 ( posterior femoral cutaneous nerve)
<b>SE</b>	Spin echo

### *List of Abbreviations*

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<b>SRY</b>	Sex-determining region of the Y chromosome
<b>TDF</b>	Testes determining factor
<b>TE</b>	Echo time
<b>TR</b>	Repitition time
<b>T1WI</b>	T1 weighted imaging (MRI sequence)
<b>T2WI</b>	T2 weighted imaging (MRI sequence)
<b>UDT</b>	Undescended testes
<b>US</b>	Ultrasound
<b>USG</b>	Ultrasonography
<b>XY</b>	Male chromosomal karyotype

## **List of Figures**

<b><u>No.</u></b>	<b><u>Figure</u></b>	<b><u>Pages</u></b>
<b>1</b>	Illustrating chart of the normal reproductive system development.	<b>6</b>
<b>2</b>	The yellow arrow shows the location of the protrusion of the peritoneum and the beginning of the testicular descent into the inguinal canal.	<b>11</b>
<b>3</b>	In this diagram, the beginning of the formation of the vaginal process is visible. It enters with the testis into the inguinal canal.	<b>12</b>
<b>4</b>	Between the 3 <sup>rd</sup> and 7 <sup>th</sup> month of pregnancy the testes remain near the inguinal canal in order to pass through it.	<b>13</b>
<b>5</b>	In the 9 <sup>th</sup> month of pregnancy (but also sometimes only after birth) the testes reach the scrotum.	<b>14</b>
<b>6</b>	Detail of the various layers that have formed in the scrotum by the end of the pregnancy.	<b>15</b>
<b>7</b>	External male genitals and contents of the spermatic cord.	<b>18</b>
<b>8</b>	Cross section of the testis and epididymis.	<b>19</b>
<b>9</b>	Illustrating diagram showing the right testis, exposed by laying open the tunica vaginalis.	<b>21</b>
<b>10</b>	Illustrating diagram of the male reproductive system.	<b>24</b>
<b>11</b>	Illustrating diagram showing the diffusion driven random trajectory of a single water molecule during diffusion.	<b>54</b>
<b>12</b>	Illustrating diagram showing diffusion of water molecules (a)Restricted and (b)Free diffusion.	<b>55</b>
<b>13</b>	Diagrammatic representation of measuring water diffusion.	<b>59</b>



## *List of Figures*

---

<b>14</b>	Illustrating diagram of echoplanar imaging within each TR period, multiple lines of imaging data are collected.	<b>61</b>
<b>15</b>	Scrotal ultrasonographic axial images showing (a) Right undescended testis seen in the iliac region and (b) The normal descended left testis in the scrotum.	<b>68</b>
<b>16</b>	coronal T1 and T2 WI showing intra-canalicular right UDT: (a) low signal on T1 ,(b) high signal on T2WI , (c-d) Coronal and axial T2WI with fat supp. showing high signal of the testis with minimal surrounding hydrocele.	<b>70</b>
<b>17</b>	Diffusion axial image at b value of 800 s/mm <sup>2</sup> showing: high signal intensity of the right intra-canalicular UDT (restricted diffusion) denoting viable tissue.	<b>70</b>
<b>18</b>	Axial MR images of the pelvis and lower abdomen showing: bilateral undescended low intra abdominal testes, (a) low signal on T1WI,(b) isointense signal on T2WI and (c) high signal on FS T2WI image (arrowed).	<b>72</b>
<b>19</b>	Diffusion axial image of the abdomen and pelvis at b value of 800 s/mm <sup>2</sup> showing: high signal intensity of both intraabdominal testes (denoting viable testes).	<b>72</b>
<b>20</b>	Axial and coronal MR images showing small sized left intracanalicular UDT with low signal intensity in (a) T2WI (b-c) T2WI with fat suppression (d) T1WI.	<b>74</b>
<b>21</b>	Diffusion WI at b value of 800 s/mm <sup>2</sup> showing low signal intensity of left intracanalicular UDT (free diffusion); the arrow head, thus denoting testicular atrophy. Note high signal intensity of the inguinal lymph node (restricted diffusion).	<b>74</b>

## *List of Figures*

---

<b>22</b>	Axial T2WI MR images of the abdomen and pelvis at different levels (a-d), non-visualized left testis all through the pathway of its descent. Coronal T2WI MR image of the abdomen and pelvis (e) showing empty left scrotal sac, with blind ended spermatic cord, with high T2 signal intensity of right testis in scrotal sac.	<b>77</b>
<b>23</b>	Diffusion WIs at b value of (a) 50 (b) 800 s/mm <sup>2</sup> showing: absence of left testis with high signal intensity of inguinal lymph nodes.	<b>77</b>

## **List of Tables**

<b><u>No.</u></b>	<b><u>Table</u></b>	<b><u>Page</u></b>
<b><u>1</u></b>	Table shows a comparison of undescended testes with ectopic testes.	<b>29</b>

# INTRODUCTION

Undescended testis or cryptorchidism, a condition in which one or both testicles are not appropriately positioned in the scrotum at birth. It is the most common congenital genitourinary anomaly in boys and has an incidence of 1–3% in term and 15–30% in premature male infants. approximately 20% of undescended testes are nonpalpable and either located in the abdomen or the canaliculi, or atrophic or are completely absent. Cryptorchidism is associated with impaired fertility, inguinal hernia, and increased risk of testis cancer. (*Ehab et al., 2014*)

The Preoperative identification and location of testicles can help to determine the optimal type of procedure and allow for appropriate advance planning. On the basis of the imaging findings, the surgeon can appropriately counsel the patient and alter the operative approaches needed. The imaging findings could obviate the need for surgical exploration.in the case of absent or vanishing testicles. (*Shah et al., 2006*)

The Various imaging techniques have been suggested for use in identifying and locating non-palpable testicles preoperatively with varying limitations including expense, invasiveness technical difficulty, radiation risk, need for contrast medium, and need for sedation. Imaging approaches include ultrasonography, computed tomography (CT), routine MRI, magnetic resonance angiography (MRA), and magnetic resonance venography (MRV), some of which require sedation or anesthesia and are without risks. (*Miller et al., 2009*)

The least expensive and frequently used technique of all imaging tools is ultrasound. However it had been shown to have low sensitivity in identifying non-palpable testicles preoperatively in a recent meta-analysis. (*Tasian and Copp, 2011*)

Conventional MRI is moderately specific in identifying absent testicles but poorly sensitive in identifying the presence of non-palpable testicles. Conventional MRI appears to be less efficient in locating intra-abdominal functioning testicles and shows limited sensitivity in locating inguinoscrotal testicles, but it fails to

locate most of the atrophied testicles, which makes conventional MRI a less reliable technique in providing guidance to differentiate those children needing surgery from those who do not. (*Krishnaswami et al., 2013*)

Additional MRI assessments, fat-suppressed T2WI and DWI are useful methods to improve the accuracy of diagnosis of non-palpable testes. It could prevent needless surgery and be worth the additional imaging tests. (*Kato et al., 2011*)

Diffusion weighted imaging (DWI) is an evolving technology with the potential to improve tissue characterization when findings are interpreted in conjunction with findings obtained with other conventional MRI sequences. It provides functional and structural information about biologic tissues; it is best used to solve specific problems. (*Qayyum, 2009*)

Use of DWI therefore facilitates characterization of tissue at the microscopic level in a mechanism different from T1 and T2 relaxation. The degree of restriction of water diffusion in biologic tissue is inversely related to tissue cellularity and the integrity of cell membranes (e.g.

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tumor tissue). Concordantly, intra-abdominal testes are considerably more cellular than the adjacent organs and tissues and can be detected easily on DW images owing to their increased signal intensity. Therefore added DWI to routine MRI to identify non-palpable undescended testes. (*Kantarci et al., 2011*)