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Research Article

DIAGNOSTIC ACCURATENESS OF MAGNETIC RESONANCE IMAGING FOR CONFINING TESTES IN CRYPTORCHIDISM CASES

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Abstract:

Aim: To determine the diagnostic accuracy of MRI for the location of undescended testes in clinically detected cases of cryptorchidism, using the results of surgical examinations as the gold standard.

Study design: A cross-sectional study

Methods: It was a cross-sectional study held in the radiology department of Allied Hospital, Faisalabad for six-months duration from March 2020 to August 2020. Patients were recruited by purposive sampling. One hundred and seventy clinically and ultrasonically [7.5 MHz superficial linear probe with AU5 Harmonic EZAOTI] diagnosed cases of undetectable undescended testes at the age of 0-16 were selected from the Department of Diagnostic Radiology. Children with ambiguous genitals in the clinical trial and boys unfit for anesthesia or surgery were excluded from the study. MRI of all cases was performed using the 1.5 Tesla MR system.

Results: Patients' age ranged from 0-16 years. The mean age of the patients was 5.1 ± 2.3 years. According to the affected side, there were 49 cases [28.8%] on the right side, 93 cases [54.7%] on the left side, and 28 cases [16.5%] on the both-sided. Comparing the MRI results with the surgical results showed that there were 127 true positives, 3 false positives, 27 false negatives, and 13 true negatives. Statistical analysis of the study showed a sensitivity of 82.4%, a specificity of 81.2%, a diagnostic accuracy of 82.3%, a positive predictive value of 97.6% and a negative predictive value of 32.5% MRI for the location of the undescended testes in clinically detected cases of cryptorchidism, considering surgical results to be the gold standard.

Conclusion: It has been concluded that magnetic resonance imaging [MRI] offers a new promising imaging method for locating the undescended testis because it has better resolution, multiplanar ability, different sequences, and is safe and safe.

Keywords: MRI imaging, testicular location, diagnostic accuracy.

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INTRODUCTION:

The most common problems with undescended testes are testicular tumor, decreased fertility, testicular torsion, and inguinal hernia. Chung and Brock described common referral scenarios for men with a prior history of cryptorchidism and orchidopexy seeking advice on infertility, and investigated the relationship between cryptorchidism and male infertility. Cryptorchidism or undescended testicle is one of the most common birth defects in the pediatric population. The frequency of cryptorchidism in full-term newborns is 1% and 3%, and in premature babies as much as 30%. Boys with cryptorchidism are at greater risk of infertility as well as testicular cancer. Boys with undescended testicles are initially diagnosed and referred by primary care physicians who detect cryptorchidism during a routine physical examination. The exact developmental phenomena leading to cryptorchidism are not well understood; nevertheless, abnormalities in functional, anatomical as well as hormonal aspects during embryogenesis and testes descent are implicated. Undescended testes can be categorized based on physical and operational findings: [1] true undescended testes [including intra-abdominal, inner ring peeping, and tubular testis] that exist along the normal descent path and have the gubernator inserted normally; [2] ectopic testis with abnormal nodular attachment; an retreating testis that are not truly undescended. The most important category to distinguish in a physical examination is the retraction nucleus as no hormone or surgical therapy is required for this condition. Cryptorchidism is associated with quite serious clinical implications, such as infertility and testicular malignancy. Undescended testes, which may be undetectable and located high up, usually have associated epididymal anomalies obstructing the sperm conduction pathway. despite the fact that surgical intervention is ultimately required; describes the roles of diagnostic imaging. The imaging assessment of a patient with an imperceptible testicle has evolved in recent decades. MRI is believed to be more accurate in determining the undescended nucleus. It is a non-invasive method with the added benefit of not being exposed to ionizing radiation. It is now widely accepted that MRI should be performed prior to any invasive procedure. The purpose of this study is to evaluate the diagnostic role of MRI in the location of the testes in cases of clinically undetectable undescended testes as a prerequisite for early corrective surgery. This will significantly reduce the number of complications.

METHODOLOGY:

It was a cross-sectional study held in the radiology department of Allied Hospital, Faisalabad for six-

months duration from March 2020 to August 2020. Patients were included by purposeful sampling without probability. One hundred and seventy clinically and ultrasonically [7.5 MHz superficial linear transducer from AU5 Harmonic EZAOTI] diagnosed cases of undetectable undescended testes from 0-16 years of age enrolled in the Department of Diagnostic Radiology. These children were observed in the surgical wards of the respective hospital in order to record the results of the operation. Children with ambiguous genitalia in the clinical trial and boys unfit for anesthesia / surgery were excluded from the study. Following informed consent, basic demographics [age] were recorded and the hospital ethics committee assessed. MRI of all cases was performed in the MR 1.5 Tesla system [Philips Gyro Scan NT, Compact Plus, the Netherlands]. Standard MR imaging techniques included axial and coronal images in the T-1, T-2 and Fat Suppression sequences. MRI results were recorded as localized / non-localized testes, if localized, whether in the sac, pre-scrotal area, inguinal canal, pelvis, or abdomen, on the right, left, or both sides. The MRI results were compared with the surgical results as a reference standard. The information collected was analyzed by SPSS version 18. The mean and standard deviation for quantitative variables such as age and affected side were calculated. Qualitative variables from the MRI results included localized / non-localized testes, if located in the sac, pre-scrotum, inguinal canal, pelvis, or abdomen, are presented as frequency and percentage. The sensitivity, specificity, negative predictive value, positive predictive value and diagnostic accuracy of the MRI were calculated by constructing a 2 x 2 table, taking the surgical results as the gold standard.

RESULTS:

The age of the patients ranged from 0-16 years. The mean age of the patients was 5.1 ± 2.3 years [Table 1]. According to the affected side, there were 49 cases [28.8%] on the right side, 93 cases [54.7%] on the left side, and 28 cases [16.5%] on both sides [Table 2]. MRI localized 130 [76.5%] of the undescended testes, while 40 [23.5%] of the undescended testes were not MRI [Table 3]. Of the 130 localized undescended testes, 70 [53.9%] were located in the inguinal canal, which appeared to be the most common site of undescended testes. 37 [28.4%] of undescended testes were found in the pre-scrotum area, 13 [10%] in the pelvis, and 10 [7.7%] in the abdominal cavity [Table 4]. Surgical results revealed the location of 154 undescended tests, while 16 infants were found to have missing testicles during surgery [Table 5]. The distribution of testicular locations by surgical findings also showed

that the inguinal canal was the most common location for undescended testes with 73 testes [47.4%] found. 41 [26.6%] testicles were found in the pre-scrotal area, 23 testes [14%] in the pelvis and 17 testes [11.1%] in the abdominal cavity [Table 6]. Comparing the MRI results with the surgical results showed that there were 127 true positives, 3 false positives, 27 false negatives, and 13 true negatives

[Table 7]. Statistical analysis of the study showed a sensitivity of 82.4%, a specificity of 81.2%, a diagnostic accuracy of 82.3%, a positive predictive value of 97.6% and a negative predictive value of 32.5% MRI for the location of the undescended testes in clinically detected cases of cryptorchidism, considering surgical results to be the gold standard.

Table 1: Distribution of cases by age [n = 170]

Age [Year]	n	Percentage
< 5	77	45.3
5-10	83	48.8
11-15	10	05.9

Table 2: Distribution of clinically diagnosed undescended testes

Unilateral				Bilateral	
Right Side		Left Side		No.	%
No.	%	No.	%		
49	28.8	93	54.7	28	16.5

Table 3: MRI localization of undescended testes

Findings	No. of testes	Percentage
Localized	130	76.5
Not localized	40	23.5
Total	170	100.0

Table 4: Distribution of undescended testes by location on MRI [n=130]

Location	No. of testes	Percentage
Pre-scrotal area	37	28.4
Inguinal canal	70	53.9
Pelvis	13	10.0
Abdomen	10	07.7

Table 5: Surgical findings of localization of undescended testes

Findings	No. of testes	Percentage
Localized	154	90.6
Not localized	16	09.4

Table 6: Distribution of undescended testes by location on surgery [n=154]

Location	Number of testes	Percentage
Pre-scrotal area	41	26.6
Inguinal canal	73	47.4
Pelvis	23	14.9
Abdomen	17	11.1

Table 7: Comparison MRI vs surgery

MRI	Surgery [Gold Standard]		Total
	Positive	Negative	
Positive	127	3	130
Negative	27	13	40
Total	154	16	170

DISCUSSION:

The embryonic development of the testicle initially takes place in the abdominal cavity. It then advances towards the scrotum in the last trimester and becomes palpable at birth. An undescended testicle refers to the condition in which the movement of the testicle has stopped before reaching the scrotum. The undescended testicle is one of the most common disorders of the genitourinary system in male infants. The undescended testicle poses a particular diagnostic and therapeutic challenge because leaving the testicle in the undescended position increases the risk of malignant degeneration in the future. MRI is considered by many to be the best single imaging method to evaluate undescended testes. Our study results show that MRI is an important sensitive and specific diagnostic tool for detecting undescended testes, with a sensitivity of 82.4%, a specificity of 81.2% and a diagnostic accuracy of 82.3%. These results are consistent with other studies such as: Kanemoto et al. They demonstrated a sensitivity of 86%, a specificity of 79%, and a diagnostic accuracy of 85%. Kamigaito et al. Found MRI sensitivity of 85.7% in the preoperative location of the undescended testes. The undescended testis in our study were well imaged by MRI in both the frontal and axial planes. This result is in agreement with Kiere et al, since all detected undescended testis were hypointense on T1W and slightly hyperintense on T2W images. The result that cryptorchidism was unilateral in most children, i.e. in 142 [83.5%] and bilateral in 28 [16.5%] cases, is comparable to the study by Dogr et al. According to Shehata and Zakaria, the most common location of the undescended testicle is 53.3% in the inguinal canal, followed by the pre-scrotum [26.7%] and the abdomen [13.3%]. Our findings are also close to theirs. The most common location of the undescended testicle in our study was the inguinal canal [53.9%]. The second common location was the pre-scrotum [28.4%], followed by the pelvis [10%] and abdomen [7.7%] on MRI. Cryptorchidism develops in all boys with plum abdominal syndrome [relaxed musculature of the abdominal wall], in fact, it is more common in boys born with abdominal wall defects that cause a decrease in abdominal pressure,

such as gastroenteritis, and also an omphalocele hernia.

CONCLUSION:

Magnetic resonance imaging [MRI] has been found to offer a new promising imaging modality for localization of undescended testis because it has better resolution, multiplanar ability, different sequences, and is safe and secure. In the case of localization of an undescended testicle, orchidopexy may be planned based on the results of MRI examinations.

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