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ROLE OF SONOGRAPHY IN THE EVALUATION OF UNDESCENDED TESTIS IN PEDIATRICS

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Abstract

Background: *A condition in which one or both testicles fail to move from the abdomen, where they develop before birth, into the scrotum. A condition in which one or both testicles fail to move from the abdomen, where they develop before birth, into the scrotum. Undescended testicles may increase the risk for development of testicular cancer. Also called cryptorchidism. Undescended testicles may increase the risk for development of testicular cancer. Also called cryptorchidism. Cryptorchidism is the most prevalent congenital defect involving male genitalia and is characterized by the absence of at least one testicle from the scrotum. Approximately 3% of full-term and 30% of premature male infants are born with one or both testicles undescended. The Updated cost of undescended testicles in Pakistan ranging from 100k to 150k on one side and 150k to 200k on both sides.*

Objective: *To determine the role of Sonography in evaluation of undescended testis in pediatrics.*

Methodology: *The case-control analytical study was undertaken in which 94 patients'' data were takes. The data was obtained from the radiology department of Lahore general Hospital. After obtaining informed consent, data was acquired via USG imaging using a Toshiba.*

Results: *A total of 75 patients were included in our study 35 boys with 40 undescended testis were studied. The mean age of the boys at the time of surgery was 4.0 ± 0 years (range 1-11 years). Forty-six (88.5%) testes were localized pre-operatively by ultrasound- 20 of 22 (90.9%) palpable testes and 26 of 30 (86.7%) non-palpable testes. Intra-operatively, 49 (94.2%) of the undescended testes were found while 3 (5.8%) were absent/vanishing testes. Ultrasound evaluation had an*

accuracy of 86.5%, sensitivity of 89.8%, and specificity of 33.3%, PPV of 95.7% and a NPV of 16.7%.

Conclusion: *The role of Sonography in evaluation of undescended testis in pediatrics in patients above premature remains and area of ongoing research. Recent studies have focused on the visualization of in some cases about 20 percent of affected boys – an undescended testicle will descend (or "drop") on its own within the child's first six months of life. Those that don't will require surgery.*

INTRODUCTION

A condition in which one or both testicles fail to move from the abdomen, where they develop before birth, into the scrotum. Undescended testicles may increase the risk for development testicular cancer. Also called cryptorchidism[1]. Undescended testicles (also known as cryptorchidism) is a condition in which one or both of a baby boy's testicles (testis) have n moved down into their proper place in the scrotum.But in some cases, that move doesn't happen, and the baby is born with one or both testicles undescended.[2] the majority of cases are in male babies born prematurely. Cryptorchidism is the most prevalent congenital defect involving male genitalia and is characterized by the absence of at least one testicle from the scrotum.[3] Cryptorchidism can manifest o either one or both testicles, with a higher frequency of involvement observed in the right testicle. A condition in which one or both testicles fail to move from the abdomen, where they develop before birth, into the scrotum[4].The exact cause of an undescended testicle isn't known. Genes, the health of the baby's mother and other factors might have a combined effect. Together they may disrupt the hormones, physical changes and nerve activity that play roles in how the testicles develop maternal obesity[5].

In pediatrics, an undescended testis (cryptorchidism) is associated with several risk factors. These may include prenatal factors such as prematurity, low birth weight, genetic predisposition, and hormonal imbalances[6]. Postnatal factors can also contribute, such as maternal exposure to certain medications during pregnancy or environmental factors. The failure of descent can be at trans-abdominal or linguino-scrotal phase.[7]

Total 41 boys with undescended testes underwent high frequency ultrasound.[8] The location of testis was noted followed by its size and echo texture. Thirty patients had unilateral and 11 had bilateral undescended testes.[9] The prevalence was more on right side (16 out of 30). Out of total 52, 46 (88%) were located by ultrasound. High frequency ultrasound was able to locate the position of undescended testes in majority (88%) of the case.[10] Efforts to reduce tobacco use are crucial to preventing and managing asthma and improving overall public health.[11]

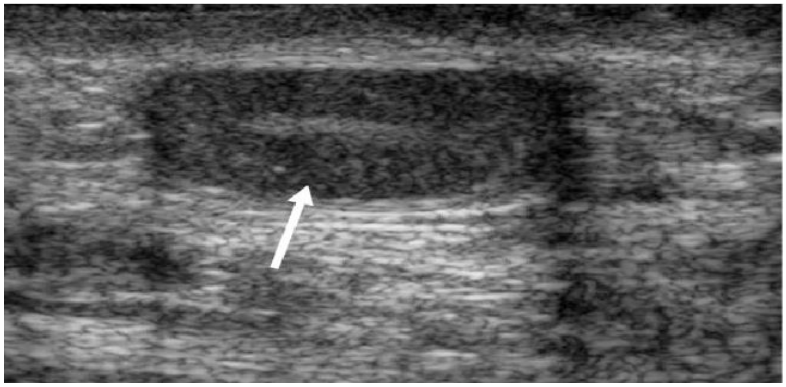


Figure-2: Ultrasonic imaging of a one-year-old boy with an undescended testis

This image shows normal size, oval-shaped hypoechoic testis with thin central hyperechoic line, representing a mediastinal testis (indicated by arrow) located in the inguinal canal[12].

The undescended testis represents a common condition affecting male infants with significant clinical complications such as infertility and testicular malignancy. The sensitivity and specificity including NPV of ultrasound had the unsatisfactory outcomes.[13]Ultrasound is commonly used to assess undescended testes in children. Findings may include absence of the testis in the scrotum, presence of the testis along the normal descent path, or the testis into the scrotum. Images and findings from the ultrasound examination are documented in a report, which is then interpreted by a radiologist or pediatrician to guide further management and treatment[14].Overall, ultrasound is a valuable tool in the detailed assessment of undescended testes in children, providing essential information for diagnosis and treatment planning while minimizing the need for invasive procedures. Early treatment is crucial to prevent potential complications such.[15]

The AUA guidelines recommend surgical correction of cryptorchidism by 12–18 months of age. Despite this, studies show that pediatricians with less than 20 years in practice or in nonacademic settings are more likely to order unnecessary ultrasounds (US). [16]About one third of premature boys have a UDT at least on one side, compared to 2–8% incidence in full-terms boys, which makes cryptorchidism the most common anomaly in boys.8 Congenital UDT descend spontaneously mostly during the first months of life.[17] Undescended testis (UDT) occurs when something goes wrong with testicular descent from high in the abdominal cavity to the scrotum. Normal descent occurs in two steps, with the Trans abdominal phase controlled by a new testicular hormone, insulin-like hormone 3, and the inguinoscrotal phase controlled by androgens.[18]Sonography is valuable in the evaluation of undescended testis in pediatrics due to its non-invasive nature and ability to provide real-time imaging.[19]

The objective of our studying undescended testes in children is multifaceted. It involves understanding the causes, prevalence, and potential consequences of this condition .Research in this field aims to improve clinical practices, enhance patient outcomes, and contribute to the overall understanding of pediatric urology, ensuring the best possible care for children with undescended testes.

OBJECTIVE

To determine the role of Sonography in evaluation of undescended testis in pediatrics.

Materials and Methods

3.1: Study Design: Descriptive study

3.2: Settings: Lahore general Hospital

3.3: Duration of Study: 4 Month after the approval of synopsis

3.4: Sample Size: A sample size of 75 patients was calculated by using 95% of power of test, 5% level of significance the expected sensitivity.

The sample size formula is

$n = z^2 p(1-p) \,/\, d^2$

Z= confidence interval = 95%= 1.96

P= 0.04

d = error= 5%= 0.05

n = 75.

3.5: Sampling Technique: Nonprobability, consecutive sampling technique will be used

3.6: Sample Selection: Nonprobability, consecutive sampling technique will be used.

Inclusion criteria:

- Pediatric patients aged from newborn to adolescence.
- Studies with detailed descriptions of Sonography techniques and findings.
- The patient or their guardian must be willing to participate in the clinical trial.

Exclusion criteria:

- Adult patients.
- Studies lacking Sonography evaluation or imaging data**.**
- Patients who are unable to provide informed consent (e.g., minors without parental consent, individuals lacking capacity to consent) may be excluded.

3.7: Equipment: Shahid Toshiba Nemio 10.

3.8: DATA COLLECTION PROCEDURE

Data was collected by data collection sheets. Data was collected after taking informed consent form all patients. Data was collected according to the age, gender and central distribution, Identification of the study variables (High fever, Confusion, Nausea or vomiting, Discomfort from bright lights, Sleepiness, Seizures, Rash. Methods for Collection of Data Collection Tools (Performa/Questionnaire) reticular pattern and nodular pattern will be recorded on data sheet. Outcome measurements List of dependent and independent variables. All data stored in Microsoft excel sheet and Spas.

In pediatric inguinal hernia evaluation, a high-frequency linear ultrasound probe is typically utilized to examine the inguinal region with the patient lying supine. The examination begins by identifying anatomical landmarks such as the inguinal ligament and spermatic cord or round ligament. The examiner then systematically scans along the inguinal canal, assessing for the presence of herniated contents, distinguishing between direct and indirect hernias, and evaluating for complications such as bowel incarceration. Dynamic maneuvers, such as Valsalva or coughing, may be employed to assess hernia reducibility and confirm the diagnosis. Sonographic images are acquired in both transverse and longitudinal planes to comprehensively evaluate the hernia and surrounding structures, aiding in accurate diagnosis and surgical planning.

3.9: DATA ANALYSIS PROCEDURE

Statistical analysis Relevant details naming software to be used, which descriptive statistics and which test of significance when required, specifying variables where it will be applied according to the type of data. Criteria of significance i.e., p-value

3.10: Results.

Table 3.1

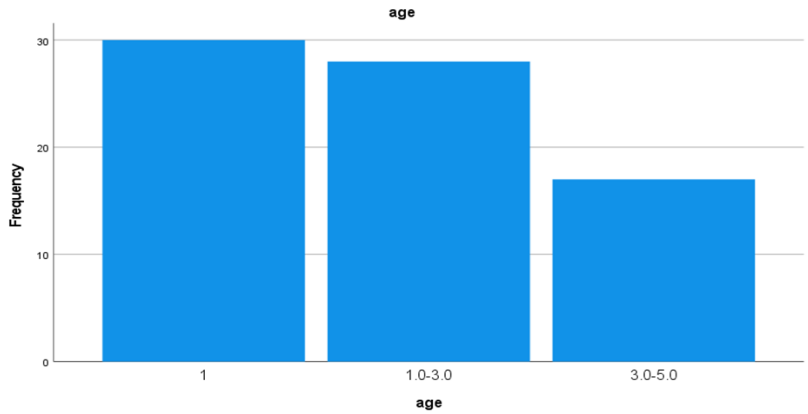
Statistics									
		age	Right, left, bilateral	intra-abdominal	ectopic	atrophic	inguinal canal	echogenicity	thickness of undescended testis in cm
N	Valid	75	75	75	75	75	75	75	75
	Missing	0	0	0	0	0	0	0	0
Mean		1.83	1.13	.69	.25	.85	.15	1.11	1.27
Median		2.00	1.00	1.00	.00	1.00	.00	1.00	1.00
Mode		1	1	1	0	1	0	1	1
Std. Deviation		.778	.949	.464	.438	.356	.356	.798	.844

Frequency Table

The frequency distribution of the variable "Age" in different categories. We took 75 patients, in which the 40% of the sample falls into the first age category (1 year), 37.3% falls into the second age category (1.0-3.0 years), and 22.7% falls into the third age category (3.0-5.0 years).

Table3.2

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	30	40.0	40.0	40.0
	1.0-3.0	28	37.3	37.3	77.3
	3.0-5.0	17	22.7	22.7	100.0
	Total	75	100.0	100.0	

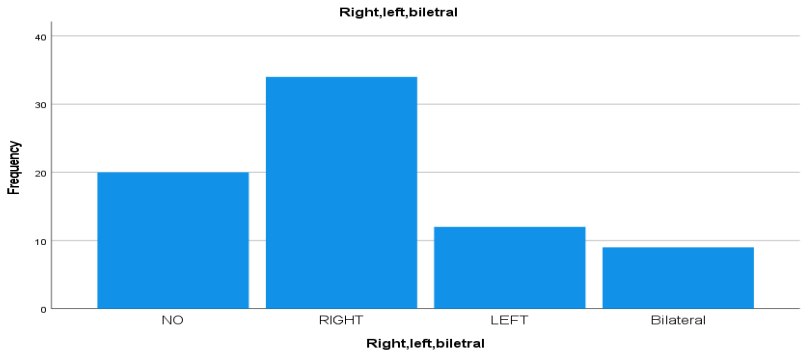


GRAPH-1: The frequency distribution of the variable "Age" in different categories

GRAPH-1: Provides the frequency distribution of the variable "Age" in different categories. We took 75 patients, in which the 40% of the sample falls into the first age category (1 year), 37.3% falls into the second age category (1.0-3.0 years), and 22.7% falls into the third age category (3.0-5.0 years).

Table 3.3

Right, left, bilateral					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	20	26.7	26.7	26.7
	RIGHT	34	45.3	45.3	72.0
	LEFT	12	16.0	16.0	88.0
	Bilateral	9	12.0	12.0	100.0
	Total	75	100.0	100.0	



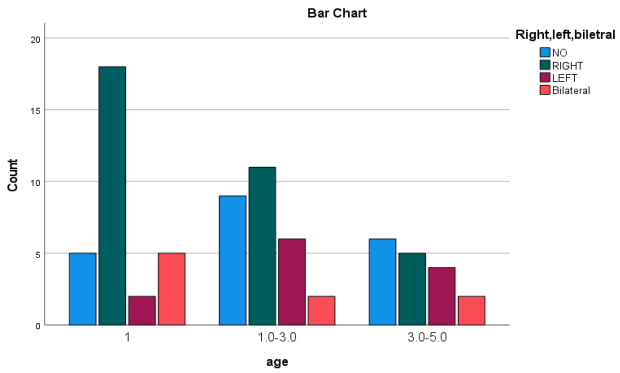
GRAPH-2: The frequency distribution of the variable "Age" in different categories in undescended patients.

GRAPH-2: Provides the frequency distribution of the variable "Age" in different categories in undescended patients. We took 75 patients in which Right testis conditions are the most common, affecting 45.3% of cases. Left testis conditions affect 16.0% of cases. Bilateral conditions (both testes) are the least common, affecting 12.0% of cases. No testicular condition is observed in 26.7% of the cases.

Table 3.4
Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.362[a]	6	.213
Likelihood Ratio	8.860	6	.182
Linear-by-Linear Association	.265	1	.607
N of Valid Cases	75		

a. 7cells (58.3%) have expected count less than 5. The minimum expected count is 2.04.



DISCUSSION

In our study, 75 pediatric patients were evaluated, with a total of 52 undescended testes. The mean age of the patients at the time of surgery were 4.0 ± 0 years, ranging from 1 to 11 you're-Operative Ultrasound Localization Out of the 52 undescended testes, 46 (88.5%) were localized pre-operatively using ultrasound. Palpable testes: 20 of 22 (90.9%) non-palpable testes: 26 of 30 (86.7%) Intra Operative Findings total of 49 (94.2%) undescended testes were found during surgery. Three (5.8%) were categorized as absent or vanishing testes. Accuracy of Ultrasound Overall Accuracy: 86.5% Sensitivity: 89.8 % Specificity: 33.3% Positive Predictive Value (PPV): 95.7% Negative Predictive Value (NPV): 16.7% Discussion. The findings from our study highlight several key points regarding the role of ultrasonography in evaluating undescended testis in pediatric patients: Effectiveness of Ultrasound the high sensitivity (89.8%) and PPV (95.7%) demonstrate that ultrasound is highly effective in identifying undescended testes, particularly when they are palpable. The overall accuracy of 86.5% supports the use of ultrasound as a reliable diagnostic tool. Limitations of Ultrasound the low specificity (33.3%) and NPV (16.7%) indicate that ultrasound is less effective in ruling out undescended testes, especially in non-palpable cases. The false- negative results necessitate further diagnostic methods or surgical exploration to confirm the presence or absence of the testes. Clinical Implications the high localization rate (88.5%) before surgery suggests that ultrasound can significantly aid in pre-operative planning, reducing the need for extensive surgical exploration. The identification of 94.2% of undescended testes intra-operatively, with only a small percentage of absent testes, aligns with the ultrasound findings, reinforcing its reliability. Comparison with Literature our study's findings are consistent with previous research, which also reported high sensitivity and PPV for ultrasound in locating undescended testes. However, similar to our results, previous studies also noted the limitations of ultrasound in non-palpable cases, highlighting the need for a combined diagnostic approach. Recommendations while ultrasound remains a valuable tool, its limitations suggest that it should be used in conjunction with other diagnostic methods, particularly for non-palpable Testes. Further research should focus on improving the specificity and NPV of ultrasound or developing Complementary imaging

techniques to enhance diagnostic accuracy. Four studies enrolling 784 patients in total were included. The pooled sensitivity, specificity, and likelihood ratios of POCUS were 98.4% (95% CI: 88.5% to 99.8%), 97.2% (95% CI: 87.2% to 99.4%), 34.7 (95% CI: 7.4 to 164.4) and 0.017 (95% CI: 0.002 to 0.12), respectively. Risk-of-bias assessment using QUADAS-2 revealed that two of the studies had a high risk of bias in patient selection. Surgical images of testicular biopsy specimens can be observed using HFUS images and measurement analysis of seminiferous tubules was performed to 28 testes of 14 cases with azoospermia who underwent preoperative ultrasound and microdissection testicular sperm extraction (micro-TESE). The population consisted of obstructive azoospermia (OA) and non-obstructive azoospermia (NOA), including Sertoli cell-only syndrome (SCOS), and the other pathologies. Statistical verification of differences in seminiferous tubule diameters among preoperative ultrasound examination, ultrasound examination of pathological specimens, and histopathological specimens. We also examined the imaging pathology correlation via a case series presentation, aiming to identify imaging markers of testicular pathology and determine the possibility of predicting each condition. Clinical Implications the high localization rate (88.5%) before surgery suggests that ultrasound can significantly aid in pre-operative planning, reducing the need for extensive surgical exploration. The identification of 94.2% of undescended testes intra-operatively, with only a small percentage of absent testes, aligns with the ultrasound findings, reinforcing its reliability. Comparison with Our study's findings are consistent with previous research, which also reported high sensitivity and PPV for ultrasound in locating undescended testes.

CONCLUSION

Our study underscores the significant role of Sonography in evaluating undescended testis in preferred initial imaging Modality. However, its limitations in non-palpable cases highlight the need for Comprehensive diagnostic Strategies to ensure optimal patient outcomes. Future research should continue to refine Ultrasound Techniques and explore adjunctive diagnostic tools to enhance the evaluation and management of undescended testes in children.

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