

# Prenatal [Ultrasound] Diagnosis of Cryptorchid Testicles

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## Abstract

The role of ultrasonography as a routine investigative test for diagnosing testicular pathologies (*in-utero* and postnatally) cannot be overemphasized. Undescended (cryptorchid) testis according to literature is prone to neoplastic transformation. Determination of fetal gender *in-utero* by ultrasound allows for sex determination albeit; its full ethical implication should be considered. 3D ultrasonography is affordable, ubiquitous, reproducible and ensures rapid evaluation of a wide array of testicular pathologies, early (coincidental) diagnosis is important to avoid complications (such as torsion, bleeding or malignant-mass-formation) thus; sonar imaging features as an indispensable tool. The case aims to document and highlight accidental detection (at 31 weeks gestational age) and expunge on the accuracy of ultrasonography in diagnosing cryptorchidism. There is sparse (Nigerian) literature on Undescended Fetal Testis (UDFT). This report used antenatal imaging as a clear descriptive evidence of faulty testicular descent with detailed examination of the fetal genitalia. Ultrasound examination during the 3rd semester allows for accurate cryptorchid diagnosis (prenatally).

## Keywords

Cryptorchid, Ultrasonography, Diagnosis, Gestational Age

## 1. Introduction

Over the past 20 years, ultrasonography has advanced with newer probes having greater resolution and clarity to differentiate the testes from adjacent tissues [1]. We report cryptorchidism/Undescended Testis (UDT) on the basis of prenatal

ultrasonography. Fetal ultrasound examination allows for observation of various anatomic structures which includes the genitalia and perineal region [2]. At around 19 weeks the scrotum becomes discernable (via ultrasound) as gestational age increases; presence of testicles in scrotal sac becomes prominent [3]. The etiology and pathophysiology of cryptorchidism are not clearly defined in literature, despite being a congenital anomaly. Achiron and others [3] investigated over 200 fetal scrotal circumferences in order to generate a logarithmic regression formula for anthropometric measurement. Cryptorchid anomaly involves absence of both or one testes from the scrotal sac in males [4].

Every obstetric sonologist will agree with the most often asked question of the diagnosis and determination of fetal sex. Both testes follow a predictable journey during its phase descent from the lumbar areas to the ipsilateral hemi-scrotal region. After birth, it is well known that ultrasound can potentially identify the palpable testis in the scrotum but not when present abdominally [5].

## 2. Etiologic Genesis Cryptorchidism

Source etiology of UDT remains largely unknown with several theories proposed. Some researchers [6] document primary fault to be the testicular anatomy. Risky factors [7] of cryptorchidism are;

- Perinatal asphyxia
- Poisoning and toxemia in pregnancy
- Extreme cold temperature
- Cesarean section
- Parity 1 (first born males)
- Microsomia/Intra uterine growth retardation (IUGR)

Environmental influences like organic chloride substances, phthalate mono-esters, nicotine abuse and complications of type II diabetes increases the risk of cryptorchidism. Etiological factors [8] can be grouped as;

- 1) HEREDITARY/GENETIC (Note can influence factors II & III)
  - 5 $\alpha$ -reductase gene mutant from chromosome 2—rare in UDT [9]
  - HOXA10 gene mutant from chromosome 7—rare in UDT [10]
- 2) ANATOMICAL
  - Shunted attachment of the gubernaculum
  - Abnormalities of the testis and epididymis [11]
- 3) HORMONAL [12]
  - Deficient AMH receptor [13].
  - Lack of sensitivity of CGRP receptors and disorder of genitofemoral nerve.

Irrespective of stated etiological factors, UDT genesis seems to be a combination of hormonal, anatomical, environmental and genetic factors [14].

## 3. Cryptorchidism Classification

For medical reasons and possible postnatal treatment, undescended testis (UDT) is classified as;

- Congenital and Acquired
- Palpable and Non-Palpable
- Bilateral or Unilateral [15] [16].

#### 4. Case Report

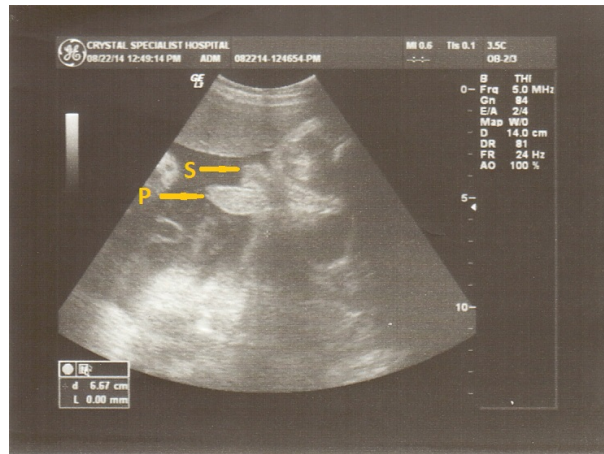
A 36-year-old woman with no surgical or medical illness was referred for routine trimesteric ultrasound. Overall ultrasound image demonstrated bilateral empty scrotal sac free of echogenicity after repeated scanning in several planes (**Figure 1**, 31 weeks gestational age), the penile shaft/phallus was easily identified. The ultrasound examination concluded on provisional diagnosis of cryptorchidism. A General Electric (GE) Pro logic 3 Ultrasound (made in the USA) was used for scanning with a 3.5 MHz curved array transducer. A consultant neonatologist examined the male newborn 2 days after birth to compare radiological findings with physical examination and palpitation.

Fetal urinary bladder improved anechoic visibility; serving as an acoustic shadow before case documentation. No treatment of the mother was done after initial confirmatory diagnosis by radiology. Ethical approval granted by Crystal Specialist Hospital (CSH) and informed consent was sought and obtained from the patient in line with the 1975 Helsinki Declaration on right's. After parturition, the neonate was found to have bilateral undescended testis after ultrasound scan by a sonologist.

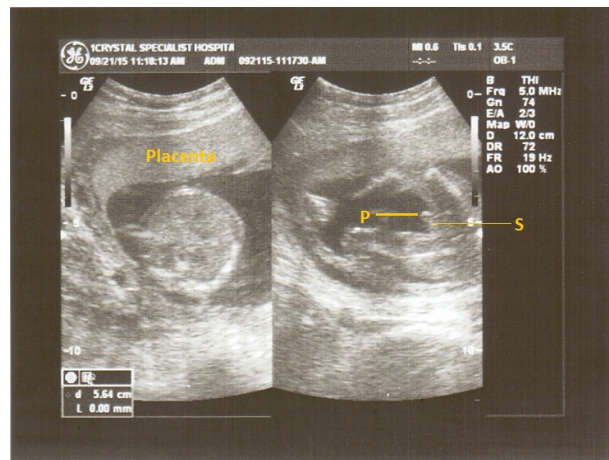
#### 5. Discussion

As postulated by Hutson *et al.* [17]; a probable factor of cryptorchidism could be imbalance between Mullerian inhibiting-factor secretion and fetal growth (above 95<sup>th</sup> percentile or less than 5<sup>th</sup> percentile) as sequelae to the 28<sup>th</sup> week of gestation (**Figure 1** and **Figure 2**). Evidence also suggests neoplastic changes is an established consequence of undescended testis. Corrective operation for neonates with testicular absence depends on the timing and approach of the pediatric surgeon managing the patient. In literature, Elder [18] reported ultrasonography identified (26.6%) about 12 of 45 cases of UDT. Sonographic determination of fetal sex *in-utero* is a major part of prenatal diagnosis of sexual mal-definition, campomelic dysplasia and testicular feminization.

For better understanding of cryptorchidism, proper in-depth knowledge of normal genital development (**Figure 3**) is needed. The baseline for UDFT is the absence of inferior testicular descent at 26 weeks' gestational age according to Freedman and Gonzalez [19]. Without a doubt, gestational observation of infected testis may relieve the (future) child from the need for further therapy for what would otherwise diagnose as an impalpable testis. Postnatal correction before age 2 [19] through laparoscopy lends pathologic-backing to the phenomenon of vanishing testis [20]. Mboyo *et al.* [21] detected a 2.5 × 2.3 cm solid mass on the left side of the bladder on a 31 week GA gravidae. It was later surgically removed on the 13<sup>th</sup> (postnatal) day. Through the use of ultrasound, it is hoped



**Figure 1.** Sonogram shows prenatal diagnosis of a cryptorchid testis. Note the absent testis in bilateral hemi-scrotum at 31 weeks GA. Anatomically the most informative scanning planes for viewing fetal genitalia are tangential and coronal sections. P = penis, S = scrotal sac devoid of testicles.



**Figure 2.** Arrowed scrotal sac free of testis, sagittal section of male external genitalia; note the “micro” penis (P) and empty scrotum (S) of another 25 weeks fetus.



**Figure 3.** (Control) Normal image of a normal testes (T) in the scrotum. Coronal section of a 3rd trimester male fetal perineal region, P = penile tissue.

that spurned interest in abdominal and normal genital development will be cultivated. Similar to a case reported by Davesa *et al.* [22] our rare cryptorchidic sonar finding was confirmed postnatally by physical examination. In alternate postnatal cases contrary to our affirmation; Tasian *et al.* [1] stated that pre-operative (Doppler) ultrasound is not reliable in localizing impalpable UDT. Without doubt, medical imaging is generally helpful for a wide range of disorders and pathologies such as hypospadias and genital tract compromise [23]. In agreement with Hutson *et al.* [13] trans-inguinal migration is thought to be hormone dependent involving contributions from calcitonin-generated peptides, inferior abdominal pressure and ilio-inguinal nerve [24]. It is possible there is late descent of testicles after 33 weeks, however as earlier stated a gross exam was followed up after birth to rule out a false positive (ultrasound) diagnosis. Testicular retention/undescended testis/cryptorchidism or maldescent of the testis describe its ectopic condition when not located at the bottom of the scrotum [25].

For investigative purposes, and for the benefit of future studies on cryptorchidism, as well as to allow treatment comparison of results studies; more precise stratification of testicular maldescent regarding position is suggested. It can be “high” or supra—scrotal, ectopic, (inguinal canal testis) or low and high abdominal variants.

## 6. Conclusions

The use of ultrasound can display testicular anatomy and vasculature in a reliable, non-invasive and reproducible method in patients with scrotal diseases making 28 weeks GA the clinical benchmark for documentation of bilateral undescended testis. The possible reasons for cryptorchidism in this case could be anatomical. Doppler sonar is better used for cryptorchid testicular diagnosis, which will allow colored testicular vasculature to rule out a false positive result and iatrogenic errors. If cryptorchidism is not resolved *in-utero*, it is advisable to avert obstructed spontaneous descent of testis in the first 4 months of life. Researchers argue for orchipexy [8] to be performed latest by 14 months of age upon diagnosis in males. Urgent decision for subsequent transfer to the scrotum is performed irrespective of testicular dimensions.

In agreement with the assertion of Nguyen [26] and Kanemoto *et al.* [27] ultrasonography is less reliable for evaluating abdominal testis but better for assessing inguinal testis. Frequency transducer >7.5 MHz offers clarity in detecting non-palpable, UDT with a sensitivity of 76% and specificity of 100%. Values for palpable testis give accuracy of 100% and a specificity numeral of 84% respectively [27]. Part of our (grey-scale) limitations was that we were unable to demonstrate the testicular tissue in the inguinal region. Ultrasonography has a high sensitivity (after maximum baseline of 30 weeks GA) in determining the presence and localization of testis in perineal region *in-utero*.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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