

MICROSCOPICAL AND MACROSCOPICAL FEATURES OF SURGICAL EXPLORED  
CRYPTORCHID TESTES<sup>1</sup>\*Dr. Ahmad Mohammad Maree, <sup>2</sup>Dr. Luay Abdulsattar Saadallah Alhankawe<sup>1,2</sup>M.B.Ch.B./C.A.B.H.S (Urology), Al Salam Teaching Hospital.

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## ABSTRACT

**Background:** Cryptorchidism defined as failure of one or both testes to descend into the scrotum, it is one of the most frequent congenital disorders affecting male genital system. **Objectives:** To evaluate the anatomical, morphological anomalies and histopathological changes of undescended testes in patients at various ages presenting to our center. **Methods:** The study includes 40 male patients with ages (range 2-37 years) who presented with a diagnosis of unilateral or bilateral undescended testes and admitted for exploration of the inguinal region in the urology department of AL-Salam Teaching Hospital in Mosul from December 2022 to December 2024. **Results:** The study included 40 male patients with ages ranging from 2 and 37 years (range 2-37 years). The location of the testes was variable with the most common being the intracanalicular position in 20 (54%) cases. Twenty-two (58%) of the explored testes had normal size, the others being smaller or atrophic. Germ cell count was markedly diminished in 26 cases (58%) with the risk being higher for older age groups. One patient (3%) in our study was discovered to have intratubular germ cell neoplasia. **Conclusion:** The study revealed that surgically explored cryptorchid testes show gradual macroscopical and microscopical degradation with age, marked by testicular atrophy, ductal abnormalities, germ cell depletion, and, in rare cases, malignant transformation. These findings strongly support early orchiopexy and highlight the need of histological assessment in guiding treatment and prognosis.

**KEYWORDS:** Germ Cell Count, Orchiopexy, Undescended testis.

## 1-INTRODUCTION

Cryptorchidism defined as failure of one or both testes to descend into the scrotum, it is one of the most frequent congenital disorders affecting male genital system.<sup>[1]</sup> Cryptorchidism affects about 1-4% of full-term male newborns, with a higher prevalence recorded in preterm infants.<sup>[2]</sup> Although spontaneous testicular descent can occur during the first few months of life, persistent cryptorchidism after infancy is considered abnormal and requires clinical assessment and surgical correction.<sup>[3]</sup>

Normal testicular descent is a complex, hormonally regulated process that happens in two stages; the transabdominal phase and the inguinal phase. Disruption of this process, whether caused by hormonal insufficiency, anatomical obstruction, genetic factors, or

environmental influences, can result in undescended testes along the normal course of descent or, less typically, in ectopic placements.<sup>[4-5]</sup> The prolonged exposure of the undescended testis to suprascrotal temperatures is thought to play a significant role in the increasing structural and functional degradation seen in cryptorchid testes.<sup>[6]</sup>

Surgical exploration, most often through orchiopexy, is still the standard of care for cryptorchidism. In addition to attaining proper testicular placement, surgical exploration offers an excellent chance to evaluate the gross (macroscopic) characteristics of the testis, epididymis, and spermatic cord.<sup>[7]</sup> Macroscopic signs such as reduced testicular size, changed consistency, abnormal pigmentation, epididymal disjunction, and

related processus vaginalis patency have been widely described and may reflect the severity and length of testicular maldescent.<sup>[8]</sup>

Beyond gross morphology, histological (microscopic) examination of cryptorchid testes has revealed a range of alterations associated with age at surgery, testicular location, and subsequent reproductive potential.<sup>[9]</sup> The clinical importance of these structural changes goes beyond the obvious anatomical implications. Cryptorchidism is a well-documented risk factor for infertility, testicular atrophy, and testicular cancer later in life. Histological abnormalities discovered throughout childhood may be early indicators of defective spermatogenesis and malignant transformation. As a result, a thorough examination of both macroscopical and microscopical characteristics of surgically examined cryptorchid testes provides crucial information about disease etiology, prognosis, and long-term results.<sup>[10-11]</sup>

Despite advances in surgical procedures and increasing awareness of early orchiopexy, there is still diversity in the morphological findings of cryptorchid testes among populations and age groups. Furthermore, the correlations between intraoperative gross appearance and underlying histological changes are not well reported in the literature, especially in resource-constrained environments. As a result, the aim of this study is to completely evaluate the macroscopical and microscopical aspects of surgically examined cryptorchid testes, as well as explore their association with clinical parameters such as patient age, laterality, and anatomical position of the undescended testis. A deeper knowledge of these morphological patterns may help to enhance clinical decision-making, optimize surgical intervention timing, and provide better counseling about future fertility and cancer risk.

**2-PATIENTS AND METHODS**

From December 2022 to December 2024, data collected was done. The study includes 40 male patients with ages (range 2-37 years) who presented with a diagnosis of unilateral or bilateral undescended testes and admitted for exploration of the inguinal region in the urology department of AL-Salam Teaching Hospital in Mosul. After obtaining signed informed consent from the patients or their parents explaining the procedure and informing them about the biopsy that would be taken from the affected testes, an open exploration of the inguinal region was done under general anesthesia. For patients in whom testes was palpable, restoration of these undescended testes into a sub-dartos pouch in the ipsilateral scrotum (orchidolysis and orchidopexy) was done after taking a biopsy from the body of the testes. The biopsy was preserved in Blouin’s solution (which is a mixture of alcohol, formalin and glacial acetic acid). The specimen was then sent for histopathological examination where germ cell count was assessed together with the absence or presence of CIS. In some cases orchidectomy was done because of small atrophied

testis or patient age. This was dependent on the surgeon personal decision at the situation. Intra-operative assessment of the testes and epididymis was done regarding the location of the testes and the absence or presence of vassal and/or epididymal anomalies. The longitudinal diameter of the testes was measured to roughly assess the testicular size. Recurrent stone formers were identified as having at least two episodes of renal stone formation. The patient's sociodemographic information, such as age, sex, residence and family history of same condition were asked in part one of the questionnaire. The second part for relevant medical history which include previous urinary tract infection, diabetes, hypertension, gout. Anthropometric information was covered in part three. While, lifestyle and environmental factors such as low daily water intake, high ambient temperature exposure (outdoor workers), high salt, high animal protein consumption and taking plenty of soft drink were covered in part four. Lastly, stone composition was covered by part five. The size of the testes measured accurately by comparison with a set of elliptical beads of increasing volume (the Prader orchidometer). These data, together with the laterality of the disease, the biopsy result and the operation that has been performed were collected and recorded in a special formula prepared for the study.

The statistical software SPSS-30 (Statistical Packages for Social Sciences, version 30) was used to analyze the data. Data were interpreted in simple measures of frequency and percentage.

**3- RESULTS**

The study was done on 40 patients with age of (range 2-37 years). As shown in table 1.

**Table 1: Distribution of the study patients according to their age.**

Age Group (years)	No. (%)
< 2	- (0)
2 – 4	11 (27.5)
5 – 10	10 (25)
11 – 15	6 (15)
16 – 20	7 (17.5)
> 20	6 (15)
Total	40

Patients underwent a total of 40 open exploration of the inguinal region for undescended testes including right operation in 25 and left in 13 patients. Bilateral operation was done for 2 patients. As shown in figure 1.

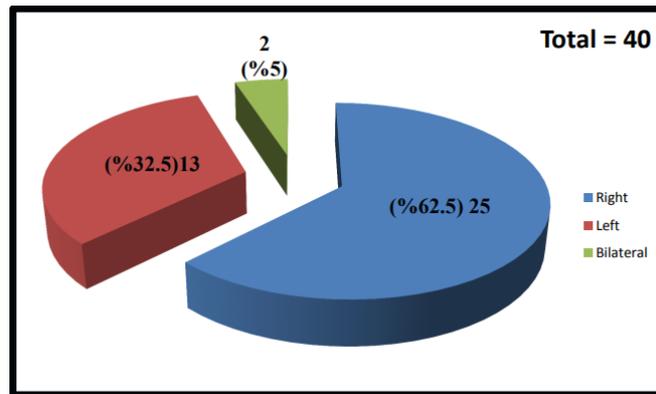


Figure 1: Distribution of the study patients according to the side of undescended testes.

Intra-operatively, the location of the testes was variable. It was found in the retroperitoneum in one case (at a level higher than the internal ring). In 13 patients, the testes were found lying on the internal ring. Twenty patients had intracanalicular testes and 3 others had their testes in the supra-scrotal area. In 5 patients no testis was found. Four of the explored testes showed vassal and/or

epididymal anomalies including a high-looped epididymis in 2 cases. A blind-ended vas away from the testes was found in the other 2 testes. Depending on the intra-operative findings and the surgeon judgment, orchidectomy was done for 5 patients their ages were (16, 13, 22, 6, 10) years and orchidopexy into the scrotum was done for the others. As shown in table 2.

Table 2: Intra-operative Findings and Type of Management.

Location of The Testes	
Intra-abdominal	1(3%)
Over The internal Ring	13 (35%)
Intracanalicular	20 (54%)
Suprascrotal	3 (8%)
Vasal &/or Epididymal Anomalies	
Present	4 (9.5%)
Absent ( No Anomaly)	38 (90.5%)
Operation That Has Been Done	
Orchidectomy	5 (12%)
Orchiopexy	32 (76%)
None (Absent Testes)	5 (12%)

Of the 37 cases in whom testes were present, 22 had normally sized testes and 15 had smaller than normal or atrophic testes as assessed by the measurement of the longitudinal diameter intraoperatively. As shown in table 2.

Histopathological examination of the biopsies taken from the testes showed different degrees of germ cell aplasia. A markedly diminished GCC was found in 26 cases, slightly diminished in 6 cases and normal GCC was encountered in 5 cases. The degree of hypoplasia was increasing in severity with increasing age. Almost all patients older than 10 years of age had a markedly diminished germ cell count. One of the two patients who had bilateral undescended testes and 37 years old had seminoma in the right side and ITGCN in the left, The patients were counseled for orchidectomy. However, he failed to continue his follow-up and orchidectomy was not done. As shown in figure 3.

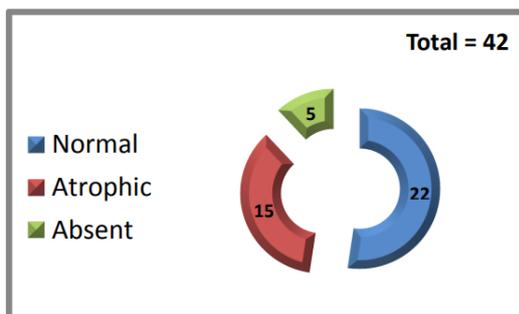


Figure 2: Testicular Size – pie chart.

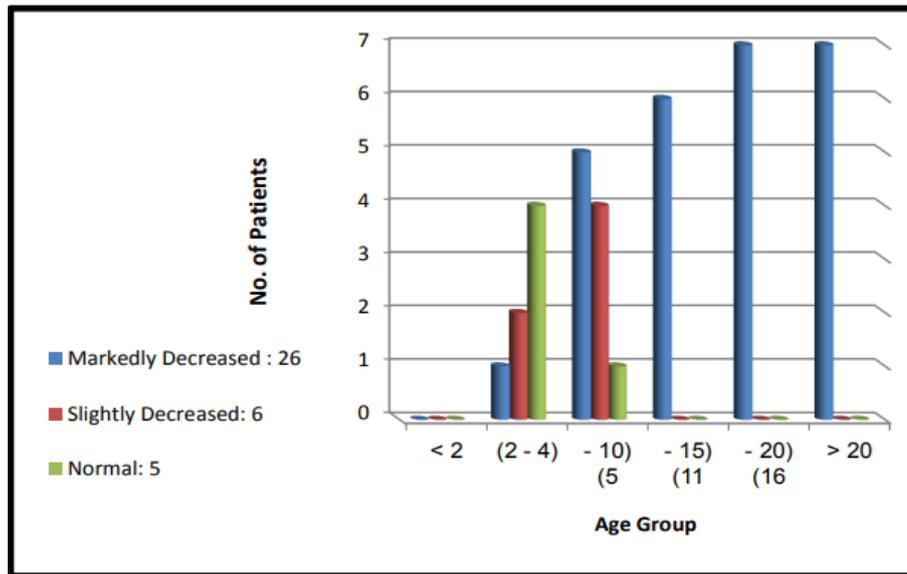


Figure 3: Germ Cell Count in The Affected Testes.

4. DISCUSSION

Cryptorchidism remains one of the most clinically relevant congenital defects of the male genital tract due to its documented link to poor spermatogenesis, testicular atrophy, and an elevated risk of cancer. The current study assessed the macroscopical and microscopical characteristics of surgically examined cryptorchid testes and found a significant link between delayed descent and gradual structural degeneration.

Although undescended testes is a congenital anomaly that is noticeable at birth, none of our patients were seen discovered in their first year of life which is the ideal age for surgical intervention.<sup>[12]</sup> In the aforementioned study, almost 80% of patients were older than four years at the time of surgical intervention, underscoring significant delays in diagnosis and referral. This pattern of late presentation is consistent with multiple large clinical series, where median ages at orchiopexy frequently exceed the recommended early intervention window.<sup>[13-14]</sup> This delay in presentation is partly a reflection of the level of awareness of people and the non-availability of trained birth attendants that can diagnose undescended testes at delivery.

The distribution of undescended testes in the current study was primarily on the right side (62.5%), with left-sided cases making up 32.5% and bilateral involvement in 5% of patients. This pattern is consistent with several clinical series that report right-side predominance; for instance, Kollin *et al*<sup>[15]</sup> found a similar predominance of right-sided undescended testes in their large pediatric cohort, and Al-Ghamdi *et al*<sup>[14]</sup> also reported a higher incidence on the right, with less frequent left and bilateral cases. These findings suggest that the laterality pattern may be due to underlying embryological asymmetries in testicular descent and vascular anatomy.

The majority of undescended testes in the current study were found in the inguinal canal or internal inguinal ring, with a minor proportion being intra-abdominal or absent. These findings are similar with earlier surgical data, in which the intracanalicular testes were the most commonly discovered region during exploration<sup>[15]</sup> Absent or vanishing testes are most likely due to prenatal vascular impairment or testicular regression syndrome.

Several patients in the present study showed associated epididymal and vas deferens abnormalities. Such abnormalities have been recorded in up to 30-40% of cryptorchid testes, and are likely to be caused by interrupted mesonephric duct formation.<sup>[16]</sup> These anomalies are clinically significant because they may impair reproductive potential even after successful orchiopexy.

Orchidectomy was performed in selected cases depending on the patient's age, intraoperative appearance, and histological findings. The approach is supported by international recommendations, which advise orchidectomy for severely atrophic testes in post-pubertal patients due to decreased reproductive potential and higher cancer risk.<sup>[17]</sup>

Macroscopic examination found that a considerable majority of cases had reduced testicular size and an atrophic look, particularly among older patients. Testicular atrophy is a well-known side effect of prolonged exposure to supra-scrotal temperature and is closely linked to reduced spermatogenic ability. Previous study has shown that as age increases at orchiopexy, testicular volume gradually decreases, confirming the hypothesis of time-dependent damage.<sup>[18]</sup> The current findings emphasize the need of early surgical intervention in maintaining testicular shape.

The histopathological examination revealed varying degrees of germ cell depletion, seminiferous tubule atrophy, basement membrane thickening, and interstitial fibrosis. Germ cell loss was the most common microscopic result, with a clear age-related trend. Almost all patients older than ten years showed severe germ cell loss. These findings are similar with the seminal work of Thorup *et al.*<sup>[9]</sup> Subsequent research has established that histological damage occurs early in childhood and worsens with age.<sup>[19]</sup>

One adult patient with long-standing bilateral cryptorchidism had malignant transformation, with a seminoma in one testis and intratubular germ cell neoplasia in the other. This finding lends strong support to the previously established link between cryptorchidism and testicular cancer. Elsonbaty *et al.*<sup>[20]</sup> found severe histological alterations, such as atrophy, fibrosis, and even cancer *in situ*, in samples from males with a history of cryptorchidism undergoing reproductive treatment. This study confirms that cryptorchid testes may have premalignant or malignant microscopical characteristics that correspond with clinical infertility. The current finding emphasizes the significance of diligent supervision and competent surgical decision-making in post-pubertal patients.

The study's main limitations are its limited sample size and the absence of long-term fertility and hormonal outcome assessments. Nonetheless, the combination of macroscopical and microscopical traits provides useful insight into the pathogenic spectrum of cryptorchid testes and validates current recommendations for early surgical intervention.

## 5- CONCLUSION

In conclusion, surgically explored cryptorchid testes show gradual macroscopical and microscopical degradation with age, marked by testicular atrophy, ductal abnormalities, germ cell depletion, and, in rare cases, malignant transformation. These findings strongly support early orchidopexy and highlight the need of histological assessment in guiding treatment and prognosis.

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## Conflict of interest

About this study, the authors disclose no conflicts of interest.

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