

## Paediatric Undescended Testes Management in Government General Hospital Guntur-5 years Study

Chanda Bhaskara Rao<sup>1</sup>, Aralikatti Hemavathi Revanappa<sup>2</sup>, Bhavana Chanda<sup>3</sup>

<sup>1</sup>M. S, M. Ch Paediatric Surgery, Associate Professor, Department of Paediatric surgery, Government General Hospital and Guntur Medical College, Guntur, Andhra Pradesh.

<sup>2</sup>MBBS (M.D), Medical Officer, Department of Paediatric Surgery, ECHS Polyclinic, Guntur, Andhra Pradesh

<sup>3</sup>MBBS (M.D), Postgraduate, Department of General Medicine, Osmania Medical College, Hyderabad.

Institution to which the research is associated with Government general hospital and Guntur Medical College, Guntur, Andhra Pradesh, India

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Corresponding author: Dr. Chanda Bhaskara Rao

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### Abstract

Undescended testis one of the common problems in pediatric population. Nearly half of the undescended testis descends into scrotum within six months spontaneously. Current trend of management is to repair as early as possible within the first year of life. Late management or repair may lead to dysplastic changes in the testis and prone for higher malignancy incidence. We have collected the data of the undescended testis in pediatric surgery department of Government General Hospital and Guntur Medical College, Guntur over the period of 5 years from January 2017 to December 2021.

**Introduction:** Cryptorchidism means hidden testes or invisible testis and other common names are undescended and maldescended testis. There are many controversies in the management and other aspects of undescended testes. Knowledge of abnormal morphogenesis, hormonal effects, molecular pathology of undescended testes very important to diagnosis as well as treatment of this very common entity. Hormonal therapy is not much useful, Orchiopexy is best successful treatment to relocate the testis into the scrotum. Successful orchiopexy may reduce but not completely prevent potential infertility and testicular malignancy. Proper counseling and regular long-term follow-up of the patient are essential to detect malignancy.

**Study design:** Its retrospective observational study of Undescended testis in children with evaluation and management during the period of January 2017 to December 2021.

**Materials and Methods:** Data collected during January 1st ,2017 to December 31<sup>st</sup> ,2019 regarding operated cases of undescended testis in pediatric surgery department of government General Hospital Guntur, Guntur Medical College, Guntur, Andhra Pradesh, India. Total number patients of undescended testis operated during these 5 years are 232 cases. Total number of testes operated was 275. Right side undescended testis 113 cases (48.7%), Left side undescended testis 76 cases (32.7%). Bilateral undescended testis 43 cases (18.5%). Procedures adopted are 1 standard classical inguinal orchiopexy done 230 testes (226 orchiopexies four nubbins, two transverse testicular ectopia noted), 2. Inguinal incision with intra-peritoneal exploration in 19 testes and orchiopexy in 16 testes, two blind ending vas, one nubbin noted, 3. laparoscopy in 26 testes, orchiopexy done in 19 testes, three testes

absent, two blind ending vas, two nubbins were noted. Total number of patients were 232. Total testes studied was 275.

**Results:** Out of 230 inguinal explorations, 226 testes placed in scrotum (98.2%). Low intra-abdominal testes 19 explorations done, 16 orchiopexies, two blind ending vas, one nubbin (84.2% orchiopexies). High intraabdominal position testes, 26 explorations done, 3 absent testes, 2 blind ending vas, 2 nubbins, 19 orchiopexies (73%). Out of 275 exploration, 261 testes placed in scrotum (94.9%). On follow up eight testes were Atrophied (3.16%), eleven testes ascended (4.34%) six wound infections (2.18%).

**Conclusion:** Surgical correction is main treatment for undescended testis. Successful placement of testes in scrotum is possible in almost all cases. Minimum surgical complication operatively. Follow up needed till attaining puberty. Incidence of malignancy, infertility increased if delayed orchiopexy beyond 2 years age. Early orchiopexy (6 months to one year) may improve the infertility, probably decrease the malignancy. Atrophy of testes, Ascended testes less common than many studies.

**Keywords:** Cryptorchidism, Undescended testis, Maldescended testes, Orchiopexy

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## Introduction

Undescended testis or Cryptorchidism is the one of the common congenital urinary tract problems seen in male children. Incidence of undescended testis in the Newborn period approximately 3.5% [1]. Cryptorchidism means hidden testes or invisible testis and other common names are undescended and maldescended testis. There are many controversies in the management and other aspects of undescended testes. Late detections and late management may lead to deleterious effects on the testis [2]. Knowledge of abnormal morphogenesis, hormonal effects, molecular pathology of undescended testes very important to diagnosis as well as treatment of this very common entity. Hormonal therapy is not much useful, Orchiopexy is best successful treatment to place the testis into the scrotum. Successful scrotal placement of the testis may reduce infertility and malignancy incidence, not completely remove the risk. Proper counseling and regular long-term follow-up of the patient are essential to detect malignancy. It was first seen in the medical literature as reported by Baron Albrecht von Haller and John Hunter (fathers of modern surgery and anatomy) in 1786. In 1820 the first

surgical repair was done by Koch and Rosenmerkal by fixing the testes to fundus of scrotum. Thomas Annandale did the first successful orchiopexy in 1877. Max Schüller, Lattimer, Arthur Dean Bevan refined to the current techniques for regular standard orchiopexy. Jones' approach (high inguinal incision), laparoscopy and scrotal approach were added later.

**Embryology:** Primordial germ cells (PGC) migrate from the yolk sac to genital ridge in 3<sup>rd</sup> week. PGC divide up to 3000 cells, undergo specialization with activation of gametogenic genes and inactivation of pluripotency genes. Gametogenesis-competent cells will either differentiate into male or female specialized cells in response to Sex-determining Region Y protein (SRY) [3] or Testis-Determining Factor (TDF) gene on short arm of the Y chromosome. Simple absence of this SRY(TDF)gene will lead to the development of a female embryo. Genital ridge is beside the dorsal mesentery and ventromedial surface of the mesonephros. Mesonephros (Wolffian duct) develops in to epididymis, seminal vesicles, and vas deferens. The paramesonephric duct

(Mullerian duct) is also found in the mesonephros and runs in parallel to the mesonephric duct. It is the female equivalent of the mesonephric duct (Wolffian duct) and gives rise to the uterus, fallopian tube, and upper vagina. The SRY gene is the principal driver for testis development, and acts as a transcription factor [4]. From the 4th to the 8th week, the germ cells coalesce to form the primordial testis. Human chorionic gonadotropin influences the Leydig cells to secrete testosterone. By 5-6 weeks, the gender of the embryo is determined. In the 9th week, labioscrotal swellings fuse to form the scrotum. The formation of the epididymis, vas deferens, and seminal vesicles from the mesonephric (Wolffian) duct is influenced by testosterone. The testis moves from the genital ridge to the internal inguinal ring, the processus vaginalis starts as an outpouching of the parietal peritoneum and extends into the bottom of the scrotum by intraabdominal pressure. The testis stays at the internal inguinal ring from 10 to 12 weeks. From 26 to 36 weeks, the epididymis precedes the testis into the processus vaginalis and is attached to the bottom of the scrotum to avoid torsion. From 37 to 40 weeks (full term), the processus vaginalis closes, and by 36 weeks the testis descends into the scrotum.

Paramesonephric structures regress by the influence of MIS (Mullerian inhibiting substance) secreted by the Sertoli cells. The appendix testis is a persistent proximal remnant of the Müllerian duct. Early development failure leads to the absence of the testis as well as Wolffian structures. Late failure may lead to the absence of the testis with intact Wolffian structures. Most cases of non-palpable testes are caused by failure of descent of the developed testis. Migration of the testes is partly dependent on high intra-abdominal pressure.

The first stage of testicular descent (transabdominal) occurs by the eighth week and is dependent on a non-androgenic hormone, which starts by the eighth week.

Between 8-15 weeks, the gubernaculum [5] enlarges as the gubernaculum bulb [6], the cranial suspensory ligament (CSL) [7] regresses. Regression of the CSL is a necessary, but not alone sufficient, for testicular descent. Growth of the gubernaculum is non-androgen dependent. Insulin-like growth factor 3 (Insl3) is a "relaxin-like factor" and facilitates the growth of the gubernaculum. Inguinoscrotal stage of descent (second stage) starts by the 26th week and is androgen-dependent. Processus vaginalis formation, abdominal pressure, contraction - regression of the gubernaculum will help in the 2<sup>nd</sup> stage. The scrotum is a continuation of the abdominal wall layers, Scarpa's fascia continues as the dartos fascia.

The testis has both an exocrine function (sperm production) and an endocrine function as part of the hypothalamic-pituitary-gonadal axis with production of androgens. Sertoli cells [8] are epithelial supportive cells that provide nutrients, phagocytosis of apoptotic spermatocytes, transport primary mature spermatocytes to the lumen, and maintain the blood-testis barrier. Sertoli cells respond to FSH and testosterone stimuli in turn regulate spermatogenesis. They secrete inhibin B [9], which helps in suppressing the secretion of FSH. They also secrete an androgen-binding protein (ABP). Leydig cells are the primary source of steroid hormones, calcium-binding proteins, and growth factors.

Gonadotrophin-releasing hormone (GnRH) by the anterior hypothalamus stimulates the luteinizing hormone (LH) and follicle-stimulating hormone (FSH) in the anterior pituitary. LH and FSH have receptors on Sertoli and Leydig cells. Leydig cells produce testosterone by LH stimulation, whereas FSH stimulates Sertoli cells to produce androgen-binding proteins (ABPs) [10]. Leydig cells produce testosterone by the cholesterol-pregnenolone-progesterone-testosterone route. Normal spermatogenesis and storage in the

epididymis require temperatures below that of the core body. Spermatogenesis needs less temperature of 2 to 7 Celsius below core body temperature .Any anomaly in either the hormonal control or the anatomical processes in normal testicular descent will cause UDT, mechanical abnormalities may be more likely than hormonal.

**Materials and Methods:** data collected during January 1st ,2017 to December 31<sup>st</sup> ,2019 regarding operated cases of undescended testis in pediatric surgery department of government General Hospital Guntur, Guntur Medical College Guntur. All the documents reviewed; data analyzed. Ectopic testes. Retractable testis excluded in study. Total number patients

of undescended testis operated during these 5 years are 232 cases. Right side undescended testis 113 cases (48.7%), Left side undescended testis 76 cases (32.7%). Bilateral undescended testis 43 cases (18.5%). Total number of testes operated was 275. Right side testes 113 (41%), left side testes 76(27.6%), bilateral testes 86 (31.2%). Clinically Testes is palpable in 89 cases (78.76%) on right side. Left side clinically palpable testis in 53 cases (69.7%). In bilateral undescended testis clinically palpable testes found in 28 cases(65.1%) either right side or left side or palpable on both sides.( on right 32 palpable , on left side 16 testes palpable, in 4 cases both sides of testis is palpable).

**Table 1: Undescended testes pre-operative status**

		UDT cases	Testes	Palpable testes
1	Right	113(48.7%)	113	89(78.76%)
2	Left	76(32.7%)	76	53(69.7%)
3	Bilateral	43(18.5%)	86	56(65.1%),R-32,L-16,BL-4 on both sides
	Total	232 cases	275 testes	198(72%)

Routine inguinal/scrotal or abdominal ultrasound is done to document the size of the testis, position of testis, presence or absence of hernial sac. MRI imaging done in cases of nonpalpable intraabdominal testis or absent testis on ultrasound. If undescended testis is associated with severe form of hypospadias, we advise karyotyping to rule out DSD (disorder of sexual differentiation).

Mean age of presentation 66.24 months or five years six months seven days. Youngest patient is 2 months old. Oldest patient age is 12 years. Right side undescended testis mean presentation age is 5.52 years. Left side undescended testes mean presentation age is 5.83 years. Bilateral undescended testis mean presentation age is 4.05 years. When newborn comes with undescended testis, we advise regular follow up up to 6

months age, Orchiopexy between 6 months to one year age, maximum permissible safe age is before 18 months.

During these five years total number of operative procedures in the department of pediatric surgery was 3998. Out of 3998 undescended testis operations were 232cases (5.80%).

Mean hospital stay was 7.81 days. least stay was 3 days. maximum stay was 15 days. Hospital stay means admission date to discharge date including Post operative stay. suture removal protocol was 7<sup>th</sup> postoperative day. Most of the cases are covered under state government run insurance scheme. This involves online submission of documentary evidence of disease and needs to get prior approval for surgery, then only operation can be done. Submission of operative images, operative notes, post operative scar after suture

removal and postoperative ultrasound are mandatory for the final approval of insurance scheme. Free food provided. Transport charges and loss of workdays minimum wages given at discharge.

Procedures done: Operative approach was decided by preoperative position of testes clinically and ultrasound/MRI information, outside the internal ring (inguinal), below the external iliac vessels (low intraabdominal) or above the external iliac vessels (high intraabdominal). Total number of patients were 232, total testes studied was 275. Procedures done 1. standard classical inguinal orchiopey done for inguinal positioned 230 testes, 2. Inguinal incision with intra-peritoneal exploration in low intraabdominal 19 testes, 3. Laparoscopic procedure done in high intraabdominal 26 testes [11].

All patients, orchiopey done with general anesthesia with endotracheal intubation. Palpable testes or ultrasound finding of presence of testis in inguinal canal or close to the internal ring, a standard inguinal approach orchidopexy done. If the testis is not found in inguinal canal or near the internal ring, peritoneum opened just above the internal ring, then and look for testes. If the testis is found next step will be assessment of feasibility of bringing the testes into scrotum, subdarto's pouch orchiopey was done. if it is not possible to bring the testes to the bottom of the scrotum, open Fowler Stephen single stage or two stage done depending on available mobility of testes. If blind ending vas and vessels was found, abandoned the search and close the wound. Contralateral testis is fixed to the scrotum to prevent future torsion. In case of nonpalpable testes with testicular remnant and contralateral testicular hypertrophy, removal of the testicular remnant and contralateral scrotal orchiopey to prevent future torsion.

We have done laparoscopic exploration and orchiopey in cases of bilateral nonpalpable testis, high abdominal testis

or absent testis on imaging studies. Primary orchiopey if the testicular vessels are long and sufficient. Short testicular vessels or testis is not mobile, Fowler-Stephens [12] single stage orchiopey if feasible, or Fowler-Stephens single stage followed by open orchiopey at later date usually post op six months' time. Routine laparoscopy procedure not done in our institute due to constraints of available personnel as well as time slots. Laparoscopy used as a diagnostic tool as well as for orchiopey. Bladder catheterized. Three ports used one 10 mm and two 5 mm ports. Entire abdomen is explored. Identification of patent process vaginalis, median umbilical ligament, latera umbilical ligament, deep ring, Hasselback triangle, Vas difference which crosses the medial umbilical ligament, spermatic vessels, inferior epigastric vessels, Triangle of doom, Iliac vessels, urinary bladder, gubernaculum testis, and Testes itself. Procedure involves only dissection or cutting of peritoneum only. Division of gubernaculum testis, used as a handle to pull the testis to assist the dissection. If the testis is found within two centimeters from internal ring [13], orchiopey can be done primarily without division of spermatic vessels in same sitting. If 8 to 10 centimeters length of spermatic vessels [14] freed or if the testes can reach opposite deep ring, it can reach bottom of scrotum as well. If the distance is more than 2 centimeters from the internal ring, needs division of testicular vessels [15] as high as possible. Fowler Stephen one stage or two stage depending upon the available length and difficulty in dissection carried out. Laparoscopy findings of vessels entering the internal ring, testis below the external iliac vessels (low abdominal) can be done in single stage, testis seen above the external iliac vessels (high), High abdomen needs two-stage Fowler-Stephens procedure. New internal ring can be created medial to

inferior epigastric artery and lateral to medial umbilical ligament.

### Results

Ultrasound done at the time of discharge as a part of insurance scheme requirement and next follow up at six weeks with clinical assessment and ultrasonic examination if necessary. At the time of discharge results are as follows. 1. standard classical inguinal orchiopexy done for 230 inguinal positioned testes, four nubbins, one transverse testicular ectopia noted, 226

orchiopexies (98.2%) 2. Inguinal incision with intra-peritoneal exploration done for low intra-abdominal 19 testes, orchiopexy in 16 testes (84.2%), two blind ending vas, one nubbin noted. 3. Laparoscopy done in 26 testes which were placed High intraabdominal position, successful orchiopexy done in 19 testes (73.07%), three testes absent, two blind ending vas, two nubbins were noted. Total number of patients were 232, total testes studied was 275, successful orchiopexies 261 (94.9%). 14 testes absent or nubbins (5.09%).

**Table 2: Surgical procedures**

	PROCEDURE	Number of testes	Successful orchiopexy
1	Inguinal explorations	230	226 (98.2%)
2	Inguinal incision with abdominal exploration	19	16 (84.3%)
3	Laparoscopic explorations	26	19 (73.07%)
	Total	275	261 (94.9%)

Complications: Hematoma in four patients (1.45%), wound infection in six procedures (2.18%) one Inguinal wound, three scrotal cellulitis. two port infection. On follow-up, eight testes Atrophied (3.16%), eleven testes ascended (4.34%). No post operative hydrocele or hernia noted, no torsion reported.

### Discussion

Undescended testes one of the common pediatric surgical problems. Diagnosed clinically with image studies ultrasound and MRI if needed. Main treatment modality is surgical correction. Hormonal treatment may have some role in cases of retractile testis management but not in UDT. Most of the most of the undescended testes are palpable in the inguinal region. Undescended testis maybe due to abnormalities in the formation of testes, arrest of descend of the testis intraabdominal part due to hormonal factors, extra-abdominal part descends abnormalities due to mechanical factors.

Orchiopexy should be done within first year of life (6-12 months) for long term optimal results with regard to improved fertility and decreased malignancy potential. Our mean age of presentation 66.24 months or five years six months seven days, shows poor information network from health care professionals to the patients in our society, needs widespread public awareness programs by the state and by healthcare professionals. Current trend is laparoscopy and assisted orchiopexy for nonpalpable intraabdominal testis [16], for palpable undescended testis classical inguinal orchiopexy [17]. mobility of the testis towards the opposite internal inguinal ring during laparoscopy is an excellent intraoperative indicator for safe orchiopexy into scrotum. 50% of intra-abdominal testes are located close to the internal ring. Operative complications of both laparoscopic orchiopexy and open orchiopexy are minimal in immediate post operative period. No scrotal incision

orchiopexy done in our institute [18]. On follow up testicular atrophy and acquired UDT are two important complications before puberty. The most serious of these complications is testicular atrophy, resulting in loss of a testis by Devascularization ischemia usually due to excessive skeletonization cord and high electrocautery. Incidence of testicular atrophy [19] 8% in palpable group and as high as 15% for non-palpable testes in literature. Ascended testis [20] after orchiopexy or acquired UDT is known complication may be due incomplete retroperitoneal dissection or inadequate cremasteric fibers dissection. Reoperation can be done for atrophy and ascent after 6 months gap. The atrophic testis remnants may be removed and sent for biopsy. long term complications are malignancy and infertility in adulthood. TGCT (testicular germ cell tumor) are 5-10 times more common in UDT on follow-up (Seminoma and embryonal carcinoma). [21] TGCT, reduced sperm concentration, hypospadias, and UDT, testicular dysgenesis syndrome (TDS), all these have a common origin in prenatal abnormal testicular development which affects germ cell differentiation and Leydig, Sertoli abnormalities. The risk of infertility significantly higher with bilateral UDT. 10% men with infertility have a history of orchidopexy. untreated bilateral UDT causes azoospermia in of 89% men. If bilateral orchiopexy was done, 28% of these men have up to 20 million sperm/ml. untreated unilateral UDT have at least 20 million sperm/ml in 50% as compared to 70% after orchiopexy. orchiopexy improves sperm count in unilateral and bilateral cases, best improvements in than 2 years age at orchiopexy. unilateral UDT have same paternity rate as the normal population though with lower fertility rate. bilateral UDT have a lower fertility and paternity rate. Ultrasound useful to assess testis parenchymal structure and size of UDT. Testicular volume is assed by Testicular

volume (TV) =  $0.52 \times \text{width} \times \text{length} \times \text{height}$ , all in centimeters. The testicular atrophy index (TAI)  $\text{TAI} (\%) = (\text{contralateral TV} - \text{affected TV}) / \text{contralateral TV} \times 100\%$ . TAI is objective and important tool in acquired UDT or retractile testes interventional assessment.

### Conclusion

Undescended testis is common pediatric surgical problem which has psychosocial implications in the in the entire family. Early surgical correction before first birthday is very important role in the management. Mean age of presentation in our institute 66.24 months or five years six months seven days, needs widespread public awareness for early referral. Open surgical orchiopexy for palpable undescended testis, laparoscopic assisted orchiopexy for nonpalpable intraabdominal undescended testis was our choice. operative complications in the immediate postoperative were minimal. Both open and laparoscopic orchiopexy, we have very excellent results, with immediate post operative success rate was 94.9% in orchiopexy and 2.18% postoperative wound infections.

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