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ORIGINAL RESEARCH

Anatomical Study of Association of Undescended Testes with Preterm Births and Low Birth Weight

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ABSTRACT

Background: Testes develops within abdomen on the posterior abdominal wall and begin to descend down through the inguinal canal to reach the scrotum. If one or both the testes fail to descend down into the scrotal sac and lie anywhere along the pathway of descent, this condition is known as Undescended testes or Crytorchidism. This condition is significantly more prevalent in preterm, premature, SGA (small for gestational age) and LBW (low birth weight) babies. The risk for injury, and carcinoma is higher in undescended testes. Such a testis fails to produce mature spermatozoa leading to infertility. Therefore the study was done with the objectives to find the presence of any association between undescended testes and LBW, prematurity and to find any congenital anomalies associated with undescended testes. **Methods**: This was a dissection based study that was carried out in 100 male cadavers of the perinatal age group. Detailed particulars of the babies like age in weeks, weight and nature of death were collected from the records in the Obstretics and gynaecology department. **Results:** Normal descent was seen in 70 % cases and undescended testes in 30 % cases. In preterm category, undescended testes was noted in 22.5% cases with low birth weight and 10% cases with normal birth weight and in term category, 75% of the cases with normal birth weight showed normal descent. The percentage of undescended testes in LBW babies is higher (60 %) than normal birth weight babies (40%). Congenital anomalies was recorded in 6.67 % cases. Testicular anomalies was seen in 3.33% cases. **Conclusions:** Thus the study have shown a significant association of undescended testes with LBW and prematurity. Congenital and testicular anomalies were also recorded associated with undescended testes.

Key words: cryptorchidism, undescended testes, prematurity, LBW.

INTRODUCTION

The testes are the primary reproductive organ in the male which develops from the primordial germ cells of the epiblast that migrate to the genital ridge around the 6th week of IUL[1]. The testes after formation in the posterior abdominal wall descend through the inguinal canal towards the scrotum. The descent of testis is controlled by various factors like [2, 3]

1. **Gubernaculum testes**: A mesenchymal band that extends from the caudal pole of the testes to the scrotum dilates the inguinal bursa and lays down the path of descent.
2. **Inguinal bursa formation**: It is an outpouching of various layers of abdominal wall towards scrotum which later forms inguinal canal.
3. **Processus vaginalis**: It is a diverticulum of peritoneal cavity that grows into the inguinal canal and scrotum and creates a pathway for the testes to descend.
4. **Increased intra-abdominal pressure** caused by the growth of the viscera hastens the descent through the inguinal canal.
5. ***Intra-abdominal temperature*** Scrotal temperature is 3^{0}C lower than the abdomen which is optimal for the production of mature spermatozoa. So this is a biological reason for the testicular descent into the scrotum.
6. ***Contraction of the arched fibers of internal oblique muscle*** squeezes the convex, slippery surface of the testis and helps in its rapid passage along the inguinal canal.
7. ***Uncurling of the foetal curves:*** When the foetus straightens up from the extremely flexed condition, the gubernaculum drags the testis in the caudal direction.

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8. ***Secretion of testicular hormone*** by the interstitial cells of foetal testis is the most important driving force for the descent.

In 97% of male newborns, testes are present in the scrotum before birth. In remaining, descent will be completed during the first 3 months postnatally. However in less than 1% of infants, one or both testes fail to descend as descent may be arrested at any point along its normal path which is called cryptorchidism or undescended testes.[2] It is a common condition occurring in 1 in 500 individuals[4].

The testis descends[5]

1. From loin to iliac fossa in 3rd month of intrauterine life.
2. From the 4th to 7th month it rests at the site of deep inguinal ring.
3. During 7th month travels through the inguinal canal.
4. In the 8th month lies at the superficial inguinal ring.
5. In the 9th month enters the scrotum, reaching its base at or after birth.

Undescended testis fails to produce mature spermatozoa which leads to male infertility. Such a testis is small and atropic and is an important risk factor for seminoma of the testis. Lifetime risk of neoplasia in undescended testis is 2–3% and such testes is also at a higher risk of injury [2]. Undescended testes are significantly more prevalent in preterm, small for gestational age, low birth weight and twin neonates[6]. The incidence of congenital anomalies of GI system, cardiovascular system, urogenital system and abdominal wall defects is higher in cryptorchids.[7] Inversion of the testis is a testicular anomaly wherein there is alteration of the normal position of the testis in the scrotum. There are 4 types of inversion: superior- posterior border of testis looks upwards and the epididymis lies horizontally on this border, anterior- epididymis is attached to the anterior border of the testis, lateral- epididymis is attached to the lateral surface of the testis and loop- the epididymis and ductus deferens encircle the testicle like a sling.[5](Fig1)

AIMS AND OBJECTIVES

1. To find the presence of an association of undescended testes with low birth weight and prematurity.
2. To find any congenital and testicular anomalies associated with undescended testes.

MATERIALS AND METHODS

This study was carried out in 100 perinatal (28 weeks of gestation to 7 days after birth) male cadavers which were selected randomly amongst the still born fetuses of the said age group delivered in the Department of Obstetrics & Gynaecology, Assam Medical College & Hospital, Dibrugarh, which were deserted by their parents/guardians. The study was carried out for a period of two years. After fulfillment of all official formalities, the bodies of the still born fetuses were received in the Department of Anatomy. The particulars of the still born fetuses (as per Proforma) were collected and preserved. The still born fetuses were dissected immediately. If not, they were preserved in 10% formal saline and dissected on the next day. The still born fetuses were divided according to their age into two groups: 28th to < 37 weeks of gestation and 38th to 42 weeks of gestation. The cadavers were meticulously dissected and the position of both the testes along with presence of any other associated gross congenital anomalies were recorded.

METHOD OF DISSECTION

A longitudinal incision was made on the skin extending downwards along the anterolateral aspect of the scrotum from the superficial inguinal ring to the bottom of the scrotum. Then the skin was reflected from the underlying dartos muscle. The remaining coverings of the testes – cremaster muscle, cremasteric fascia and internal spermatic fascia were also incised and reflected. The testes and spermatic cords were identified, the levels of testes were noted. If one or both the testis were not present in the scrotum, exposure of the inguinal canal was carried out. The superficial and deep inguinal rings were examined for the presence of testes. If the testes were absent in the inguinal canal, exposure of the kidneys in the posterior abdominal wall were done. The testicles were searched for in the lumbar region beginning from the lower pole of the kidney upto the deep inguinal ring. If still not found, the ectopic sites like the perineum, root of penis, upper part of thigh, anterior abdominal wall were exposed and examined for presence of testes. The perinatal cadavers were finally examined for the presence of any other gross congenital anomalies. Findings were recorded as per proforma.

DOI: 10.69605/ijlbpr_14.5.2025.80

PROFORMA

- Serial No. :
- Hospital No. of Mother :
- MRD No. of Mother :
- Name of Mother :
- Age of Foetus (intrauterine/perinatal) :
- Sex :
- Religion :
- Caste/Tribes :
- Date of Death :
- Cause of Death :
- Birth Weight :
- Position of the Testes : Left ... ... Right ...
- congenital anomalies :
- Testicular anomalies :

Inclusion criteria

The still born fetuses or intra uterine deaths of the age group 28- 42 weeks of gestation that are abandoned by the parents in the labour room of Obstretics and Gynaecology department of Assam Medical College.

Exclusion criteria

There is no exclusion criteria.

RESULTS

In this study normal descent was seen in 70% cases and undescended testes in 30% cases (Fig 2). Congenital anomalies were seen in 2 (6.6%) of cases of undescended testes and rest 93.3% of undescended cases were normal without any malformations(Table 1). The first case was 38 week with 3 kg birth weight. Multiple malformations were present in the form of left sided cleft lip and cleft palate, arhinia, soft tissue swellings in the left side of forehead and between right eye and right upper lip, bilateral microphthalmia, epicanthic fold, bilaterally low set ears, syndactyly of middle and ring fingers of right hand and also ring and little fingers of left hand with no distal phalanx, great toe absent bilaterally, syndactyly of left 3rd and 4th toes, hypoplastic scrotum.(Fig 3). The second case belongs to 37 weeks with 3kg birth weight and presented with encephalocele.(Fig. 4) Testicular anomaly in the form of superior inversion of testes was noted in 1 case i.e 3.3 % (Table 2). Our study also showed that out of total 30 cases of undescended testes, 12 cases (40%) had a normal birth weight($\geq$ 2.5 kg) and the rest 18 cases (60%) had a low birth weight(< 2.5 kg). Thus it can be inferred that undescended testes is more common in babies with a low birth weight ($p = 0.003$) which is statistically significant using the chi square test.(Table 3). It was also found that out of 20 term cases (Table 4), normal descent occurred in 16 cases, out of which normal weight was seen in 15 cases (75%) and low birth weight in 1 case (5%). Thus it can be inferred that descent of the testes is generally normal in babies with normal birth weight at term. However, only 4 cases of undescended testes were noted in term newborn who are having normal birth weight. Undescended testes were not seen in term low birth weight babies. This 0% found in the present study ($p > 0.005$) may be attributed to

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the fact that only one baby presented with low birth weight at term. Observation in a larger sample size may lead to modification of results. It was also seen that 54 cases showed normal descent out of the total 80 preterm case (Table 5). Out of these 54 cases, 35 cases (i.e., 43.7%) had a normal birth weight and 19 cases (i.e. 23.75%) had a low birth weight. Thus it shows that normal descent is more common in babies with normal birth weight in preterm newborn. Also 26 cases of undescended testes were noted. Out of the 26 cases, 8 cases (10%) had a normal birth weight and 18 cases (22.5%) had a low birth weight. Hence it can be inferred that in premature babies with low birth weight, the percentage of undescended testes is more than the babies with normal birth weight (p=0.004)

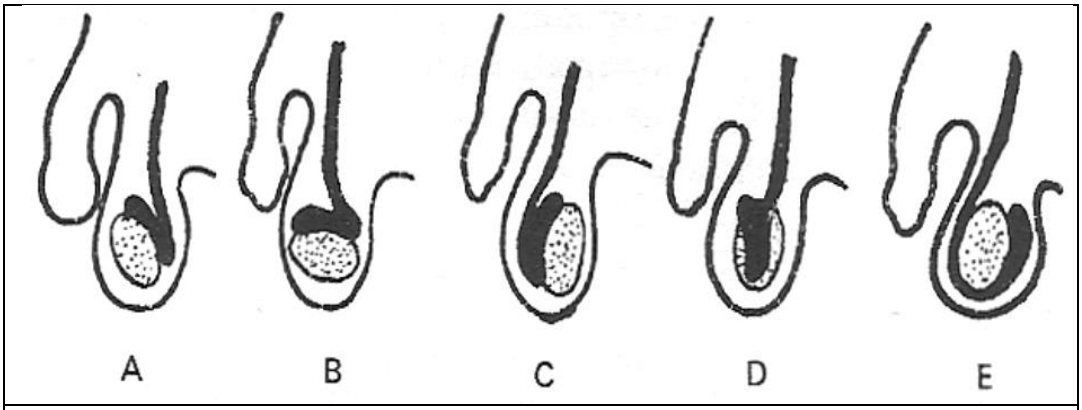

Figure 1 : Inversion of testis

A. Testis normally oriented; B. Superior inversion; C. Anterior inversion; D. Lateral inversion; E. Loop inversion ***(Source: Lee McGregor's Synopsis of Surgical Anatomy, 12th Edition)***

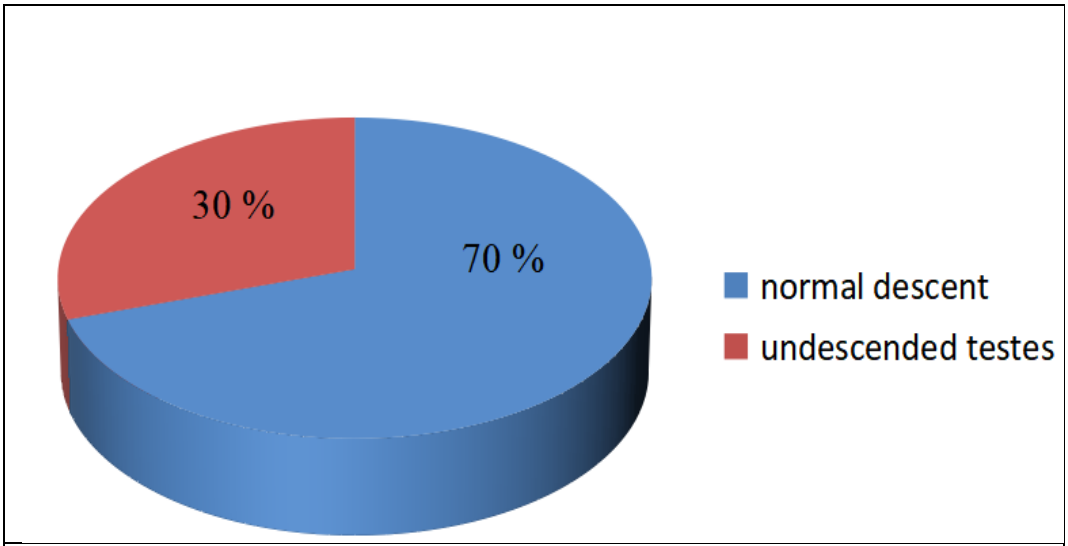

Figure 2: Percentage of normal descent and undescended testes

Congenital anomalies	Number of cases	Percentage (%)
Present	2	6.67
Absent	28	93.33
Total	30	100.00

Table 1: Percentage of cases of undescended testes with and without congenital anomalies

Testicular anomalies	Number of cases	Percentage (%)
Present	1	3.33
Absent	29	96.6

Table 2: Percentage of undescended testes with testicular anomalies

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Birth Weight (in Kg)	Undescended testes		Normal descent		Significance
	No	%	No	%	
≥ 2.5	12	40.00	50	71.43	χ^2= 8.804
< 2.5	18	60.00	20	28.57	df=1
Total	30	100.00	70	100.00	p=0.003
Table -3: Percentage of normal descent and undescended testis in normal and low birth weight					
* p- value calculated using Chi-square test					

Descent	Normal Birth Weight (≥ 2.5 Kg)		LowBirth Weight (<2.5 Kg)		p-value
	No	%	No	%	
Normal	15	75.00	1	5.00	p>0.05
Undescended	4	20.00	0	0.00	
Table -4: Association of Normal Descent & Undescended testes in Term cases					
* p- value calculated using Fisher's exact test					

Descent	Normal Birth Weight (≥ 2.5 Kg)		Low Birth Weight (<2.5 Kg)		p-value
	No	%	No	%	
Normal	**35**	**43.70**	**19**	**23.75**	**χ2= 8.183; df=1**
Undescended	**8**	**10.00**	**18**	**22.50**	**p=0.004**
Table 5:Association of Normal Descent & Undescended testes in preterm cases					
*** p- value calculated using Chi- square test**					

Figure 3: Multiple congenital malformations

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Figure 4: Encephalocele

Figure 5: Superior inversion of testes

DISCUSSION

Scorer (1964)[8] found the occurance of undescended testes as 2.5% in full term infants and 21% in premature infants. Scorer and Farrington (1971)[9] reported that cryptorchidism affects 3% of full term male newborns and in premature infants the incidence rate is 30.3%. According to the Cryptorchidism Study Group (1992)[6] undescended testes are significantly more prevalent in preterm, small for gestational age, low birth weight and twin neonates. Favorito (1998)[10], reported that testes remain undescended in fetuses that weighed less than 990g whereas all testes were descended in fetuses that weighed more than 1220 g. These data support epidemiologic findings in newborn boys with cryptorchidism and suggest that fetal and birth weights are a significant determinant of descent in males after 30 weeks of gestation. Thong *et al* (1998)[11] reported in a study of 1002 Malaysian male newborn that premature infant with undescended testes were more likely than term newborns with undescended testes to demonstrate complete testicular descent. Mayr *et al*(1999)[12] found that risk for cryptorchidism increases with decreasing birth weight

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independent of gestational age. Hutson *et al* (2010)[13] stated that cryptorchidism is a very common anomaly of the male genitalia affecting 2–4% of male infants and more common in premature infants. V. Kubarsepp et al (2021) [14] found that prevalence of cryptorchidism at birth was higher in preterm boys (11.9 %), boys of low birth weight (16.7%) and boys small for gestational age (14%) and was lower in full term newborn boys (1.1%). Cryptorchidism is common in infants with abdominal wall defects like exomphalos or omphalocele, gastrochisis and bladder exstrophy (Levard and Laberge, 1997)[15] It is associated with Prader Willi Syndrome, Kallmans Syndrome, Prune Belly Syndrome (European society of Urology, 2008). [16]

CONCLUSION

In this descriptive study we found the percentages of normal descent and undescended testes in perinates and also recorded congenital and testicular anomalies associated with undescended testes. We have also found a statistically significant association between undescended testes and prematurity, low birth weight. Therefore we can conclude that descent of testes is generally normal with normal birth weight babies at term.

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