THE DESCENT OF THE TESTIS

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This study is based on observations made on boys at birth, during infancy, and throughout early childhood. Its purpose was to find out how often the testes were in the scrotum at birth and what happened in later years to those that were not.

An analysis of the position of the testes was made in over 3,500 infant boys at birth. Those in whom one or both testes were not in the scrotum at the age of 1 month were followed up. To this number a further 40 cases of failure of descent in early infancy have been added in order to obtain, as nearly as possible, a true incidence of the various types of failure.

Criteria of Descent

At birth in the full-term baby boy the testis is usually lying in the scrotum at a distance of between 5 and 8 cm. from the pubic crest. The position varies with the state of contraction or relaxation of the scrotum, but a gentle pull brings the testis down to 7 or 8 cm. The measurement is taken from the upper anterior edge of the pubic bone to the centre of the testis. Sometimes the testis is found to be lying in the groin simply because the scrotum is contracted; by manipulation, it can be drawn into the scrotum and distally for a few centimetres.

The cremasteric reflex has not developed at birth and, in attempting to elicit it, the most that can be achieved is a momentary flick upwards of the testis. For this reason if the testis is descended there is no doubt about it.

In order to establish a criterion of what constitutes descent in a full-term infant, a testis 4 cm. or more below the pubic crest was considered to be descended, for at this level it is lying in the scrotum. If less than this it was counted as undescended. But it must be emphasized that the vast majority of testes at birth lie between 5 and 8 cm. down and all of those at 4 cm. immediately after birth will be found to be lower a few days later.

In premature infants (5 lb. 8 oz (2,500 g.) or less at birth) the distance used was 2.5 cm. It is realized

that maturity and birth weight do not necessarily go hand in hand. A sliding scale of measurements would obviously be the ideal, but for the sake of simplicity it has not been adopted.

Analysis of Results

Table 1 indicates the position of the testes in 3,612 infant boys who were examined within 4 days of birth. Each of the boys with the deformity had either one or both testes affected. In 97.3% of boys born at full term both testes were descended, but in only 79% of boys born prematurely were the testes in the scrotum.

Each boy affected was re-examined at intervals of a few days or weeks until descent was complete, or he was followed up after leaving hospital for an indefinite period of time.

Table 2 shows what happened to testes that had failed to reach the scrotum at birth; some descended within a month, others came down within 3 months, a very few appeared to do so up to 9 months

TABLE 1
POSITION OF TESTES IN 3,612 BOYS AT BIRTH

	Descended	Per cent.	Undescended	Per cent.	Total
Full term	3,222	97.3	90	2.7	3,312
Premature	237	79.0	63	21.0	300
Total	3,459	95.7	153	4.3	3,612

TABLE 2
TIMING OF DESCENT OF TESTES IN 153 BOYS WHOSE TESTES WERE UNDESCENDED AT BIRTH

	Descended			Undescended	Total
	1 month	3 months	9 months		
Full term	45	15	7	23	90
Premature	35	11	—	5 (12)	63
Total	80	26	7	28 (12)	153

The figures in parentheses denote premature babies who died before descent had occurred.

and some did not descend at all. The period of follow-up study varied between 7 and 11 years as possible maxima.

At about the third month increase in subcutaneous fat may make determination of the exact position of an undescended testis difficult; moreover, cremasteric retraction begins to become noticeable at about this time, so that between 3 months and 2 to 3 years of age observations are not necessarily accurate. By the time the boy is 3 or 4 years old the pubic fat is less obvious but the cremaster may become more active as the boy gets older and hence the continuing difficulty in diagnosis. Nevertheless, in the present series, by patient examination over the years, it became obvious how far the testis had descended in all cases.

It was soon apparent that if, in the full-term infant, descent occurred during the first month of life, it would be complete (Scorer, 1956); that is, the testis would reach a position 7-8 cm. from the pubic crest on gentle traction. But if descent had not occurred after about six weeks, the testis later reached a distance of only 5 or 6 cm. at the most and there stopped. It did not descend as far as its normal fellow the other side; moreover, it remained smaller in size, as is the case with all testes that fail to descend completely. In other words, in no single instance has a testis been found to reach the bottom of the scrotum (8 cm.) unless it has passed the 4 cm. mark within the first 4 to 6 weeks of life, even though followed up for many years. In premature boys, because they are born early, descent may continue for longer and may be completed if the testis reaches the scrotum in three months.

In the final analysis (Table 2) it will be seen that of the 90 cases of undescended testis in full-term infants at birth, 45 came down within one month (and descent was complete), in 23 the testis never reached the scrotum, i.e. was always less than 4 cm. from the pubic crest, and in the remaining 22 the testis passed the 4 cm. mark but never descended as low as its fellow on the other side.

With the 63 examples in premature infants, 46 descended within three months (and descent was complete), 5 failed to reach the scrotum at all, and there were none in which the testis reached the scrotum but remained too high.

In sum, there were 28 boys out of a total of 3,612 (0.8%) in whom one or both testes remained undescended. This figure of 8 per 1,000 probably represents a true incidence of undescended testis in boyhood. After correction of the total number of boys by subtraction of probable deaths in the neonatal period and in infancy it remains virtually the same.

Position of Testis when Descent had Ceased

In order to find the true incidence of the various degrees of failure in descent 40 more cases were collected, after the original study had been terminated. In all these cases descent had failed to occur within one month from birth (or three months for premature babies). From Table 2 it will be seen that there were 45 full-term babies in whom one or both testes were still undescended after one month, and 5 premature babies were so affected after three months. There was thus a total of 90 infant boys in whom the deformity was present, and these were studied further. An analysis of the final position of the testis in the 90 cases gives the results which are shown pictorially (Fig. 1). In 10 cases the condition was bilateral, and so there were 100 examples in all. The side on which the deformity occurred is recorded and it will be seen that there is a slight preponderance on the right side.

FIG. 1.—A pictorial analysis of the final position of the testis in 90 cases (in 10 the condition was bilateral), making 100 examples in all. a = absent, abdominal, or undetermined; c = canalicular (down to 3 cm.); o = obstructed (mobile in superficial inguinal pouch); h = high scrotal (down to 4-7 cm.); and n = normal (down to 8 cm.).

There were 4 groups which were divided as follows.

(1) Eleven testes had never been felt. By surgical exploration 4 proved to be absent and one was intra-abdominal. The position of the remaining 6 was undetermined.

(2) 17 testes had been felt in the groin emerging from the external ring. None could be manipulated lower than about 3 cm. at any time.

(3) 24 testes lay in the superficial inguinal pouch at or shortly after birth. They were then as large as the opposite normal testis but had never been seen to come lower than 4 cm. and appeared on manipulation to be obstructed in their entry to the scrotum by a thin, firm fascial barrier. This group is commonly misclassified 'ectopic'.

(4) 48 testes reached a position in the scrotum between 4 and 7 cm. from the pubic crest but compared with its fellow the testis was not as far down and was smaller in size. The testes in which descent was incomplete, having merely failed to reach the normal 8 cm. from the pubic crest, were much more common than those in which descent had never started or had failed within, or just outside, the canal.

In this present series there happened to be no examples of true ectopic testis.

Discussion

Terms used to describe the position of the testis are often used too loosely. The cavity of the scrotum is the point of reference. Any testis not in the scrotum, that is, 4 cm. or less from the pubic crest in infants and boys is *undescended*. If it is more than this distance but not as low as it should be it is *incompletely descended*. The terms mal-descent and imperfect descent have no useful meaning.

The word 'ectopic' means out of position. If it be accepted that the normal position of testis is in the bottom of the scrotum then, accurately speaking, all testes that are undescended or incompletely descended are ectopic. Unfortunately the word has been attached to that form of failure of descent in which the testis lies in the superficial inguinal pouch, and the phrase 'superficial inguinal ectopia' is commonly used. The pouch is a normal subcutaneous cul-de-sac lying over and a little above the external inguinal ring. It is found in varying size and shape in all boys. If the testis has failed to reach the scrotum (or is retracted) it will not lie in front of the pubic bone for that is an unstable position; it will slip up into the pouch. But *it is still in the line of normal movement* even though temporarily accommodated in a sub-cutaneous recess.

It seems better to reserve the word ectopic for that rare condition in which the testis lies away from the line of natural descent such as in the perineum, in the femoral region, or in front of the symphysis pubis. This strict use of the word brings it into agreement with the description of other organs which may lie out of position, the pelvic ectopic kidney or ectopic splenic or pancreatic tissue, all of which are rare.

The following conclusions may be drawn from the observations that have been made.

(1) Complete descent of the testis normally occurs before birth.

(2) If, in a newborn full-term infant, descent has not occurred, it may do so in the first few weeks of life, and this descent is complete. In a premature infant the equivalent time may be up to 3 months.

(3) If descent is not completed in these stated times the testis remains either undescended or incompletely descended, at least in boyhood.

(4) A testis that is not fully descended by the age of 3 months is always smaller than its normal fellow.

Looking at the phenomenon of testicular descent from the point of view of these observations alone, the migration of the testis from the abdomen to the bottom of the scrotum is an event that apparently takes place *during a limited time just before and just after birth*. In other words, the stimulus (whatever that may be) that causes the testis to migrate is most active shortly before birth, it continues for about a month to six weeks after birth and then gradually disappears. If descent is not complete within a few weeks of birth, it never will be.

This hypothesis is contrary to most modern opinion. Current textbooks describe descent as occurring any time during boyhood and particularly at puberty when, as it is said, hormonal activity is known to be much increased.

On what evidence is this continuing possibility of descent in boyhood based? Why should it be thought that a manifestly embryological event, i.e. the migration of a vital organ, may occur at any time over a period of many years?

Arguments in favour of descent of the testis *after* infancy appear to be based on two observations: the recorded decrease of incidence of undescended testes with the advance of age from infancy to manhood, and the frequent observation that testes are alleged to 'descend' when the boy passes through puberty to adolescence.

The Incidence of the Deformity at Different Ages

An editorial in the *Lancet* (1957) put the widely accepted view succinctly as follows: 'Undescended testes may enter the scrotum spontaneously at any time from infancy to manhood. More than 10% of testes are undescended at birth, but only 2.0% remain outside the scrotum at puberty, and in mature men the proportion is as low as 0.2%.'

A critical examination of these figures shows them to be unreliable. The only other published series which presents the incidence of undescended testes at birth is that of Hofstätter (1912) who examined 450 infants born at full term and found that 96% had normally descended testes. This figure agrees closely with my first observations when I found an incidence of 96.6% in 1,500 full-term babies (Scorer, 1955). But the larger series, with perhaps more experience in examination, shows a figure of 97.3%. That is, in 2.7% of babies one or both testes have failed to reach the scrotum at birth.

As shown above many testes reach the scrotum in the first month of life and a few more in early infancy so that at the end of one year the incidence appears to be of the order of 0·8%.

The number of testes outside the scrotum in boyhood is difficult to assess owing to the phenomenon of retraction. Figures published vary between 1·72% in 31,609 boys (Johnson, 1939) and 9·8% in 1,255 boys under 15 years (McCutcheon, 1938).

The incidence of the deformity in adults varies between 0·2% (Hempel, 1911) and 0·8% (Baumrucker, 1946). But the most significant thing about these figures both for boys and adults is that no author has defined what he regards as an undescended testis. If a testis lies in the scrotum at a high level, is it undescended? At what level in the scrotum is it considered descended? Moreover, in the adult records mention is often not made of men who have had operations to bring the testis down into the scrotum. Are these counted as descended or undescended?

The most useful contribution that has been found is that of Baumrucker (1946) who investigated the position of the testis in 10,000 consecutive army recruits between the ages of 18 and 37. There were 58 'inguinal testes', 15 'abdominal testes', and 7 had had orchidectomy 'for correction of undescended testis', a total of 80. It may be mere coincidence that his figure for the deformity in adults agrees exactly with mine in young boys, but the true incidence of undescended testis in both is probably just less than 1%.

'Descent' at Puberty. The most frequently quoted author is Johnson (1939) who examined 31,609 boys in New York and found 544 cases of undescended testis. 217 were lost to follow-up, 14 were operated on, and spontaneous descent occurred between the ages of 7 and 17 in 313. Once again no definition was given of what constituted an undescended testis.

Clearly (but Johnson does not mention it) this so-called 'spontaneous descent' may have been due to the disappearance of the persistent retractile pull of the cremaster. Many doctors have witnessed this kind of 'descent'. This impression is confirmed by the high incidence of bilateral undescended testes in Johnson's series, 45%. The usually accepted figure is about 10%.

But the fact that there is a normal increase in distance between the testis and the pubic crest in all boys at puberty is frequently overlooked. That is to say, from birth up to about 12 years of age, the distance of the testis from the pubic crest averages 8·0 cm. By 16 the testis will have moved down to 15·0 cm. or more. This is not a migration of the

organ but a growth in size of all the component parts of the external genitalia. Such is not descent, it is genital enlargement.

At puberty, therefore, the testis alters in two ways, it enlarges with the rest of the external genitalia and the cremaster, if previously active, no longer exercises its persistent pull. Neither of these occurrences is in any way related to the embryological migration of the organ from the abdomen.

The High Scrotal Testis. The descent of the testis is the movement of the organ from the abdominal cavity to the bottom of a fully developed and fully relaxed scrotum. This movement is usually complete, but it may fail completely and the testis remain wholly within the abdomen. Between these two extremes there are degrees of descent. The testis may get no further than the inguinal canal, it may be held up at the entrance to the scrotum or it may get into the scrotum but fail to reach its full distance from the pubic crest. This last form, which is an incomplete descent, is much more common than any other.

Most congenital abnormalities vary in the degree of failure of development and at one end shade off into the normal. So with the descent of the testis, the most common variety is that in which the testis is well in the scrotum but is a little higher and a little smaller than it should be. Such testes are usually associated with a hernia for, as has been noted previously (Scorer, 1962), the processus vaginalis only closes completely when the testis has reached its point of full descent. The hernia demands the surgeon's attention, usually, but not always in childhood; but the fact that the testis is higher than normal may be overlooked. Indeed, later, the hernia operation may be erroneously blamed for the higher position of the testis on that side.

As mentioned earlier, in the present series 48 of 100 testes were found to be in a high scrotal position after a few months from birth. Subsequent follow-up for several years has shown no further descent in any of them. As these testes are as susceptible to retraction as others, determination of their precise whereabouts in boyhood may be difficult except by repeated examinations.

If no operation is done what happens? It seems evident that at puberty the retraction disappears, the genital organs enlarge and the high scrotal testis takes up its adult position in the scrotum some 6 to 8 cm. further from the pubic crest but never quite as low as its normal fellow.

If this be accepted it explains why we not infrequently find adult men with one testis lying a few centimetres higher than the other and, by palpation,

a little smaller and softer. They often seek help because of the associated hernia.

Summary

In a series of 3,312 full-term boys, 3,222 (97·3%) had fully descended testes at birth. The figure for 300 premature babies (5 lb. 8 oz. (2,500 g.) or less at birth) was 237 (79·0%).

Descent of the testis may be completed during the first 6 weeks of life, and up to 3 months in a premature infant.

If the testis fails to reach the bottom of the scrotum in these stated times it appears to remain permanently higher than its fellow.

An analysis is given of 100 examples of undescended testis followed up from birth for several years.

There are inadequate grounds for accepting the hypothesis that the testis can truly descend at any time during boyhood and particularly at puberty.

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