SYNOPSIS: In this chapter the prevalence of acquired undescended testis is determined and spontaneous descent of this acquired form in the pubertal period is investigated. In addition, the influence of acquired undescended testis on the high rate of orchidopexy is analysed. Finally, the high scrotal testis is analysed as mainly acquired.
2.1 PREVALENCE OF ACQUIRED UNDESCENDED TESTIS IN 6-YEAR, 9-YEAR, AND 13-YEAR OLD DUTCH SCHOOLBOYS

W.W.M. Hack, K. Sijstermans, J. van Dijk, L.M. van der Voort-Doedens, M.E. de Kok, M.J. Hobbelt-Stoker

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ABSTRACT

Objective. To investigate the prevalence of acquired undescended testis (UDT) in Dutch schoolboys.

Methods. As a part of routine school medical examinations, during a 2-year period (2001-2003), testis position was determined in 6-year, 9-year, and 13-year old schoolboys. Before the examination, a parent questionnaire was sent inquiring both about the position of the testes and whether the child had been admitted earlier to hospital for orchidopexy (ORP). In 6-year and 13-year olds, a physical examination was performed by the school medical officer; in 9-year olds, a school nurse interview was held. Each boy for whom there was any doubt of the scrotal position was referred to the hospital for examination of both testes.

Setting: Institution for Youth Health Care “Noordkennemerland” and Medical Centre Alkmaar, Alkmaar, the Netherlands.

Results. Testis position was determined in 2042 boys aged 6, 1038 aged 9 and 353 aged 13. Of these, 47, 53 and 8 boys, respectively, were referred to the hospital and seen for further evaluation. The diagnosis of acquired UDT was made in 25 boys aged 6, 23 aged 9 and four aged 13. In 33 boys, a congenital UDT was diagnosed; 32 (97%) had already been diagnosed and treated at an early age.

Conclusion. The prevalence of acquired UDT for 6-year, 9-year, and 13-year olds was, respectively, 1.2% (25/2042), 2.2% (23/1038), and 1.1% (4/353). In addition, congenital UDT is treated during the early years of life and, in contrast with popular belief, screening programmes for detecting UDT in the early years are successful.
INTRODUCTION
At present, undescended testis (UDT) is categorised in congenital and acquired forms (1-3).
The prevalence of congenital UDT is about 0.8 to 1.1% by 1 year of age,(4) whereas orchi-
dopexy (ORP) rates appear to be three times higher than expected if only this prevalence of
congenital UDT is taken into account (5,6). Further, despite the recommendations for early
ORP, most operations are performed late in childhood (7,8).
The true prevalence of acquired UDT is still unknown. There is increasing evidence from
retrospective studies in selected groups of boys to suggest acquired UDT is a common oc-
currence, outnumbering congenital UDT by a factor of 2-3 (9). This prospective study was
initiated to provide estimates of the prevalence of acquired UDT in unselected groups of
boys at various ages. The results of this study may shed light on the high ORP rate in later
childhood (9,10).

METHODS
General design
The study was performed in the Youth Health Care Institution of the Gemeenschappelijke
Gezondheidsdienst “Noordkennemerland”, Alkmaar and in Medical Centre Alkmaar. The
district has 119 primary schools. During a 2-year period (2001-2003), 6-year, 9-year, and
13-year old boys were studied. Routine medical examinations at school take place at these
ages, and this study was part of these medical examinations. The policy of the Youth
Health Care Institution is to focus more on 6-year olds. Therefore, more 6-year olds are
seen annually than 9-year, and 13-year olds. Six-year-old boys were born between 1 Octo-
ber 1995 and 1 October 1997, 9-year olds between 1 October 1992 and 1 October 1994,
and 13-year olds between 1 October 1989 and 1 October 1990. In the end, 13-year olds
were studied for only a 1-year period. They were initially unwilling to participate and an in-
formation campaign proved essential. Before examination, a parental information letter in-
forming about the study, together with a parental questionnaire, was sent inquiring about
their son's testes position and whether he had previously been admitted to hospital for
ORP. We did not enquire whether the operations were specifically for maldescent. Inquiries
about other groin surgery as well as other associated conditions and family history were
not made. At the school medical, the questionnaire was collected by the school nurse.

Youth Health Care Institution
6-year and 13-year olds
In boys aged 6 and 13 years, testicular examination was carried out by a school doctor as
part of a routine medical programme. Scrotal examination was performed by the doctor
while the boy was in a standing position, according to a previously approved protocol. A
solely screening examination was performed to determine whether or not the testes were
present in the scrotum.

9-year olds
Boys aged 9 years where seen by a school nurse who routinely performed audiometric as-
ssessment, tested visual acuity, and measured height and weight. Additionally, an interview
was performed inquiring about, among other things, testes position, and to collect the
parental questionnaire. A boy was referred if the parent reported any doubt on the scrotal position of one or both testes.

Referral
Each boy in whom there was any doubt on the scrotal position of one or both testes was referred to the hospital for further examination. Adequate referral was ensured as follows: the questionnaires were collected at regular intervals of a few weeks at the Youth Health Care Centre by the research nurse of the hospital. At the same time, the data on previous testicular positions, determined by proficient Youth Health Care medical officers at various ages during routine medical inspections, were collected from the Youth Health Care medical records. In view of the long-term cooperation with the Youth Health Care medical officers, instructions have been repeatedly given by the authors concerning the definition of UDT (2). Parents were then contacted by the research nurse by telephone and requested to visit the hospital, with their son, for further evaluation. Simultaneously, an appointment for the outpatient clinic was made.

Medical Centre Alkmaar
At the outpatient clinic, a full physical examination was performed on each boy by the same paediatrician (WH). Testicular examination was carried out by a two-handed technique with the boy in the supine and cross-legged positions. All boys were seen within a few weeks of referral.

Definitions
A “retractile testis” was defined as a testis that could be manipulated into a (low) stable scrotal position where it remained until the cremasteric reflex was elicited. Traction on cord structures was not painful. An “undescended testis” was defined as a testis which could not be manipulated into a stable scrotal position and further tension on cord structures was painful (2). A “high scrotal testis (HST)” was defined as a testis which can (still) be brought through the scrotal entrance into a high but unstable scrotal position, although further traction on cord structures is painful. An “acquired UDT” was defined as a UDT for which a previous scrotal position was documented on at least one occasion. Acquired UDT involves “high scrotal testes” and “(inguinal) ascending testes”.

Ethics approval
The study protocol was approved by the ethics committee of the hospital (reference number: MO 1-08).

RESULTS
A total of 3627 boys were invited for the school medical examination, and 3433 (94.7%) attended the routine medical inspections at school at ages 6, 9 and 13 years (Table 1). In all medical examinations, the questionnaire was returned, and in most cases a parent attended the school medical examination.
6-year olds
A total of 2093 boys received an invitational letter and a questionnaire and 2042 (97.6%) were seen by the school doctor. At the school physical examination, 57 non-scrotal testes were found in 48 boys. Of those, 47 (97.9%) boys were seen at the hospital, and in 25 boys an acquired UDT was diagnosed. In all of these boys a previous scrotal position was documented: in two testes, at least twice; in two, at least three times; and in 24 testes, at least four times.
In two boys, a congenital UDT was diagnosed. In one, scrotal descent was documented once immediately after birth, and thereafter the testis had never been palpated. After referral, ORP was performed and an abdominal testis was found. Therefore, observer error in physical examination immediately after birth is likely, although early ascent cannot be excluded. The other boy was known to have congenital UDT from birth, but his parents refused surgical treatment.

9-year olds
At the age of 9, 1146 boys were invited by letter, and 1038 (90.6%) were interviewed by the school nurse. All these questionnaires were returned; 56 parents indicated that one or both testes of their son was non-scrotal; 53 (94.6%) were seen at the hospital, and in 23 boys an acquired UDT was diagnosed. In these boys, a previous scrotal position was documented at least once in two testes, at least twice in three, at least three times in three, and more than three times in the remaining 19 testes.

Table 1 Number of boys seen at school medical examination, together with the number of boys seen in hospital for UDT. Data for individual testes included.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>6</th>
<th>9</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seen at school medical</td>
<td>2042</td>
<td>1038</td>
<td>353</td>
</tr>
<tr>
<td>Seen in hospital</td>
<td>47</td>
<td>53</td>
<td>8</td>
</tr>
<tr>
<td>retractile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>congenital UDT</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>acquired UDT</td>
<td>25</td>
<td>23</td>
<td>4</td>
</tr>
</tbody>
</table>

UDT: Undescended Testis
A congenital UDT was found in one boy. He was known to have Prader-Willi syndrome and congenital UDT from birth. On request by the parents, active treatment was not performed.

13-year olds
A total of 388 boys received an invitational letter with a questionnaire; 353 (91.0%) were seen by the school medical officer and testicular position was determined; 11 testes in eight boys were judged as non-scrotal. In four boys, the testis was diagnosed as a retractile testis. In the other four, a diagnosis of acquired UDT was made. A previous scrotal position was documented at least three times in one testis and more than three times in the remainder. In the four boys with acquired UDT, the parents were unaware of the non-descent. The prevalence of acquired UDT in 6-year, 9-year, and 13-year olds was, respectively, 1.2% (25/2042), 2.2% (23/1038) and 1.1% (4/353).

Congenital UDT
ORP had been performed for congenital UDT, by 6 years of age in 17 boys, by 9 years of age in 11 boys and by 13 years of age in two boys. In addition, in two 6-year olds, in one 9-year old and in no 13-year olds, a congenital UDT was found. The prevalence of congenital UDT in 6-year, 9-year, and 13-year olds was, respectively, 0.9% (19/2042), 1.2% (12/1038), and 0.6% (2/353). In one boy congenital UDT was misdiagnosed at birth, and in the remaining 32 (97%) the condition was well diagnosed and surgically treated (n=30) or treatment advised (n=2).

DISCUSSION
In this series, the prevalence of acquired UDT in 6-year, 9-year, and 13-year olds was, respectively, 1.2%, 2.2% and 1.1%, whereas the rate of congenital UDT was 0.9%, 1.2% and 0.6%, respectively. This prevalence of congenital UDT is in accordance with the known prevalence of 0.8-1.1% in 1-year olds (4); therefore the questionnaire seems to be adequate. In addition, 32 of 33 cases of congenital UDT had already been treated surgically or diagnosed at an early age, indicating adequate medical youth surveillance.

The prevalence of UDT varies considerably depending on the design of the study (e.g. cohort studies are more reliable than registry data studies) and the criteria and definitions used. Other compounding factors include racial and ethnic heterogeneity, gestational age and birth weight, seasonal variability and regional differences (11). Reported UDT rates vary at 6 years from 0.0% to 2.6%, at 9 years from 0.0% to 5.0%, and at 13 years from 0.0% to 4.0% (12-15). A major factor explaining the wide variety, however, must be, at present, the recognition of congenital UDT and acquired UDT. Many studies on UDT prevalence do not distinguish between these forms. Until now, a few dozen reports have been published on acquired UDT, and prevalence has been reported in selected groups of boys. These include boys who were referred for non-scrotal testis or in whom ORP had been performed for UDT. These studies showed that acquired UDT may outnumber congenital UDT by a factor of 2-3.

As in this study, congenital UDT is seen in 0.8-1.1% of 1-year-old boys, accounting for the early ORP peak. This study shows that the prevalence of acquired UDT ranges from 1.1% to 2.2%, and these figures correspond very closely with the late ORP rate of 2-3%. Therefore, we believe that acquired UDT may indeed account for the late ORP peak as suggested previously (16-18) and that testicular ascent is a real phenomenon. At present, acquired UDT is ac-
cepted as a new entity (19), although some claim it to be unrecognised congenital UDT (20). Screening for UDT is one of the important elements of child health surveillance. However, it is generally believed that screening programmes fail to identify UDT at an early age, possibly because of the subtleties of the anatomy and difficulties inherent in examining children (20), and that recommendations for early treatment are not followed (21-23). This series, however, shows that nearly all congenital UDT are recognised early and treated as recommended, and that, after the age of 5 years, acquired forms are almost exclusively seen. In this series, only one (3%) of 33 congenital forms was misdiagnosed at birth, whereas the remaining cases were already treated (30 cases) or known (2 cases). Therefore, the recognition of congenital and acquired UDT explains why only about one third of all ORPs is performed in the first 2 years despite recommendations (7,21, 24-28). Although ORP is routinely performed for acquired UDT in prepubertal boys, this procedure is heavily under debate. It has been shown that most acquired forms descend spontaneously in the peripubertal period with testicular volumes appropriate for age (29). Therefore, ORP might be postponed until at least mid puberty. In the studied boys, testicular position is still assessed annually. At present, in eight boys (seven 9-year olds and one 13-year old), the testis has descended spontaneously, whereas in four cases ORP had to be performed (one 9-year old, three 13-year olds).

It must be emphasised that this study has obvious limitations. It is not a population-based study, so we were unable to estimate the number of males with UDT in the general population. An occasional unrecognised (congenital) UDT can never be ruled out, owing to interobserver variability in the healthcare personnel. Potential errors may have been introduced by the difference in the number of boys included in the various age groups, owing to a difference in priority at the Youth Health Care Institution. In addition, 13-year olds were studied for only a 1-year period. In addition, not all boys were physically examined and the results were dependent on adequate parental participation. As previous authors have documented ascent at ages as young as 1-3 years (30,31), ORP in earlier years could potentially have been performed for both congenital and acquired UDT. A population-based study is needed to fully ascertain the true incidence of acquired UDT in the general population. We speculate that this rate might be significantly higher than seen in this series.

In conclusion, in this series, the prevalence of acquired UDT in 6-year, 9-year, and 13-year olds varies from 1.2% to 2.2%. After the age of 5 years, only acquired UDT is seen. Congenital UDT is recognised and treated in the first years of life as recommended, indicating adequate medical youth surveillance. Routine medical examinations in older boys - that is, after the age of 5 years - should also include examination of both testicles. Finally, those involved in the care of boys with UDT ought to realise that a boy referred for UDT after the age of 5 years has almost certainly an acquired UDT.

ACKNOWLEDGEMENTS
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REFERENCES


2.2 PUBERTY STAGE AND SPONTANEOUS DESCENT OF ACQUIRED UNDESCENDED TESTIS: IMPLICATIONS FOR THERAPY?


Abstract
Objective. We assessed spontaneous descent of acquired undescended testis (UDT) at puberty.

Methods. 299 Boys (aged 1.2 to 16.5 years, mean 9.4) with 350 acquired UDT were examined annually during a 12.6 year period (mean 3.1). An acquired UDT was defined as a previously intrascrotal testis which can no longer be manipulated into a stable scrotal position. Each year, position of the testis and pubertal development according to Tanner’s stages were assessed. Early puberty was defined as puberty stage G2 (testicular volume 4-9 ml), mid puberty as puberty stages G3 (testicular volume 10 ml) and G4 (testicular volume 11-15 ml), and late puberty as puberty stages G5 (testicular volume > 15 ml). Follow-up was completed if spontaneous descent had occurred, if mid pubertal orchidopexy (ORP) had to be performed, if the boy was lost for follow-up, or if prepubertal ORP was performed in another hospital.

Results. In 139 boys with 164 acquired UDT follow-up was meanwhile completed. Twelve boys with 14 UDT were lost for follow-up. In an additional 16 boys with 21 UDT, ORP was performed in another hospital. In 98 of the remaining 129 (76.0%) acquired UDT spontaneous descent at puberty occurred. Mean follow-up was 2.5 years (range 0.2 to 8.5). In 70 of 98 testes (71.4%) descent occurred in early puberty, in 26 of 98 testes (26.5%) in mid puberty, and in two testes in late puberty. In 31 of 129 testes (24.0%) ORP had to be performed at mid (30 cases) or late (one case) puberty.

Conclusion. In this series, 98 of 129 acquired UDT (76.0%) descended spontaneously at puberty, whereas in 31 of 129 (24.0%) pubertal ORP was performed. If ORP is postponed until puberty stage G3 (testicular volume of 10 ml) three of four acquired UDT will descend spontaneously.
INTRODUCTION
At present, undescended testis (UDT) is categorised into congenital and acquired forms (1-3). Congenital forms are treated surgically at 6-12 months of age. For acquired UDT prepubertal orchidopexy (ORP) is also frequently recommended. There are however indications that surgical treatment of acquired UDT may be postponed until at least mid-puberty since acquired forms have a high tendency of spontaneous descent (4,5). If spontaneous descent does not occur, surgery is intuitively recommended at mid puberty, although the exact timing of surgery remains obscure. This study was undertaken to provide information on the approximate timing of spontaneous descent at puberty. These data may be helpful in deciding at which puberty stage ORP may eventually be performed in case of non-descent.

METHODS
We evaluated 557 consecutive boys referred to the outpatient clinic during 1993-2004. At referral the mean age was 7.4 years (range 0.3 to 16.5). In each boy, previous position of the testis, as determined by proficient Youth Health Care medical officers at various ages during routine medical inspections, was obtained from the Youth Health Care Institution in our region.

Definitions
In this study the following definitions were used (4,5). A retractile testis was defined as a normally developed testis which could be brought into a low scrotal position where it remained until the cremasteric reflex was elicited. Traction on cord structures was not painful. An undescended testis was defined as a testis which could not be brought into a stable scrotal position and further traction on cord structures was painful. A congenital UDT was defined as an UDT which had never been fully descended from birth. An acquired UDT had been previously normally sited in the scrotum. A high scrotal testis was defined as a testis which can (still) be brought through the scrotal entrance into a high but unstable scrotal position while further traction on cord structures is painful. Descent was defined as attainment of a spontaneously stable position of the testis at the bottom of the scrotum.

Methods
In each boy, physical examination was performed with a two handed technique by the same doctor (WH) while the boy was in a supine position as well as in a frog leg position. Testis volume was measured by comparative palpation using the Prader orchidometer. The volume was measured by means of the descended testis in case of non-descensus and after spontaneous descent by the testis itself.

Determination of pubertal development
Pubertal development was assessed according to Tanner’s stages. In this study we categorised puberty stages into early, mid, and late puberty. Early puberty included stage G2 (testicular volume 4-9 ml), mid puberty included stages G3 (testicular volume 10 ml) and G4 (testicular volume 11-15 ml), and late puberty included G5 (testicular volume > 15 ml).
Study design
Boys in whom a diagnosis of acquired UDT was made were annually assessed and the investigation included a clinical examination regarding position and volume of the testis and pubertal development. Enquiries about other associated conditions were not made. Follow-up was continued until spontaneous descent had occurred. If the testicle did not descended spontaneously ORP was performed when the boy had reached at least puberty stage G3 (testicular volume 10 ml), reminding that there are yet no clear criteria, and individual factors are taken into account. Follow-up was considered complete if the testis had descended spontaneously, if ORP was performed at mid or late puberty, if the boy was lost to follow-up, or if ORP was performed in another hospital mainly on request of the parents. Presently, these boys are followed up in a long-term study on a yearly basis till they reach adulthood.

RESULTS
At referral, in 415 boys (aged 0.3 to 16.5 years, mean 7.4) with 479 testes a diagnosis of UDT was made (Figure 1). In 116 boys (aged 0.3 to 9.0 years, mean 2.4) with 129 non-scrotal testes the testis had never been scrotal and a diagnosis of congenital UDT was made. In 299 boys (aged 1.2 to 16.5 years, mean 9.4) with 350 non-scrotal testes the testis had been previously normally sited in the scrotum and a diagnosis of acquired UDT was made. Of 19 testes the previous scrotal position was documented on at least one occasion, in 35 at least on two, in 52 at least on three, and in the remaining cases on more than three occasions. In 136 cases the condition was right-sided, in 106 left-sided and in the remaining 54 bilateral. Of these 350 acquired UDT 220 testes in 193 boys (age 2.5 to 16.5 years, mean 9.2) were classified as high

Figure 1 Flow chart of the number of boys enrolled in this study and outcome.
ORP, orchidopexy; UDT, undescended testis.

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Different Aspects Of Acquired Undescended Testis

In 139 boys with 164 acquired UDT follow-up was completed. Twelve boys with 14 UDT were lost to follow-up. In an additional 16 boys with 21 UDT ORP was performed in another hospital. As shown in Table 1, in 98 of the remaining 129 (76.0%) acquired UDT spontaneous descent at puberty occurred, 76 of 98 testes (77.6%) were classified as high scrotal and 22 of 98 testes (22.4%) as inguinal. A representative example is shown in Figure 2. Mean follow-up was 2.5 years (range 0.2 to 8.5). In 70 of 98 testes (71.4%) descent occurred in early puberty, in 26 of 98 testes (26.5%) in mid puberty, and in two testes in late puberty. In 31 of 129 testes (24.0%) ORP was performed at mid (30 cases) or late (1 case) puberty, 16 of 31 testes (51.6%) were classified as high scrotal and 15 of 31 (48.4%) as inguinal.

In one boy spontaneous descent occurred at the age of 10 years, in 11 at 11 years, in 18 at 12 years, in 18 at 13 years, in 17 at 14 years, and in the remaining after 14 years of age.

**DISCUSSION**

This study shows that 70 of 98 acquired UDT (71.4%) descended spontaneously at early puberty and 26 of 98 (26.5%) at mid puberty. In mid or late puberty in 31 of 129 cases (24.0%) ORP was performed due to non-descent.

Acquired UDT refers to the condition in which a previously scrotal testis can no longer be manipulated into a stable scrotal position. Acquired UDT includes “high scrotal” as well as “inguinal” forms (‘ascending testis’). In addition, primary as well as secondary forms are recognised.

In this study spontaneous descent of a cryptorchid testis was frequently seen during puberty and the pubertal development of these boys was within normal range when compared with a Dutch reference (6). Until recently it was generally thought that descent of an UDT after 1 year of age was exceedingly rare (7,8). At present, two periods of descent may be recognised: around birth and during puberty. The perinatal descensus is a diphasic process in which a transabdominal and inguinal scrotal phase

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**Table 1** Puberty stage at which spontaneous descent of acquired undescended testis occurred or orchidopexy was performed.

<table>
<thead>
<tr>
<th>Puberty stage</th>
<th>Spontaneous descent (n = 98)</th>
<th>Orchidopexy (n = 31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early puberty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G₂ (testis volume 4–9 mL)</td>
<td>70</td>
<td>0</td>
</tr>
<tr>
<td>Mid-puberty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G₃ (testis volume 10 mL)</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>G₄ (testis volume 11–15 mL)</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>Late puberty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G₅ (testis volume &gt;15 mL)</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

G, genital development according to Tanner’s criteria.
is recognised (9,10). The peripubertal descensus, as frequently observed in this study, was already recognised in the early 1930s as shown in Table 2 (11-22). Several authors have reported that at the age of puberty most UDT will descend spontaneously without treatment and in addition become normal in size (11,23,24). Spontaneous descent of the testis was observed in 132 of 175 boys with UDT at the age 10-14 years, with the maximum at the age of 12-14 years (22). Similar findings were reported by Hostrup et al. in 545 cryptorchid boys (25). A strikingly similar phenomenon was observed in this study in which spontaneous descent was found with a maximum also at the age of 12-14 years. However, the limitations of the studies shown in Table 2 must be addressed, as some studies were retrospective and have a small sample size. In our study, errors in physical examination might have occurred due to interobserver variability in the healthcare personnel.

Figure 2 Acquired undescended testis (primary form: “high scrotal testis”) at 9¾ years of age (left). At puberty stage G2 (age 13½ years, testicular volume 5 ml) spontaneous descent occurred (right). (Left photograph reproduced with permission from Hack et al.(4)).
The concept of testicular ascent is now commonplace. Previous authors have suggested a number of mechanisms for the development of ascent, including a persisting processus vaginalis that allows the testis to ascend and become trapped in a higher position (26-28), preventing normal elongation of the spermatic cord (29) and cremaster muscle spasticity (30). It occurs in young infants and older children. Studies in selected groups of boys have shown that acquired UDT outnumbers congenital UDT by a factor of 2-3. It has been shown that the high rate of late ORP is nearly solely accounted for by acquired forms (3,31-34). However, despite the frequent occurrence, the health consequences of acquired UDT remain largely unclear, and hardly any information is available on the treatment of the condition. ORP is usually intuitively advocated and seems to be the mainstay of treatment, although long term follow-up studies to justify this treatment policy have not been reported so far. As in this series, acquired UDT has a definite and constant tendency to spontaneous descent. The majority attain their normal scrotal position at about the age of puberty. It is tempting to speculate that this can be explained by surges of luteinizing hormone and testosterone as also is seen in the first 3 months after birth (35) when spontaneous descent of congenital UDT can still occur. Routine surgical interference before commencement of puberty is therefore probable unnecessary. Furthermore, ORP carries a 5-6% risk of iatrogenic damage to the testicular tissue resulting in later atrophy (36,37).

As shown in this study, in acquired UDT, ORP might be postponed until the boy has reached Tanner’s stage G3. But whether this is an adequate therapeutic approach remains to be seen as unresolved issues remain. Probably, about 70-80% of the boys with acquired UDT do not need surgical intervention. Although studies have been conducted to evaluate testicular growth after spontaneous descent, it has not yet been definitely shown that testicular volume is normal at adulthood, but this seems to be realistic.

Whether this means normal fertility at adulthood remains to be seen. In addition, the risk of testicular cancer in acquired UDT remains unknown. At present, no follow-up studies after mid or late pubertal ORP for acquired UDT have been published which may

Table 2 Review, in relation to the year of publication, of the literature on spontaneous descent of UDT in elderly boys.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Boys with UDT</th>
<th>Age (years)</th>
<th>Boys with spontaneous descent, n (%)</th>
<th>Age at descent (years)</th>
<th>Study design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drake (1934)</td>
<td>12</td>
<td>9</td>
<td>10 (83.3)</td>
<td>10-16</td>
<td>Retrospective/medical charts</td>
</tr>
<tr>
<td>King (1934)</td>
<td>16</td>
<td>8</td>
<td>7 (43.8)</td>
<td>10-14</td>
<td>Retrospective/medical charts</td>
</tr>
<tr>
<td>Wireman Cook (1934)</td>
<td>10</td>
<td>9</td>
<td>7 (70)</td>
<td>11-14</td>
<td>Retrospective/medical charts</td>
</tr>
<tr>
<td>Williams (1936)</td>
<td>59</td>
<td>8</td>
<td>38 (64.4)</td>
<td>11-17</td>
<td>Retrospective/medical charts</td>
</tr>
<tr>
<td>McCutcheon (1938)</td>
<td>192</td>
<td>15</td>
<td>143 (74.5)</td>
<td>Until 16</td>
<td>Retrospective/medical charts</td>
</tr>
<tr>
<td>Johnson (1939)</td>
<td>544</td>
<td>17</td>
<td>300 (55.1)*</td>
<td>7-17</td>
<td>Retrospective/medical charts</td>
</tr>
<tr>
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UDT, undescended testis. * 174 cases (32.0%) descended spontaneously between the ages of 11 and 13.
help in deciding the proper timing of surgery. In our experience, ‘inguinal forms’ tend to
descent less easier than ‘high scrotal’ forms. We therefore tend to plan surgery earlier
in the former (testicular volume about 10 ml) than in the latter (testicular volume 15 ml
or even more).

In summary, acquired UDT has a high tendency of spontaneous descent in early and
mid puberty. ORP might therefore be recommended at mid or late puberty in case of
non-descent. However, there is an urgent need for further data on the natural course of
acquired UDT and on testicular growth after mid or late pubertal ORP.

ACKNOWLEDGEMENT
The help of the ‘Beeldgroep, Medisch Centrum Alkmaar’ in preparing the illustrations
is appreciated.

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2004;89:890.
5. Hack WWM, Meijer RW, van der Voort-Doedens LM, Bos SD, Haasnoot K. Natural course of acquired undescended
Tijdschr Geneeskd 1982;126:2294-2296.
2.3 REDUCTION IN THE NUMBER OF ORCHIDOPEXIES FOR CRYPTORCHIDISM AFTER RECOGNITION OF ACQUIRED UNDESCENDED TESTIS AND IMPLEMENTATION OF EXPECTATIVE POLICY


* Both authors contributed equally

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ABSTRACT
Objective. Since the mid-1990s, acquired undescended testis has gradually been recognised as a separate entity for which the efficacy of prepubertal surgery has not been univocally been demonstrated. Therefore, in our hospital, orchidopexy was no longer routinely performed for acquired undescended testis.
Aim. To investigate the effect of expectative policy in our hospital on the number of orchidopexies.
Methods. Two 5-year periods were compared. Period A (1991-1995), in which undescended testis was treated surgically, and Period B (2000-2004), in which prepubertal orchidopexy in our hospital was no longer performed for acquired undescended testis. In addition, a comparison was made between the percentage reduction in hospital and national figures.
Results. In Period B, the number of orchidopexies in our hospital was reduced by 61.8% (from 387 to 148), mainly in the age group > 6 years. Nationally, during the same period, the number of orchidopexies decreased only by 2.4% (from 18024 to 17591).
Conclusion. The results of this study confirm that recognition of acquired undescended testis is crucial for reducing the high number of (late) orchidopexies.
INTRODUCTION
Despite recommendations to perform orchidopexy (ORP) as early as 6-12 months of age for the treatment of undescended testis (UDT) (1), the number of boys operated later in childhood is still large (2). Initially the view was held that this high rate of ORPs in boys in mid- and late childhood, was due to surgery on retractile testes. However, at present, acquired UDT is increasingly recognised as a major cause (3-5).
In our hospital, acquired UDT was recognised in the mid 1990s as a separate entity. Since spontaneous descent at puberty occurred in many boys with acquired UDT, surgery was withheld during the late 1990s. Boys referred for acquired UDT were annually assessed until spontaneous descent or until ORP had to be performed at mid puberty (6). This policy, however, has not yet been adopted nationwide in the Netherlands, mainly due to unfamiliarity with the phenomenon of acquired UDT.
This study reports the effect of the above-mentioned expectative policy on the number of ORPs in our hospital. In addition, a comparison was made between our ORP numbers and the national figures.
METHODS
Design
In this retrospective study, the number of ORPs for UDT in two 5-year periods were analysed. During period A (1991-1995) UDT was treated surgically; during period B (2000-2004) prepubertal ORP was no longer performed for acquired UDT in our hospital. In addition, a comparison was made between the percentage reduction in hospital- and national numbers.
Definitions
UDT was defined as a testis which could not be manipulated in its most caudal position into a stable scrotal position and further traction on cord structures was painful. Congenital UDT was defined as an UDT which had not previously been descended. Acquired UDT was defined as an UDT in which a previous scrotal position was documented on at least one occasion.
Number of ORPs
Data on the number of boys who underwent ORP for UDT (uni as well as bilateral) in our hospital were obtained from the Unit of Medical Registration. Data on the number of boys who underwent ORP for UDT in the Netherlands were obtained from the research- and advice institute for the Dutch Healthcare, Prismant. All data were stratified by age. For period B, the hospital medical files were analysed to obtain information on indications for surgery.
Statistics
The non-parametric statistic for K related samples, “Kendall’s W”, was used to test agreement between the hospital- and the national rates, as well as between the two studied periods (Kendall’s W > 0.7 means “high agreement”).
RESULTS

Number of ORPs

Table 1 shows the number of ORPs per year, stratified in two-year age groups, in the hospital as well as nationally. In period A, in our hospital, the number of ORPs amounted to 387; in period B 148. Nationally the numbers amounted to 18,024 and 17,591, respectively.

Table 1 Number of orchidopexies, performed for undescended testis, according to age in our hospital and in the Netherlands, during period A (1991-1995) and period B (2000-2004). The period between is indicated in grey.

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Age distribution

Figures 1 and 2 show the age distribution of the total number of ORPs, during both periods in our hospital (Figure 1) as well as nationally (Figure 2). Comparing period A with period B, less statistical agreement (Kendall W: 0,177) was found in the hospital number
Different Aspects Of Acquired Undescended Testis

of ORPs. During period A, ORP-peaks can be seen at two ages (5 and 11.5 years) and during period B only at one age (2 years).

High statistical agreement (Kendall W: 0.757) was found in the national number of ORPs when comparing period A with period B. During both periods two ORP-peaks can be seen (at 2.5 and 11 years and at 2 and 11 years, respectively).

Medical records

Figure 3 and Table 2 show the indications for ORP in our hospital during period B, stratified in 6-year age groups. In 148 boys aged < 17 years, ORP was performed for unilateral (n=128) and bilateral (n=20) UDT. 102/148 ORPs (68.9%) were performed for congenital UDT and 40/148 (27.0%) for acquired UDT. In six cases it could not be ascertained whether the UDT was congenital or acquired.

Figure 1 Number of orchidopexies, performed for undescended testis, during period A (1991-1995) and period B (2000-2004), according to age in our hospital.

Figure 2 Number of orchidopexies, performed for undescended testis, during period A (1991-1995) and period B (2000-2004), according to age, nationally, in the Netherlands.

Figure 3 Flowchart of orchidopexies for congenital and acquired undescended testis in our hospital during period B (2000-2004).
DISCUSSION

This study demonstrates a 61.8% reduction in the number of ORPs for UDT in our hospital, after recognition of acquired UDT as a separate entity and implementation of an expectative policy. During the studied periods, the number of referrals seemed to be unchanged, although the exact number of referrals during period A is not precisely known. However, comparing the number of referrals for UDT at our outpatients clinic during Period B (368) with the number of ORPs in period A (387), during which any referral for UDT underwent ORP, we found minimal difference (Table 3). In addition, during the studied periods, in the Netherlands, the birthrates did not change dramatically, as shown in Table 4.

Table 2 Number of orchidopexies for congenital and acquired undescended testis in our hospital, per year, and stratified in 6-year age groups.

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<th>12-16 years</th>
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Table 3 The number of orchidopexies during period A and the number of referrals for undescended testis during period B, in our hospital.

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</table>
Currently, the observed 2-3% ORP-rate is still substantially higher than the presumed UDT-rate of 0.8-1.0% (7,8). This large number of (late) ORPs has initially been explained by late referrals, surgery on retractile testes and misdiagnosis. However, several authors have already suggested that acquired UDT may play an important role and might explain the discrepancy between the UDT- and ORP-rates. At present, acquired UDT is commonly accepted as a separate form of UDT (9,10). It occurs in 1.2% of 6 year olds, in 2.2% of 9 year olds and in 1,1% of 13 year olds (11). Acquired UDT has also been described in boys less than 1 year of age (“early ascents”) (12). Although the exact pathogenesis of acquired UDT is still uncertain, alteration in the length of the inguinal canal with growth and failure of the spermatic cord to elongate in proportion to somatic growth are described (13,14). For treatment, prepubertal ORP is intuitively recommended, although long term follow-up studies to justify this policy have not yet been published.

In the Netherlands, since it was assumed that many ORPs were performed on retractile testes, a national testis registration at birth was introduced after a Consensus Development Conference in 1986 (15). However, the high rate of ORPs did not reduce dramatically making the retractile testis an improbable cause. Due to the national testis registration, in our hospital, acquired UDT was gradually recognised as a separate entity. Since a definite and constant tendency towards spontaneous descent of acquired UDT at puberty became apparent with probable normal growth after spontaneous descent, surgery was slowly but surely withheld since the mid 1990s (16). However, it is still unknown if testes that are in a suprascrotal position may be damaged by this environment. Some authors believe that subsequent high temperatures in testes later in childhood decrease the total number of stem cells (17,18). Also, abnormal histology has been shown to exist in some ascending testes, but it is unclear what these findings mean (19,20). On the other hand, operation early compared to late within the age of 4 to 14 years has no effect on subsequent fertility (21). In addition, the consequences of prepubertal ORP remain unknown and there are indications that ORP

### Table 4

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Newborn Boys</th>
<th>Year</th>
<th>Number of Newborn Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>101581</td>
<td>2000</td>
<td>105637</td>
</tr>
<tr>
<td>1992</td>
<td>100862</td>
<td>2001</td>
<td>103806</td>
</tr>
<tr>
<td>1993</td>
<td>100118</td>
<td>2002</td>
<td>103734</td>
</tr>
<tr>
<td>1994</td>
<td>100261</td>
<td>2003</td>
<td>102870</td>
</tr>
<tr>
<td>1995</td>
<td>97560</td>
<td>2004</td>
<td>99230</td>
</tr>
<tr>
<td>Total</td>
<td>500382</td>
<td></td>
<td>515277</td>
</tr>
</tbody>
</table>

*n-orchidopexies: 18024
orchidopexy-rate: 3.60%*
might result in iatrogenic testicular damage later in life (22). It remains, however, difficult to
gain a comprehensive view of the consequences of the postponement of ORP since long-
term follow-up studies have not been published so far.

Although ORP is recommended between 6-12 months of age we found in this study,
during period B still 12/101 boys (11.9%), aged 6 years and over, undergoing ORP for con-
genital UDT. As far as we could ascertain, these boys were not referred earlier even though
the parents and testis registration suggested no previous stable scrotal position of the
testis from birth. This might be, in our opinion, at least disputable and additional education
programs should be initiated. Despite the introduction of an expectative policy in our hos-
pital, 12/40 boys (30.0 %) 6-12 years of age, still underwent ORP for acquired UDT during
period B. In these cases surgical intervention was perseveringly requested by the parents.
It apparently takes some time before they are convinced of the advantages of waiting until
puberty. This is not surprising since we have long taught them that UDT should be brought
to a normal position as early as possible. Therefore, we provide parents with actual infor-
mation leaflets and we spend explicit time for explanation about these new insights. Until
now, we perform ORP when the volume of the (contralateral) testis amounts 10-15 ml, as
measured by the orchidometer. Whether this is the most optimal moment is still subject of
study. Also, in our study, 5/40 Boys (12.5%) underwent ORP for acquired UDT before the
age of 6. This might be explained by the phenomenon of “early ascents”. The slight incre-
ase in ORPs in boys, aged 12 years and older, during period B, can be attributed to UDTs in
which spontaneous descent did not occur in early or mid puberty. Since, however, most of
the acquired UDTs have descended spontaneously, the total number of ORPs in period B is
still notably less than in period A.

This study has some obvious limitations. There was not an explicit moment at which our
policy was changed but it gradually took place during the mid 1990s. Therefore, only a
five-year period (2000-2004) after completion of the policy change could be studied. Ad-
ditionally, reliable data concerning previous testicular position were not available for the
national ORPs for both periods, nor for period A in our hospital. We assume, since during
period A, UDT was not classified into congenital and acquired forms, previous testicular
position was not explicitly requested in this period.

In summary, this study demonstrates a 61.8% reduction in the number of ORPs in our
hospital after recognition of acquired UDT and implementation of an expectative policy.
However, the final outcome of postponing orchidopexy is still unknown, and must be
studied in prospective controlled studies. In addition, a randomised study concerning the
health consequences of expectative policy is desirable. Still, we expect that extension of our
expectative policy may lead to a further reduction in ORP-rates, nationally and internatio-
nally. Therefore, we believe education programs should be initiated to promote familiarity
with the phenomenon of acquired UDT.

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data. We also thank Gavin ten Tusscher, MD, PhD, for editing the manuscript.

REFERENCES


2.4 THE HIGH SCROTAL (“GLIDING”) TESTIS REVISED

W.W.M. Hack, K. Sijstermans, L.M. van der Voort-Doedens, R.W. Meijer, K. Haasnoot

ABSTRACT
Objective. At present, the high scrotal testis (HST) is considered a distinct and separate entity of undescended testis (UDT). The aim of this study was to assess whether HST is actually either a congenital or acquired UDT.
Methods. In 527 consecutive boys (aged 0.4 to 16.5 years, mean 7.5) referred for non-scrotal testis, the number of HST was prospectively determined. According to previous testis position, the HST was classified into congenital and acquired HST. In congenital HST orchidopexy was performed whereas spontaneous descent at puberty was awaited in acquired HST.
Results. In 210 testes, the gonad was diagnosed as high scrotal. In six testes the condition was congenital and 204 testes were diagnosed as acquired. All cases of congenital HST were treated surgically. In 100 acquired HST follow-up was performed. Of these, 75 testes descended spontaneously at puberty.
Conclusion. We propose that the HST should be regarded, not as a distinct and separate entity, but as a part of the spectrum of either congenital UDT or acquired UDT. Since spontaneous descent can occur at puberty in acquired HST, therapy may be different between both forms.
INTRODUCTION
The ‘high scrotal testis’ (HST) or ‘gliding testis’ is usually considered a mild form of undescended testis (UDT) (1). It is defined as a testis which can be manipulated through the scrotal entrance into a high, but unstable scrotal position, while further traction on cord structures is painful (2). After release, the testis retracts immediately to the groin region. For treatment, orchidopexy (ORP) is usually recommended (3). The HST or ‘gliding testis’ is at present considered a separate and distinct category of UDT (1,4). In this article we want to support the view that the HST is not a distinct entity but part of the spectrum of either congenital or acquired UDT. This distinction might be important since the therapeutic approach might differ for either form.

METHODS
527 consecutive boys with non scrotal testis, referred to the outpatients clinic were, evaluated prospectively during the time period 1993-2004. The age of the boys ranged from 0,4 to 16,5 years (mean 7,5).

Definitions
In this study the following definitions were used (2). A retractile testis was defined as a normally developed testis which could be brought into a low scrotal position where it remained until the cremasteric reflex was elicited. Traction on cord structures was not painful. In contrast, an UDT was defined as a testis which could not be brought into a stable scrotal position and traction on cord structures was painful. A congenital UDT was defined as an UDT which had never been fully descended from birth, whereas an acquired UDT had previously been normally sited in the scrotum. A HST was defined as a testis which can (still) be brought through the scrotal entrance into a high but unstable scrotal position while further traction on cord structures is painful.

Methods
In each boy, physical examination was performed by one and the same physician (WH) with a two-handed technique while the boy was in supine as well as in squatting position. Testis volume was measured by comparative palpation using the Prader orchidometer. Puberty stage was assessed according to Tanner’s stage. In each boy previous testis position, as determined by proficient Youth Health Care medical officers at various ages during routine medical inspections, was obtained from the Youth Health Care Institution in our region.

Treatment and follow-up
In the case of congenital HST, ORP (i.e. funiculolysis and ORP) was performed between 12 and 24 months of age. In the case of acquired HST, size and position of the testis was assessed regularly at least once a year until spontaneous descent occurred. ORP was only performed if the boy had reached Tanner stage P3G3 with testicular volume of 10 to 15 ml and the gonad had not descended spontaneously. Follow-up was considered complete if the testis had descended spontaneously, mid pubertal ORP had to be performed, or if the boy was lost for follow-up.
RESULTS
Diagnosis at referral
At referral, in 178 testes a diagnosis of retractile testis was made whereas in 471 non-scrotal testes, a diagnosis of UDT was made (Figure 1). Of these, 210 testes were classified as high scrotal. In 92 cases the condition was right-sided, in 90 left-sided and in the remaining 14 bilateral.
In six testes, the testis had, from birth, never descended and a diagnosis of congenital HST was made. A representative example is shown in Figure 2. In these boys ORP was performed within a few weeks after referral.
In 204 testes, the testis had fully descended previously. In eight testes, this was documented at least once, in 15 at least twice, in 34 at least three times and in the remaining cases more than three times. Treatment was not performed in these cases but the boys were followed on a yearly basis.

Figure 1 Flowchart of the number of boys enrolled in this study and outcome.

Prolonged follow-up
204 acquired HST were followed and in 100 HST follow-up has currently been completed, while the remainder are still in follow-up. Four acquired UDT were lost for follow-up. In 75 out of 93 testes (80.6%), spontaneous descent occurred in the peripubertal period. A representative example is shown in Figure 3. In 18 testes (19.4%) ORP had to be performed at mid puberty. In seven testes prepubertal orchidopexy was performed in another hospital mainly on request of the parents.
Of the 93 acquired HST, 82 remained in a high scrotal position until spontaneous descent occurred (67 testes) or ORP had to be performed (15 testes). During follow-up 11
Figure 2 A. Congenital high scrotal testis in a 6 month old boy. B. In squatting position on the mother’s lap, the right testis can be brought into a high unstable scrotal position. Further traction on cord structures elicited discomfort. After release the testis immediately retracts to the groin region.

Figure 3 A. Acquired high scrotal testis in a 10 year old boy. At squatting the left testis can be brought into a high unstable scrotal position. Active treatment was withheld and puberty was awaited. B. At age 14 the testis had meanwhile descended spontaneously with a testicular volume appropriate for age (15 ml versus 15 ml of the contralateral gonad).
testes ascended to the groin region. Eight of these descended spontaneously and in three testes ORP had to be performed at mid puberty.

**DISCUSSION**

This series shows that the HST might not be a separate entity but rather part of the spectrum of congenital UDT and acquired UDT. We found that in 6 out of 210 cases (2.9%) the HST is congenital and in 204 out of 210 (97.1%) acquired. At present, UDT is categorised into a congenital and acquired condition. Congenital UDT is defined as an UDT which has never descended whereas the acquired form has fully descended initially (2). It was recently suggested that some of the acquired UDT might in fact be congenital (5). Congenital as well as acquired forms may include high scrotal as well as inguinal variants. The inguinal variant of acquired UDT is also known as “ascending testis”.

The HST should be clearly distinguished from the retractile testis (RT). Initially, it was thought that both conditions were identical and the HST was therefore also named “pathological retractile testis” (6,7). However, they are two different and distinct non-scrotal entities (8) and can be readily recognised clinically (see Table 1).

To distinguishing both forms a squatting position of the boy at physical examination is essential (9). The RT can be brought into a low stable scrotal position and traction on cords structures is not painful (10). In contrast, the HST can only be brought into a high unstable scrotal position and further traction on cord structures is painful. The RT is a physiological variant of a fully descended testis and therefore active treatment and long term follow-up is usually not indicated. The RT is attributed to an overactive cremasteric reflex or to alterations within the contractile properties of the cremasteric muscle (11).

<table>
<thead>
<tr>
<th>Age at occurrence (years)</th>
<th>Retractile testis</th>
<th>High scrotal testis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>½ until puberty</td>
<td>0–½ to 1</td>
</tr>
<tr>
<td>Preferred</td>
<td>5 – 6</td>
<td>0 – 3 months</td>
</tr>
<tr>
<td>Prevalence</td>
<td>50 – 60% at school entry</td>
<td>Unknown, probably &lt;½</td>
</tr>
<tr>
<td>Position of the testis</td>
<td>Scrotal/groin</td>
<td>Groin</td>
</tr>
<tr>
<td>Spontaneous</td>
<td>Low scrotal, stable</td>
<td>High scrotal, unstable</td>
</tr>
<tr>
<td>At physical examination</td>
<td>Not painful</td>
<td>Painful</td>
</tr>
<tr>
<td>Traction on cord structure</td>
<td>Hyperactive cremasteric refle</td>
<td>Incomplete descent</td>
</tr>
<tr>
<td>Cause</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anatomical findings</td>
<td>Normal</td>
<td>Epididymis may be abnormal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Testis may be abnormal</td>
</tr>
<tr>
<td>Treatment</td>
<td>None</td>
<td>Surgical</td>
</tr>
<tr>
<td>Follow-up</td>
<td>None</td>
<td>None after surgery</td>
</tr>
</tbody>
</table>

**Table 1** (Clinical) characteristics of the retractile testis and the congenital and acquired high scrotal testis.
It is especially common in boys around the age of starting school (5-6 years) (12). Some authors suggest that the RT may not be as innocuous as has been widely believed (13). In addition, recent evidence suggests that a RT may evolve into an acquired UDT (14). In contrast to the RT, a HST belongs to the spectrum of UDT.

The distinction between congenital and acquired UDT might offer an explanation of the phenomenon of the HST which has been seen hitherto as a separate entity. A congenital HST has already emerged from the inguinal canal and has reached the scrotum but its cord is too short to reach the distal part of the scrotum. Therefore, the last phase of descent from high scrotal to the distal scrotum has not been completed. The etiology of incomplete descent is not clear. The descent is a diphasic process in which a trans-abdominal and inguinal scrotal phase is recognised (15). In this process hormonal as well as mechanical factors play a role. Congenital HST may offer an explanation for the observed phenomenon of “early ascent” (16). In these cases the testis has descended at birth but ends up in an extra-scrotal position already in early infancy due to lengthening of body structures. It is tempting to speculate that “early ascenders” might be the same as “late descenders”. In these infants scrotal descent takes place in the first months after birth and most of them are cryptorchid at 1 year of age (17).

Acquired UDT has initially completed the process of descent. However, in order to remain in the scrotum as the boys grow, adequate elongation of the spermatic cord is needed, as the distance between the inguinal canal and the scrotum increases. During this process, the testis initially becomes high scrotal in an unstable scrotal position. Finally the gonad may become fully extra-scrotal (“ascending testis”). Other mechanisms for the development of testis ascent may include partial absorption of the processus vaginalis into the partial peritoneum (18,19,20) and cremaster muscle spasticity (21). In this series, in 82 out of 93 cases (88.2%) the HST remained high scrotal until puberty, whereas 11 cases (11.8%) became inguinal.

Congenital HST should be corrected surgically between 6 and 24 months after birth (22). In contrast, there is evidence that many acquired forms might descend spontaneously at puberty with testicular volume appropriate for patient age (23). It is tempting to speculate that this can be explained by hormonal influences during puberty. Surgical treatment is only recommended at Tanner stage P3G3 and testicular volume of at least 10-15 ml at ages 13-15 years.

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