# Current Referral Patterns and Means to Improve Accuracy in Diagnosis of Undescended Testis

**WHAT'S KNOWN ON THIS SUBJECT:** Primary care providers (PCPs) identify patients with undescended testis (UDT) and refer them to surgical specialists. Referral beyond the recommended times for orchiopexy has been reported, and PCPs' accuracy in identifying and distinguishing UDTs from retractile testes has been questioned.

**WHAT THIS STUDY ADDS:** We describe 3 observations that are strongly correlated with UDT, that is, birth history of UDT, prematurity, and visible scrotal asymmetry. UDT diagnoses are best made by 8 months of age, to reduce confusion with testicular retraction and to facilitate timely orchiopexy.


## abstract

**OBJECTIVES:** The goals were to determine current referral patterns for boys suspected of having undescended testis (UDT) and to identify factors to assist primary care providers in distinguishing retractile testes from UDTs on the basis of history, physical examination, or imaging findings.

**METHODS:** By using a standardized history assessment, visual inspection of the scrotum for symmetry, physical examination, and review of previously obtained imaging findings, we performed a prospective observational study with consecutive patients referred to a pediatric urologist for evaluation of UDT.

**RESULTS:** Of 118 boys, 51 (43%) had descended testes, 60 (51%) had UDTs, and 7 (6%) had initially indeterminate findings. Boys with UDT were referred at a median age of 43.3 months. Patients referred at <1 year or >10 years of age were significantly more likely to have UDT than were those referred at 1 to 10 years of age. History of UDT at birth, prematurity, and scrotal asymmetry strongly increased the risk of UDT. Genital ultrasonography had been performed for 25% of patients, incorrectly indicating UDT for 48%.

**CONCLUSIONS:** Most boys were referred well beyond the recommended age of <12 months for orchiopexy. Only one-half of the patients had UDT, with most errors in diagnosis being made for boys 1 to 10 years of age, which suggests difficulty distinguishing UDT from retractile testis. Positive birth history findings, prematurity, and scrotal asymmetry predicted UDT and can be used by primary care physicians in their assessment before referral. Genital ultrasonography did not distinguish UDTs from retractile testes. *Pediatrics* 2011;127:e382–e388



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**KEY WORDS**
undescended testis, orchiopexy, retractile testis


**ABBREVIATIONS**
CI—confidence interval
PCP—primary care provider
OR—odds ratio
UDT—undescended testis


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Testicular descent from the abdomen to the scrotum normally occurs at ~28 weeks of gestation, with incomplete descent reported for ~3% of term neonates,[1–3] which makes undescended testis (UDT) the most common birth defect among boys. Most UDTs migrate into the lower scrotum within the first 3 months of life, presumably as a consequence of a postnatal testosterone surge, with <1% remaining undescended by 1 year of age.[1,2]

The low likelihood of spontaneous descent after 1 year of age and the observation that germ cell counts decrease in UDTs after 1 year resulted in a recommendation that orchiopexy be performed by 12 months.[4,5] UDT diagnoses usually are made by primary care providers (PCPs), with referral to pediatric surgeons or urologists for surgery. Previous reports on referral patterns emphasized the patient age at presentation for orchiopexy,[6–9] with all noting that most patients were referred beyond the recommended age for therapy.

Similarly, we noted patients with diagnoses at birth who were referred at >1 year of age when UDT persisted; in addition, we observed other boys with normal examination results who were referred for evaluation of possible UDT despite a history of normal descent. To document findings, we performed a prospective study with a standardized parent questionnaire and physical examination by a single pediatric urologist for consecutive boys referred for evaluation of UDT. There were 2 study objectives, that is, (1) to document current referral patterns for UDT and (2) to identify factors to assist PCPs in distinguishing retractile testis from UDT on the basis of history, physical examination, or imaging findings.

## METHODS

Consecutive patients referred for evaluation of UDT in January through April 2009 first underwent standardized history-taking with a questionnaire (Appendix). Queries for parents addressed a history of prematurity (<37 weeks of gestation), whether the diagnosis of UDT had been discussed with them before hospital discharge, and whether the PCP who made the referral had been the provider since the initial outpatient newborn evaluation or was a new provider. Visual inspection of the scrotum then was made with the patient supine, to determine whether the 2 hemiscrota appeared symmetric or 1 side was hypoplastic (Fig 1). Finally, physical examination was performed by a single pediatric urologist (Dr Snodgrass). BMI was calculated on the basis of height and weight at presentation. Genital ultrasound scans obtained before referral by the PCP were reviewed. Data were recorded prospectively in a database and were reviewed with institutional review board approval for this report.

Examinations were performed with all patients supine. A nurse assisted in maintaining a slightly frog-legged position for infants and young boys, whereas older patients were instructed to assume this position and to avoid contraction of the abdominal musculature during inspection and palpation. Testes were considered normally descended if they resided in the middle to lower scrotum without palpable tension on the spermatic cord. Testes that were found in the upper scrotum or lower inguinal canal adjacent to the base of the penis, could be manipulated into the middle to lower scrotum without spermatic cord tension, and then remained there when released were considered retractile. Testes that could not be delivered into the middle to lower scrotum or could be manipulated there only with persistent spermatic cord tension that immediately returned the testis cephalad upon release were considered undescended. Findings of testes that could be palpated in the middle to lower scrotum and did not immediately return to a higher position when released but had tension on the spermatic cord were considered indeterminate. Patients with such findings underwent additional examinations to distinguish retractile testes from UDTs.

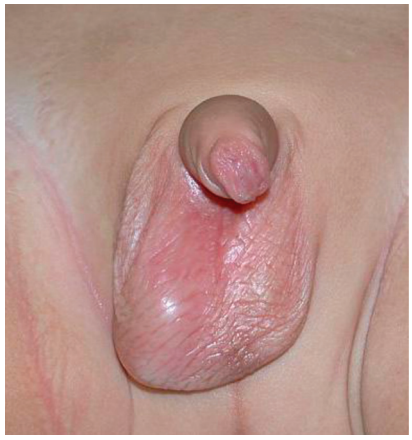

**FIGURE 1**
Visible scrotal asymmetry. The right testis can be seen in the lower scrotum, whereas the left testicle is not observed and the left hemiscrotum is relatively underdeveloped.

Because retractile testes may present variable examination findings, sometimes residing within the middle to lower scrotum and sometimes being noted in the upper scrotum or lower groin, but are considered a normal variant not requiring surgery, no distinction was made between descended testes and retractile testes in data analyses. Therefore, in this report, testes were defined as descended, undescended, or indeterminate. Patients with histories of ipsilateral inguinal or scrotal surgery were excluded, as were those with multiple-malformation syndromes.

We summarized continuous variables as means and SDs and categorical variables as frequencies and proportions. The variables (risk factors) were compared between subjects with UDTs and those with descended testes by us-

ing Student's $t$ test, Fischer's exact test, or $\chi^2$ tests. Logistic regression models with binary outcomes (undescended versus descended) were constructed to assess the association between testis position and predetermined risk factors, including birth history, age at diagnosis, scrotal asymmetry, BMI, history of prematurity, and practitioner (new provider versus established provider). Univariate logistic regression models determined the relationship of individual factors to testis position, whereas multivariate logistic regression analyses assessed the joint effect of these factors. A stepwise variable selection procedure was used to construct the final multivariate model. Statistical significance was declared for $P$ values of $<.05$. All analyses were conducted by using SAS 9.2 (SAS Institute, Cary, NC).

## RESULTS

A total of 121 consecutive patients were referred for evaluation of UDT, of whom 3 were excluded from additional analyses; 2 had descended testes with hydroceles and 1 had been adopted, with an unknown birth history. Of the remaining 118 boys, 51 (43%) had descended testes, 60 (51%) had UDTs, and 7 (6%) had initially indeterminate findings. Subsequent examinations diagnosed UDT in 4 cases, for a total of 64 patients with UDTs, 51 patients with descended testes, and 3 cases that remained indeterminate, with future reevaluation scheduled. UDT was unilateral in 57 cases and bilateral in 7 cases, and testes were not palpable in 21 cases (bilaterally in 3 cases). The median age at referral for all boys with UDT was 43.3 months.

The various demographic and clinical factors assessed at referral for subjects with and without UDT are summarized in Table 1. Discussions of a UDT diagnosis after hospital newborn examination were reported for 34 patients, of whom 32 (94%) had UDT. Only 21 of those patients (62%) were referred at <12 months of age (median age: 21.4 months [range: 4–111 months]). The parents of the remaining 32 patients with UDT did not recall the diagnosis being discussed before hospital discharge; this group included 11 of 21 patients with nonpalpable testes and 2 of 3 patients with bilaterally nonpalpable testes.

**TABLE 1** Demographic and Clinical Features of Patients With UDT, Compared With Patients With Normal Examination Results

| | UDT ($N = 64$) | Normal Results ($N = 51$) | $P$ |
|---|---|---|---|
| UDT discussed with caregivers at birth, *n* (%) | 32 (50) | 2 (3) | <.0001 |
| Gestational age of <37 wk, *n* (%) | 11 (17) | 4 (7) | .149 |
| Scrotal asymmetry on physical examination before palpation, *n* (%) | 45 (70) | 1 (1) | <.0001 |
| BMI, mean ± SD, kg/m$^2$ | 18.3 ± 2.6 | 19.0 ± 4.0 | .271 |
| Referred by new PCP, *n* (%) | 18 (28) | 25 (49) | .003 |
| Nonscrotal position demonstrated through testicular ultrasonography, *n* (%) | 15 (23) | 14 (27) | .597 |

Findings were determined by an experienced pediatric urologist and were evaluated with Student's $t$ test, Fischer's exact test, or $\chi^2$ test as appropriate. Three patients with multiple indeterminate physical examination results were excluded from this analysis.

Of 35 patients referred before 12 months of age, 27 (77%) had UDT, as did 6 (85%) of 7 boys referred during puberty, at >10 years of age. In contrast, only 31 (42%) of 73 patients referred between 1 and 10 years of age had UDT ($P = .003$) (Table 2). Regardless of age at referral or other risk factors, a history of prematurity was associated with higher risk of UDT, which was found for 11 (73%) of 15 boys born at <37 weeks of gestation.

Visual inspection of the scrotum before palpation revealed asymmetry for 46 patients, of whom 45 had UDT. Asymmetry was noted for 44 of 57 patients with unilateral UDT, 1 of 7 patients with bilateral UDTs, and 1 patient with descended testes.

Genital ultrasonography was performed before referral for 30 patients (25%) and indicated UDT for 29 patients, of whom 14 had descended testes on physical examination. For 9 patients, testing was performed between birth and 1 year of age. Of those patients, 4 were evaluated between birth and 6 months, with findings confirming suspected UDT in each case. Among 5 boys 7 to 11 months of age, ultrasonography in 3 cases indicated bilateral inguinal testes that were demonstrated to be descended in subsequent physical examinations. Another 20 patients were between 1 and 10 years of age at the time of genital ultrasonography, 4 with nonpalpable testes. Of the remaining 16, 12 were reported to have bilateral inguinal testes but had normal physical examination results. Ultrasonography was performed for 1 pubertal boy with UDT.

These 121 patients were referred by a total of 92 PCPs, of whom 49 were the established providers since the initial outpatient newborn examinations and

**TABLE 2** Risk Factors for UDT According to Age Group

| | 0–12 mo | 13 mo to 10 y | >10 y |
|---|---|---|---|
| *N* | 35 | 73 | 7 |
| With UDT, *n* (%) | 27 (77) | 31 (42) | 6 (85) |
| UDT diagnosed at birth, *n* (%) | 21 (60) | 13 (17) | 0 (0) |
| Scrotal asymmetry, *n* (%) | 24 (68) | 7 (25) | 4 (57) |

43 were new providers. New PCPs were more likely to refer patients for UDT who were found to have descended testes than were established providers (Table 1).

Multivariate logistic regression analyses identified a history of UDT at birth (odds ratio [OR]: 21.4 [95% confidence interval [CI]: 3.8–120.8]), scrotal asymmetry (OR: 121.3 [95% CI: 14.3 to >999]), and gestational age of <37 weeks (OR: 6.8 [95% CI: 1.5–32.3]) as important factors that increased the odds of a UDT diagnosis, achieving a *C* statistic of 0.925, which indicates a high discriminative power to distinguish high-risk patients from low-risk patients (Table 3). Although simple logistic regression analyses did not identify it as an independent risk factor, history of prematurity was associated with a higher risk of UDT with controlling for the other risk factors, such as age at referral and scrotal asymmetry. Of 15 boys born at <37 weeks of gestation, 11 (73%) had UDT.

## DISCUSSION

Although the diagnosis of UDT ultimately is established through physical examination by a surgical specialist, the initial responsibility for assessing testicular position resides with PCPs, including providers in both newborn nurseries and outpatient clinics. The small numbers of affected boys (3% of term newborns and <1% of infants 12 months of age) mean that individual PCPs do not encounter the condition frequently. Evaluation is complicated by the potential for changes in testicular position over time, that is, descent of most newborn UDTs during the first 6 months of life and retraction of descended testes above the scrotum through cremaster muscle contractions between ~12 months of age and the onset of puberty. We identified 3 readily assessed factors that increased significantly the odds that a patient would be diagnosed as having UDT on physical examination by an experienced pediatric urologist, namely, a history of UDT mentioned to the caregivers at birth, prematurity, and visible scrotal asymmetry.

The odds of having UDT were >20 times higher for boys whose parents recalled being told of the UDT at birth. Among 34 patients for whom the diagnosis of UDT was discussed with caregivers at the time of the hospital newborn examination, 32 (94%) had UDT, compared with only 2 of 51 patients with normally descended testes. Similarly, 73% of boys born prematurely had UDT, and 77% of boys with unilateral UDT (which constituted the majority) exhibited ipsilateral underdevelopment of the scrotum on visual inspection.

Although it is subject to recall bias, the observation that approximately one-half of the patients with UDT did not have the diagnosis discussed with parents at birth raises concerns regarding the accuracy of newborn examinations, as highlighted by the 2 cases with bilateral nonpalpable testes in which evaluation for intersexuality should have been performed. It is possible that the newborn physical examination identified UDT in some of the remaining cases but this finding and its clinical significance, including the need for surgery in the event the testicles did not descend spontaneously by 6 months of age, were not communicated effectively to the family.

Of patients with a reported diagnosis of UDT at birth, 38% were referred for surgery after 12 months of age. The mean age at referral for all boys with UDT in this series was 43.3 months, well beyond the currently recommended 12 months for orchiopexy.[4,5] Other authors noted a tendency for similar late referrals, at 42.6 months[10] and 50.4 months,[8] and, although review of a New York statewide database showed decreases in the age at orchiopexy from 1984 to 2002, the authors noted that, in the last cohort (1999–2002), 62% of surgically treated patients were >2 years of age.[9] However, multiple factors influence the timing of specialist referral in the United States, including not only the age at diagnosis of the UDT by the PCP but also the parents' ability to schedule and to attend the appointment. There were no differences in wait times to see the specialist in this single-surgeon series, and insurance status did not affect wait times from the date of referral to the date of appointment for our patients. However, we could not control for possible effects of insurance status on time to presentation to the PCP.

Most errors in diagnosis occurred for boys between 1 and 10 years of age. PCPs ' difficulty in distinguishing descended testes from retractile testes is suggested by the observation that, with subtraction of the 12 patients in this age group with positive birth history findings and UDTs, only 19 (26%) of 73 boys had UDT. Among boys 1 to 10 years of age who lacked any of the 3 risk factors (not told of UDT at birth, symmetric-appearing scrotum, and term gestation), only 5 (6%) of 73 had UDT. Our data indicate that term boys 1 to 10 years of age with negative birth history findings and scrotal symmetry

**TABLE 3** ORs for UDT for Significant Predictors

| Variable | OR (95% CI) | *P* |
|---|---|---|
| UDT discussed with caregivers at birth | 21.4 (3.8–120.8) | .0005 |
| Scrotal asymmetry on examination | 121.3 (14.3 to >999.9) | <.0001 |
| Prematurity (<37 wk of gestation) | 6.8 (1.4–32.3) | .0148 |

Multivariate logistic regression analyses were performed by using stepwise selection of the variables in TABLE 1. The variables indicated were found to be statistically significant predictors of UDT.

have a low risk for UDT; therefore, we recommend that these patients undergo a second examination by their PCPs to rule out retractile testis before referral to a surgical specialist. This caveat especially applies to new providers performing their initial examination, whom we found to be more likely than established PCPs to refer patients with retractile testes for evaluation of UDT.

Evaluation to distinguish UDTs from retractile testes is best performed with the child relaxed, in a supine, partially frog-legged position. Visual inspection may demonstrate the retractile testis residing in the middle to lower scrotum, with subsequent palpation along the inner thigh or scrotum stimulating a cremasteric reflex that retracts the testis to the upper scrotum/lower inguinal canal. Patients with symmetric scrota were much more likely to have retractile testes than UDTs, whereas most patients with asymmetry had UDTs. However, limitations of visual inspection include its subjective nature and the potential for false-negative findings with bilateral UDTs, which represent the minority of cases.

We did not distinguish between descended and retractile testes in this report. Most of the patients we describe as having descended testes were observed to have both testes lying in the middle to lower portion of a symmetric scrotum. In some but not all cases, retractile activity of a scrotal testis was noted before palpation, but we assumed that others might have demonstrated similar retraction during examination by the PCP before referral. Some patients had scrotal symmetry, with testes residing in the lower groin, which were manipulated readily into the scrotum without tension on the spermatic cord; these retractile testes also were considered descended. We thought that obesity might complicate examinations, but mean BMI values were similar for patients with and without UDTs (Table 1). Of the 15 patients >2 years of age with BMI-for-age values of >95th percentile, 5 had UDTs and 10 had normally descended testes (data not shown).

Genital ultrasonography was performed before referral for 20 patients (27%) between 1 and 10 years of age, including 4 with nonpalpable testes. Of the remaining 16 boys, ultrasonography indicated bilateral inguinal testes for 12, all of whom exhibited descended testes in physical examinations. Genital sonography does not distinguish accurately retractile testes from UDTs, presumably because of cremaster muscle contraction during the examination.

Some patients with negative birth history findings and previous normal examination results might have been referred for evaluation of possible "ascending testes." This term refers to testes that are thought to be descended normally and then ascend to an abnormal location. Proposed causes include inadequate spermatic vessel growth, tethering by a fibrous remnant of the processus vaginalis,[11] and an inadequate postnatal testosterone surge to stabilize the testis within the scrotum.[12] A recent, prospective, longitudinal study of newborn boys examined by a team of trained research nurses reported a prevalence of UDT among 784 boys of 5.9% at birth, which decreased to 2.4% by 3 months of age as a result of postnatal descent but then increased to 6.7% at 12 months of age as a result of testicular ascent. The authors concluded that testicular ascent accounts for UDTs presenting in older infants and children.[12]

Although 74% of our patients with negative birth history findings who were referred between 1 and 10 years of age did not have UDT, we cannot state whether those with UDT had the condition from birth or acquired it subsequently. However, the diagnosis of ascending testis assumes accurate birth examination results to confirm that normal descent occurred originally. The accuracy of newborn and infant genital examinations has been questioned,[13] and our observation that 11 of 21 patients with nonpalpable testes did not recall the diagnosis being mentioned at birth supports that concern. An alternative explanation is that ascending testes are either retractile testes or UDTs that were not detected previously. It is apparent that newborn and subsequent examinations during the first year of life for boys should be performed carefully, to document that the testes reside without tension in the middle to lower scrotum.

Although examination by an experienced provider is considered the standard method for diagnosing UDT, our study was limited to a single surgeon at a single institution. Orchiopexy rates greater than the anticipated incidence of UDT after 12 months of age have been reported,[9,14] which suggests that the results of physical examinations even by experienced pediatric surgical and urologic specialists are not always accurate and may result in patients with retractile testes undergoing orchiopexy. We considered initial evaluation results indeterminate for 6% of referred patients, but it is possible that some cases we diagnosed as UDT were only testicular retraction and some considered normal represented UDT. However, of 18 patients 1 to 10 years of age with negative birth history findings whom we diagnosed as having UDT, 8 had a nonpalpable testis, and a patent processus vaginalis, which commonly occurs with UDTs and would not be expected with retractile testes, was found for 5 during orchiopexy. Furthermore, no patient with a diagnosis of UDT was found to have a descended testis after induction of general anesthesia for orchio-

pexy, when cremaster muscle contraction should be reduced. Agarwal et al[15] reported that retractile testes sometimes are later found to be undescended, especially when there is tension on the spermatic cord (ie, cases we characterized as indeterminate). The 3 patients whose evaluations remained unclear continue with follow-up examinations scheduled as recommended.

Applying evidence-based findings regarding means to change physician practices, Brown et al[14] considered physician education alone ineffective to prompt earlier referral. They instituted a regional system that combined a letter from the newborn nursery informing PCPs of UDT, parent leaflets when the birth examination yielded positive findings for UDT, and a policy that referrals to surgical specialists should be made by 8 months of age in all cases in which there was doubt by PCPs regarding normal testicular position. Reductions in both age at referral and number of orchiopexies performed were noted after these 3 measures were instituted.

We agree with Brown et al[14] that a universal policy among PCPs that referrals should be made by 8 months for all patients with a question of abnormal testicular position would increase the number of orchiopexies performed during the recommended time period. For cases in which a question arises after 8 months, our observations that term boys 1 to 10 years of age with negative birth history findings and visibly symmetric scrota rarely have UDT should reduce unneeded referrals for retractile testes and should clarify the role, if any, of secondary testicular ascent.

## CONCLUSIONS

In this study, only one-half of the patients referred by PCPs for evaluation of UDT had UDT, and their median age significantly exceeded recommendations that orchiopexy be performed before 12 months of age. Boys $<$1 year or $>$10 years of age were more likely to have UDTs than were those between 1 and 10 years of age, which suggests confusion in distinguishing UDTs from retractile testes. A history of UDT diagnosed at birth, prematurity, and the finding of scrotal asymmetry increased the odds for UDT by 21.4-, 6.8-, and 121.3-fold, respectively. Boys without these risk factors should undergo repeat examinations for retractile testes before referral to a surgical specialist. Genital ultrasonography does not distinguish UDTs from retractile testes.

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**APPENDIX** Standardized History Questionnaire for Patients Referred for Evaluation of UDT

Was your child born full term or premature?
Did the doctors at the hospital where your child was born mention a problem with his testicle?
If not, when was the first time a doctor said the testicle was not in the normal position?
Was the doctor who first mentioned a testicle was not in the correct place a new PCP or has he had the same PCP his whole life after discharge from the hospital?
Have any x-ray tests been performed to evaluate the testicles?