Testing the undescended testis

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Natural course of undescended testes after inguinoscrotal surgery

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ABSTRACT

Purpose
To study the natural course of undescended testes after inguinoscrotal surgery.

Methods
From 2003-2010, 24 boys were observed with 26 undescended testes after inguinoscrotal surgery; 12 had previously undergone inguinal hernia repair and 12 orchidopexy. Spontaneous descent was awaited and (re-)orchidopexy would only be performed in case of non-descent at puberty. The boys were assessed annually for testis position and for testis volume as measured by ultrasound.

Results
At the end of the study period, 19 testes had reached scrotal position; of these, 13 (68%) had descended spontaneously and 6 (32%) had been (re-)orchidopexied. No difference was found in the rate of spontaneous descent after previous orchidopexy or inguinal hernia repair (p = 0.419).

Conclusion
Spontaneous descent of undescended testes after inguinoscrotal surgery occurs regularly. In this study, it was observed in two out of every three cases.
INTRODUCTION

After inguinal hernia repair or orchidopexy, the testis may gradually ascend out of the scrotum, resulting in a respectively iatrogenic undescended testis (UDT) and a congenital UDT despite orchidopexy. After orchidopexy, UDT has been described in 0.2 - 13% 1-6 and after inguinal hernia repair in 0.8 - 2.8%.7-11 Those UDT after inguinoscrotal surgery are usually treated surgically at diagnosis in the belief that scar tissue will prevent spontaneous descent at puberty. However, re-do surgery may further worsen fertility outcome.

In this article we describe the natural course of UDT after inguinoscrotal surgery and we hypothesize that spontaneous descent occurs at puberty.

Methods

Design of the study

Since the 1990s, a cohort of boys with acquired UDT were monitored annually for puberty stage, testis position and testicular volume measurement by ultrasound at the outpatient department at the Medical Center Alkmaar. In accordance with the Dutch consensus on non-scrotal testis 12, a wait-and-see policy was followed for acquired UDT until puberty. If spontaneous descent did not take place at puberty stage 3, orchidopexy was performed. All measurements were carried out by the same physician (WH). In 77.5% of cases, spontaneous descent was observed.13

Within this cohort, from 2003-2010, we recruited 29 boys, with 32 UDT after inguinoscrotal surgery who received the same policy. Boys were excluded if they were lost to follow-up or a re-operation was performed before they had reached puberty stage 3.

Boys were categorized as ‘still in follow-up’ if, by the end of the study period, they had not reached puberty stage 3 and their UDT had not reached scrotal position. If by the end of the study period, the testis had reached scrotal position, the outcome was defined as either ‘spontaneous descent’ or ‘(re)orchidopexy’. The date of the outcome was defined as the day the boy was observed with a spontaneous descended testis at the outpatient department and the day the (re-)orchidopexy took place.
Data
Pediatric and surgical records were reviewed to confirm the diagnosis of ‘undescended testis after inguinoscrotal surgery’ and to collect data regarding:
- type of primary surgery (orchidopexy or inguinal hernia repair)
- age at primary surgery
- age at referral
- outcome: still in follow-up / spontaneous descent / (re-)orchidopexy
- age at outcome

Testicular volume after spontaneous descent or (re-) orchidopexy
Boys with spontaneously descended or (re-)orchidopexied testes were seen in follow-up. Position was checked and an ultrasound was performed to measure testis volume. To measure the volume, the scanner was placed on the scrotum while exerting light pressure to avoid distorting the testicular shape. Grey-scale images of the testes were obtained in the transverse and longitudinal planes. Three separate transverse and longitudinal images were recorded for each testis. The epididymis was not included in the images. After maximum length, width and height were obtained in the ultrasonogram, these were measured and the volume was calculated with the formula for an ellipsoid, i.e. $\frac{\pi}{6} \times$ length $\times$ width $\times$ height. For each testis, the highest value of the three testicular volumes was taken as volume measurement.

The volume of the spontaneously descended or (re-)orchidopexied testis was compared with the volume of its counterpart using the index of both testes: $V_{SD \ or\ (re)ORP}/V_{contralat}$. Besides, the volumes of the spontaneously descended or (re-)orchidopexied testes were plotted in the curve of normative values of testicular volumes.14

Definitions
A UDT was defined as a testis which could not be manipulated into a stable scrotal position in its most caudal location and further traction on cord structures was painful. This may include high scrotal as well as inguinal and impalpable forms.
Inguinoscrotal surgery was defined as surgery performed in the inguinal and/or scrotal region. This includes inguinal hernia repair or orchidopexy. Surgery was performed under general anesthesia.
Inguinal hernia repair involved an open procedure in which an inguinal incision and
Undescended testes after inguinoscrotal surgery

exploration of the groin was followed by ligation of the open processus vaginalis. Orchidopexy was performed as an open procedure involving an inguinal incision and exploration of the groin: if present, the open processus vaginalis was separated from the cord structures and ligated. Subsequently, separation of the cremaster muscle and retroperitoneal funiculolysis were performed to mobilize the cord. Finally, the testis was fixated in the scrotum by a scrotal incision in a created Dartos pouch.

A spontaneously descended testis was defined as a previously undescended testis which had descended to a stable painless scrotal position without any intervention. Re-orchidopexies were performed through the original but extended inguinal incision. Exploration of the groin took place and, if necessary, further mobilization of vas and vessels as well as ligation of the processus vaginalis were carried out, followed by fixation of the testis in a created Dartos pouch.

Statistical analysis

All data were managed and analyzed with SPSS, version 14.0. Pearson’s chi-squared test was used to test the relationship between the type of primary surgery and the outcome. The Mann-Whitney U test was used to test the relationship between age (at primary surgery, at referral and at outcome) and follow-up periods. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Study population

During an eight-year period (2003-2010), 29 boys with ages ranging from 2.2 – 13.4 years (mean ± SD: 8.0 ± 3.0 years) were diagnosed with 32 UDT after inguinoscrotal surgery. Five boys were excluded: two boys were lost to follow-up, and three boys had undergone (re-)orchidopexy before reaching puberty stage 3. In two of these boys (age 4 and 11 years, both orchidopexy as primary surgery), the indication for this re-operation stemmed from the belief that scar tissue would prevent spontaneous descent. Both boys appeared to have some scar tissue. The third boy had undergone an inguinal hernia repair as primary surgery and was 11 years old when he developed inguinal pain. As a testicular torsion was suspected, he was operated on. During the operation, a recurrent open processus vaginalis was found, which was closed, followed by fixation of the testis
in a created Dartos pouch.

Exclusion of these 5 boys resulted in a total of 24 boys with 26 UDT after inguinoscrotal surgery. The baseline characteristics and relevant pathology of the study population are presented in Table 1.

**Table 1** Baseline characteristics and relevant pathology of study population (n = 24).

<table>
<thead>
<tr>
<th></th>
<th>n = 24</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nationality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dutch</td>
<td>17</td>
<td>70.8</td>
</tr>
<tr>
<td>Turkish</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td>Moroccan</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td>Portuguese</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Unknown</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td><strong>Birth weight</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥2500 gr</td>
<td>15</td>
<td>62.5</td>
</tr>
<tr>
<td>&lt;2500 gr</td>
<td>7</td>
<td>29.2</td>
</tr>
<tr>
<td>Unknown</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td><strong>Pregnancy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥37 wks</td>
<td>17</td>
<td>70.8</td>
</tr>
<tr>
<td>&lt;37 wks</td>
<td>5</td>
<td>20.8</td>
</tr>
<tr>
<td>Unknown</td>
<td>2</td>
<td>8.3</td>
</tr>
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<td><strong>Asthma and/or allergy</strong></td>
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<td></td>
</tr>
<tr>
<td>Asthma and/or allergy</td>
<td>4</td>
<td>16.7</td>
</tr>
<tr>
<td>Attention deficit disorder</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Chromosomal disorder (PXE)</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Development disorder</td>
<td>4</td>
<td>16.7</td>
</tr>
<tr>
<td>Congenital urogenital disorders</td>
<td>3</td>
<td>12.5</td>
</tr>
</tbody>
</table>

**Primary inguinoscrotal surgery**

Of the 24 boys, 12 had undergone orchidopexy as primary surgery, and two of these had bilateral UDT. The remaining 12 boys had an iatrogenic UDT after inguinal hernia repair, and all of these boys had unilateral UDT. In other words, 14 of the 26 (54%) were congenital UDT despite orchidopexy and 12 (46%) were iatrogenic after inguinal hernia repair.
Age at primary surgery
Mean age at primary surgery (n = 24) was 2.5 ± 2.0 years (range 0.1 to 8.8 years), with a mean age for orchidopexy of 2.7 ± 1.4 years (range 0.2 to 4.5 years) and for inguinal hernia repair of 2.3 ± 2.6 years (range 0.1 to 8.8 years). No significant difference was found (p = 0.326).

Time between primary surgery and referral
With a mean age at referral (n = 24) of 7.9 ± 2.9 years (range 2.2 to 13.4), the interval between primary surgery and referral was 1.2 to 10.0 years (mean 5.4 ± 2.8 years). The interval for boys who had previously undergone orchidopexy (n = 12) was 2.2 to 10.0 years (mean 6.0 ± 3.0 years) and for the boys who had undergone inguinal hernia repair (n = 12), the interval was 1.2 to 9.1 years (mean 4.8 ± 2.7 years) (p = 0.326).

Follow-up period
The interval between referral and outcome varied from 0.2 to 8.9 years (mean 3.8 ± 2.6 years).

Outcome

Still in follow-up
Six of the boys with 7 of the 26 UDT (27%) were still in follow-up at the end of the study period. At that moment, the boys’ ages were 6.1 to 14.0 years (mean 9.6 ± 2.7 years). The remaining 19 testes had reached the scrotal position and could be analyzed.

Spontaneous descent
Of the 19 UDTs, 13 had descended spontaneously (68%). The age at spontaneous descent was 8.6 to 13.8 years (mean ± SD: 11.6 ± 1.9), which was 5.2 to 13.3 years (mean ± SD: 8.9 ± 2.4 years) after primary surgery and 1.2 to 7.1 years (mean ± SD: 4.2 ± 2.0 years) after referral.

Re-operation
In 6 of the 19 UDT (32%), (re-)orchidopexy had to be performed as spontaneous descent had not occurred before reaching puberty stage 3. Age at (re-)orchidopexy was 13.1 to 14.3 years (mean 13.7 ± 0.4 years). The cases are summarized in Table 2. Most
re-operations were characterized by scar tissue in the former operation area. In two cases, the surgeon decided to perform an orchidectomy due to atrophy of the testis. Both boys were 14 years old. In the first boy, known with Pseudoxanthoma Elasticum, pathology of the testis revealed a testis of 4 x 1 x 1 cm (volume 2.1 ml) with atrophic signs and microlithiasis but no other abnormalities. In the other boy, pathology showed a testis of 3 x 3 x 1.5 cm (7.1 ml) with normal testis tissue.

Table 2  Cohort of patients in whom (re-)orchidopexy was indicated: type of primary surgery, age, perioperative findings and procedure performed.

<table>
<thead>
<tr>
<th>Primary surgery</th>
<th>Age at (re-) ORP</th>
<th>Perioperative findings</th>
<th>Procedure performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>IHR 13</td>
<td>some scar tissue</td>
<td>ORP</td>
<td></td>
</tr>
<tr>
<td>IHR 13</td>
<td>testis in SIP, scar tissue at the internal inguinal ring</td>
<td>ORP</td>
<td></td>
</tr>
<tr>
<td>ORP 14</td>
<td>firm scar tissue</td>
<td>re-ORP</td>
<td></td>
</tr>
<tr>
<td>ORP 14</td>
<td>atrophic testis in scar tissue</td>
<td>ORE</td>
<td></td>
</tr>
<tr>
<td>IHR 14</td>
<td>some inguinal scar tissue</td>
<td>ORP</td>
<td></td>
</tr>
<tr>
<td>ORP 14</td>
<td>firm inguinal scar tissue with high-scrotal atrophic testis</td>
<td>ORE</td>
<td></td>
</tr>
</tbody>
</table>

(re-)ORP = (re-)orchidopexy
IHR = inguinal hernia repair
ORE = orchidectomy
SIP = superficial inguinal pouch

Of the UDT after inguinoscrotal surgery 4/7 (57%) after inguinal hernia repair versus 9/12 (75%) after orchidopexy descended spontaneously. With a p-value of 0.419 this is not a significant difference in chance of spontaneous descent.

**Testicular volume after spontaneous descent or (re-)orchidopexy**

Of all 13 UDT after inguinoscrotal surgery that had descended spontaneously, volume was measured with ultrasound. During ultrasound, the boys were 10.9 to 16.9 years old (mean 13.6 ± 1.9 years), and the interval after spontaneous descent was 0 to 5.2 years (mean 1.9 ± 1.7 years).
The volume of the spontaneously descended UDT after inguinoscrotal surgery was 1.1 to 11.0 ml (mean 4.7 ± 3.2 ml), and the volume of the contralateral testis was 1.9 to 16.4 ml (mean 7.5 ± 4.7 ml). The laterality index ranged from 0.4 to 1.2 (mean 0.8 ± 0.3).

Of the 6 boys (with 6 UDT after inguinoscrotal surgery) who were re-operated, 2 underwent an orchidectomy and one did not receive an ultrasound postoperatively. The remaining 3 boys underwent an ultrasound examination at the age of 13.4, 15.4 to 16.2 years, with an interval after (re-)orchidopexy of 0.3, 1.5 and 2.8 years, respectively. The volumes of the (re-)orchidopexied testes were 3.5, 7.5 and 8.4 ml. The volumes of the corresponding contralateral testes were 6.6, 14.2 and 11.0 ml, resulting in laterality indexes of 0.5, 0.5 and 0.8.

Figure 1 shows the testicular volumes measured by ultrasound of the spontaneously descended testes (■) and (re-)orchidopexied testes (O), plotted in the curve for normal testicular values.14
DISCUSSION

This study shows that descent occurs spontaneously in 68% of UDT after inguinoscrotal surgery, both after orchidopexy and after inguinal hernia repair. The UDT after orchidopexy may be due to insufficient (retroperitoneal) mobilization of vas and vessels, inadequate high ligation of patent processus vaginalis and/or deficient intrascrotal testicular fixation. Furthermore, the pathogenesis of UDT after inguinoscrotal surgery may include entrapment of the testis or cord in scar tissue in the groin region. Surgery is usually recommended at diagnosis in the belief that scar tissue will prevent spontaneous descent at puberty. However, some authors suggest that re-do surgery may further compromise fertility outcome. In our experience, most testicles were indeed found in firm scar tissue which makes iatrogenic injury to the testicle probable during re-orchidopexy. To the best of our knowledge there are no long-term follow-up studies on fertility outcome after re-do surgery for UDT after inguinoscrotal surgery.

Spontaneous descent of congenital as well as of acquired undescended testis is a well-known phenomenon. Of the 3-5% of boys in whom the testis is undescended at birth, only 1% needs orchidopexy, due to spontaneous descent during the first months of life. Moreover, in acquired UDT, a similar proportion of cases (57-78%) descends spontaneously at puberty. This study is the first to report that spontaneous descent can also occur in UDT after inguinoscrotal surgery. It has been observed in two out of every three patients, both after inguinal hernia repair and after orchidopexy.

The limitations of this study need to be addressed. First, a critical comment should be made about the orchidectomy performed on two boys, both aged 14. If until puberty conservative therapy will result in atrophy and orchidectomy, this does not warrant a wait-and-see policy until puberty. The testes found during re-operation had a volume of 2.1 and 7.1 ml. If these volumes are compared with the normative testicular volume values found by Goede et al, they are at the 10th and > 50th centile for age, respectively. Pathology of both testes did not show any alarming abnormalities. Therefore, it is debatable whether these testes needed to be removed.

Moreover, this study concerns only a small number of boys. Therefore, statistical analysis of the testicular volumes of the spontaneously descended and (re-) orchidopexied testes was not possible. In addition, it is likely that subgroup analysis would not have reached significance levels. For instance, the distinction whether the
primary surgery was an inguinal hernia repair or an orchidopexy seems to differ for the chance of spontaneous descent (respectively 4/7 vs 9/12). Nonetheless, statistical analysis shows a p-value of 0.419. Therefore, we could not demonstrate a difference in spontaneous descent between those subgroups. In addition, we do not suggest a different policy for an iatrogenic UDT after inguinal hernia repair and a congenital UDT despite orchidopexy. Additional analysis with larger numbers of patients needs to be performed.

**CONCLUSION**

Spontaneous descent of UDT after inguinoscrotal surgery occurs. In our study, this was observed in two out of every three cases. It is as yet unknown whether a conservative attitude will improve fertility potential in comparison to (re-)orchidopexy at diagnosis; this should be further examined in a randomized controlled trial.
References