Digital imaging by parents: an aid to the diagnosis of inguinal hernia in infants and children

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ABSTRACT
Introduction: The aim of the study is to see the feasibility of utilisation of digital imaging by parents in the diagnosis of inguinal hernia in children, and reduce the rate of occasional negative groin exploration.

Methods: During a two and a half year period, 155 inguinal hernias were diagnosed and operated on in our university teaching hospital. The diagnosis was based on the history and physical examinations of all patients. In 21 patients, the diagnosis was made based on the examination of history alone, as they did not demonstrate the hernia at presentation. In the last year, digital imaging by parents was utilised to aid in the diagnosis of difficult cases. There were ten cases, in addition to the history and physical examinations, that were confirmed by this method. All hernias were confirmed at exploration during surgery.

Results: Out of 155 inguinal hernias, 21 (13.5 percent) were diagnosed by history alone, of which four (2.5 percent) had negative exploration, eight (5.1 percent) were positive for hernia, supported with digital imaging by parents’ pictures, and nine (5.8 percent) were positive at exploration, without any additional means of diagnosis.

Conclusion: History-taking and physical examinations are the mainstay of diagnosis of inguinal hernia in children. The capture of a digital image of the presenting complaint by the patients’ parents, can be used as an additional aid in the diagnosis of difficult cases to demonstrate inguinal hernia, as demonstrated in a selected group of children.

Keywords: diagnosis of inguinal hernia, digital imaging, inguinal hernia, parents

INTRODUCTION
Currently, no accurate method exists for the diagnosis of inguinal hernia, especially in young infants. History-taking and physical examinations remain the mainstay in the diagnosis of inguinal hernia in children. Unless the hernia is out or incarcerated, causing a bulge, or obvious asymmetry of the groin, diagnosis relies on history alone. The most accurate way of diagnosis is to visualise it out and to reduce it during physical examination, especially in young infants. Few methods have been used over the years with various success rates. The contralateral side has been the focus of attention and study. The purpose of this study is to raise awareness of digital imaging that may be employed for diagnosing inguinal hernia, and to encourage readers and medical personnel to further utilise it.

METHODS
During the past two and a half years, from July 2004 to December 2006, 155 inguinal hernias in 137 children were diagnosed and operated on in our university teaching hospital. There were 115 (83.9%) males and 22 females (16.1%). 81 (59.1%) hernias were on the right side, 38 (27.7%) were on the left side, and 18 (13.1%) were bilateral. Their ages ranged from one week to 12 years (Table I).

RESULTS
Diagnosis of inguinal hernia was made in four different ways: (1) hernias which were obvious and reducible all the time; there were 95 (61.3%) cases; (2) hernias which were incarcerated or there was a history of incarceration, reduction and referral for surgery; there were 16 (10.3%) cases; (3) hernias that demonstrated on effort or change in position (standing from sitting), or crying; there were 16 (10.3%) cases; and (4) hernias that were diagnosed based solely on history alone; there were 21 (13.5%) cases. Comorbid disease conditions associated with hernia, and simultaneous operations along with herniotomy, were recorded. Both had no relation to the diagnosis of hernia.

DISCUSSION
A common and frustrating problem faced by all paediatric surgeons is the course to follow when an excellent history of inguinal hernia exists, but the hernia cannot be demonstrated at presentation. The majority of inguinal hernias in children are diagnosed with certainty, but are occasionally difficult to diagnose in some cases;
surgeon encounters the hernia
side
herniography; ultrasonography
history -taking and
to
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hernia
paediatric surgeons
Marchildon, in which questionnaires were sent
out
the
cannot be demonstrated.

Total simultaneous
Comorbid
diseases, and

Table I. Demographics of patients, diagnosis, comorbid
diseases, and simultaneous procedures performed at the
time of herniotomy.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>No. of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>115 (83.9)</td>
</tr>
<tr>
<td>Female</td>
<td>22 (16.1)</td>
</tr>
<tr>
<td>Total</td>
<td>137 (100)</td>
</tr>
<tr>
<td>Side of presentation</td>
<td></td>
</tr>
<tr>
<td>Right side</td>
<td>81 (59.1)</td>
</tr>
<tr>
<td>Left side</td>
<td>22 (16.3)</td>
</tr>
<tr>
<td>Bilateral</td>
<td>81 (59.1)</td>
</tr>
<tr>
<td>Total</td>
<td>137 (100)</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
</tr>
<tr>
<td>All times</td>
<td>98 (63.2)</td>
</tr>
<tr>
<td>Effort</td>
<td>20 (12.9)</td>
</tr>
<tr>
<td>Incarceration</td>
<td>16 (10.5)</td>
</tr>
<tr>
<td>History alone</td>
<td>21 (13.5)</td>
</tr>
<tr>
<td>Positive</td>
<td>9 (5.8)</td>
</tr>
<tr>
<td>Positive with digital camera</td>
<td>8 (5.1)</td>
</tr>
<tr>
<td>Negative</td>
<td>4 (2.5)</td>
</tr>
<tr>
<td>Total</td>
<td>155 (100)</td>
</tr>
<tr>
<td>Comorbid disease</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Prematurity</td>
<td>5</td>
</tr>
<tr>
<td>Central nervous system pathology</td>
<td>6</td>
</tr>
<tr>
<td>Congenital heart disease</td>
<td>3</td>
</tr>
<tr>
<td>Collagen disease</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>16 (10.3)</td>
</tr>
<tr>
<td>Total simultaneous procedure</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Circumcision</td>
<td>16</td>
</tr>
<tr>
<td>Hydrocele</td>
<td>7</td>
</tr>
<tr>
<td>UDT</td>
<td>6</td>
</tr>
<tr>
<td>Umbilical hernia</td>
<td>2</td>
</tr>
<tr>
<td>Orthopaedic procedure</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>34 (21.9)</td>
</tr>
</tbody>
</table>

a situation where the history is typical, but the hernia
cannot be demonstrated. Or a question of hernia is
raised and the paediatric surgeon is consulted to rule
out the presence of a hernia. In an article by Rowe and
Marchildon, in which questionnaires were sent to senior
paediatric surgeons regarding the diagnosis of inguinal
hernia in children, 45% said they would operate based
on history alone, while 55% would examine the child
again. The results were similar even when a paediatrician
referred the child—35% would operate and 65% would
examine the child again.11 Traditional methods used
to diagnose inguinal hernia in infants and children are:
history-taking and physical examination, silk glove sign;
herniography; ultrasonography (US), picture taken with
a Polaroid camera; and laparoscopy for the contralateral
side diagnosis.

The most accurate diagnosis is when the paediatric
surgeon encounters the hernia out while examining the
child and reduces it by his own hand. The next encounter
is the obvious asymmetry between the two sides of the
groin or inguinoscrotal region due to chronic hernia,
resulting in thickening of the cord structures. This is best
demonstrated while the child is in the upright position.
The silk sign is not always easy to elicit.

Herniography is considered by most paediatric
surgeons as a difficult procedure, and carries risk of
complications. Although its accuracy rate is about 90%,
it use has been discontinued.12 US has been used in all fields
of medical diagnosis, but rarely in the diagnosis of inguinal
hernia. Its diagnostic accuracy for patent processus
vaginals (PPV) was 86.6% and 96.6% in two separate
studies.13 US is well known to be an operator-dependent
instrument, and individual variation is substantial. Only
a few recent reports on the use of US in the diagnosis
of inguinal hernia have appeared in the literature.16,17
Laparoscopy was only popularised for the diagnosis of
contralateral side while operations were performed on a
definite hernia. Pictures taken with a Polaroid camera,
once popular, was suggested as a tool to diagnose the
hernia while out. Today, with the widespread availability
and use of the digital camera in many households, parents
may utilise digital imaging to capture incidents like
inguinal hernia in a child. We operated on 21 (13.5%)
cases based on history alone. We encountered 9 (5.8%)
positive cases on explorations without any additional
diagnostic measures, 8 (5.1%) positive cases which were
clinically diagnosed and supported with the use of digital
imaging by a parent, and 4 (2.5%) cases with negative
exploration. There is, to our knowledge, no reports in the
literature on negative explorations to compare our results
with; however, while the numbers are small, it can be
reduced with more utilisation of digital imaging.

Although history-taking and physical examination
remain the mainstay of diagnosis of inguinal hernia in
children, the capture of a digital image of the presenting
complaint by parents, can be used to aid in the diagnosis
of inguinal hernia in a selected group of infants and children,
and further reduce the negative exploration rate.

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