Pediatric inguinal hernia: Outcome of repair

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ABSTRACT

Objectives: Controversial issues in the diagnosis and management of inguinal hernia in children, with a relatively high rate of reported postoperative complications (up to 8%), suggested the examination of our current policy in the management of pediatric inguinal hernia. The determination of risk factors, predisposing to postoperative complication may be identified so as to improve postoperative outcome.

Methods: A prospective audit of 499 children with inguinal hernias, treated in a teaching hospital between 1987 and 1995 was performed. A detailed protocol was used to record the data. There were 394 boys and 105 girls between one day and 14 years of age. There were 130 (26%) neonates. Out of 499 patients, 478 were operated upon either electively (429) or as emergency (46).

Results: The hernia was correctly diagnosed by the parents 366 times and by a physician 118 times. All emergency cases underwent a routine attempt of conservative reduction; this was successful in 33 of 46 (56%) cases. Patients discharged after conservative reduction for delayed elective operation defaulted in 12 of 33 (36.4%) cases. A hernia appearance on the opposite side was noticed in 17 (3.4%) cases. In 5% complications such as wound infection, recurrence, misplaced testis, respiratory distress, ileus, bleeding per rectum and anesthesia were recorded. Low educational level of the surgeon, prematurity, younger age or both of the patient and emergency operation were identified as risk factors predisposing to complications.

Conclusion: Parental finding of an inguinal swelling is an acceptable diagnosis for hernia in children. Failure to demonstrate the hernia should not be considered an indication for invasive diagnostic procedure like herniography. Following conservative reduction, herniomyotomy must be performed within 24-48 hours because of high rate of default (36.4%), if herniomyotomy is delayed. We do not advocate a routine contralateral exploration as the incidence of the appearance of a hernia is small (3.4%). Pediatric herniomyotomy is not a suitable operation for unsupervised training.

Keywords: Pediatric inguinal hernia, recurrent hernia, misplaced testis.

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Inguinal hernia is the most frequent condition in children necessitating surgical repair.1 Despite cumulative clinical experience of more than a century since herniomyotomy procedure was first described by Czerny in 1877,2 its diagnosis and management remains debatable. This paper reports our prospective experience of 499 children with inguinal hernia managed over 7 years. Aspects and points of controversy in the diagnosis and management of inguinal hernia in children are considered.

Methods. The data of 499 patients, admitted to King Fahd Hospital of the University, Al-Khobar, Saudi Arabia, during the period 1987 to 1995 inclusive were prospectively recorded on a specially designed protocol. The information included age, sex, laterality, history of irreducibility, associated abnormal conditions, admission and operation status...
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(elective or emergency), rank of the surgeon, postoperative complications including recurrence and dislocation of the testis.

For elective cases, children were admitted to the wards one day before the operation and discharged one day after. Pre-anesthetic, complete blood count, PT and PTT were carried out on an outpatient basis. Pre-operative assessment was carried out by the anesthetist on the day of admission. Chest x-ray was carried out only if there was clinical evidence of an abnormal chest condition. If a concomitant infective condition, e.g. respiratory tract infection or diaper rash was discovered after admission, patients were discharged to be readmitted after recovery. All children underwent a standard inguinal herniotomy with incision of the external oblique aponeurosis usually in children above two years of age. In difficult cases, dissection of the sac was facilitated by injection of normal saline into the posterior wall of the sac.

The SPSS statistical package, along with EPI-Info program, was used to analyze the data on the PC. For differences between two proportions, Chi-Square and Fisher exact tests were used. The Odds ratio and its 95% confidence interval (C.I.) were calculated. The level of significance was set to be less than 0.05 throughout the study.

Results. There were 394 boys and 105 girls (ratio 3.76 : 1) between one day and 14 years of age. A total of 262 children were a year old or younger and there were 130 (26%) neonates. The hernia was right-sided in 280 cases (56%), and left-sided in 176 (35.3%) children. Bilateral hernia sacs accounted for 38 (7.6%) cases; the record for laterality was missed in 5 patients. The children were classified as having been born full term in 395 and as premature in 38 cases, while the gestational age could not be determined in 66 cases.

Admissions were categorized as: elective 430, emergency 58 (11.6%) and status not recorded for 11. The hernia was detected by the parents 366 times, by a physician 100 times and by both the parents and physician 18 times. In 15 cases, there was no record as to who made the initial diagnosis. Associated physical anomalies were encountered in 120 (24%) children: Undescended testes 27, other external hernias (usually umbilical) 29, and certain abdominal wall and gastrointestinal tract anomalies in 64 patients. A positive sibling's history was documented in 30 children. Clinical and operative diagnoses matched in all cases.

Out of the total 499 patients, 478 underwent inguinal herniotomy (elective 429 and emergency 46). For 58 children presenting with obstructed inguinal hernia, sedation with valium (diazepam 0.3 mg/Kg body weight) and manual reduction was used as primary management unless there were clear signs of strangulation. The hernia reduced in 33 (56.9%) cases while the remaining 25 cases underwent an emergency herniotomy under general anesthesia. Of the 33 children in whom conservative reduction was successful, 21 (63.6%) remained in the hospital to undergo herniotomy on the next operation list, while 12 patients were discharged for various reasons to be readmitted for elective operation. These 12 children failed to return, an abscondor rate of 36.4% for those initially admitted with obstructed hernia.

In children with unilateral hernia, contralateral exploration was not performed as a matter of division policy. In case of concomitant undescended testis, subdarts pouch orchidopexy was performed at the same time. In 356 cases, the hernia sac was empty at the time of surgery, while the content was serous fluid in 41, a gonad in 40 (mostly females), intestine in 21 and omentum in 20.

There was an overall complication rate of 5% (Table 1). The list excludes transient scrotal swelling - a not unusual findings in infants following herniotomy. The risk of developing post-herniotomy complications was appreciably higher when operated upon by a non-supervised resident than for those operated upon by a consultant, or by a resident under the supervision of a consultant (P = 0.02, CI = 1.04-11.04). The rate of complications was also significantly higher in patients undergoing emergency operation than those undergoing elective procedure (10 out of 46 = 21.7% vs. 14 out of 429 = 3.26%, P = 0.003, CI = 1.91-15.83).

The hernia recurred in 5 children (Table 2), but there was no significant correlation between recurrence and any of the known risk factors: emergency operation, educational level of the surgeon, patient's age and gestational age. Although, preterm babies are at a much higher risk (eight times more often) of developing hernia recurrence; this relation was found to be statistically border line (P = 0.058, CI = 0.62-69.15). The results show further that patients operated upon in emergency were about 6 times at risk of developing recurrence compared with elective cases. Besides, younger patients (less than one year of age) are about four times at risk of having hernia recurrence.

Iatrogenic cryptorchidism (or testicular dislocation), after herniotomy was a feature in 4 children (Table 1). These were all full term infants and had undergone elective procedure performed in one case by a consultant and in 3 cases by a resident. However, the difference in the rate of dislocated testsis between a consultant performing or a resident performing the procedure is statistically not significant. A total of 17 children returned during the period of follow up with hernia of the opposite side.

Discussion. The overall clinical features:- sex frequency, laterality, the peak age at presentation and bilateral hernias in our study material, is identical to what has been documented in the literature, indicating that there are no gross geographical or

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Table 1 - Complications versus surgeons' educational level

<table>
<thead>
<tr>
<th>Surgeons' Educational Level*</th>
<th>Wound Infection</th>
<th>Testicular dislocation</th>
<th>Recurrence</th>
<th>Bleeding per rectum</th>
<th>Ileus</th>
<th>Respiratory distress</th>
<th>Ventilation</th>
<th>Cyanosis</th>
<th>Anesthetic</th>
<th>Total</th>
<th>No of patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant</td>
<td>-</td>
<td>1</td>
<td>2**</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>188</td>
<td>2.7</td>
</tr>
<tr>
<td>Resident</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>15</td>
<td>183</td>
<td>8.2</td>
</tr>
<tr>
<td>Resident Supervised by Consultant</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>102</td>
<td>3.9</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>24</td>
<td>478</td>
<td>5</td>
</tr>
</tbody>
</table>

*Educational level was not defined in 5 cases
**Emergency operations

% - Percentage

Table 2 - Relation of hernia recurrence and some risk factors

<table>
<thead>
<tr>
<th>No.</th>
<th>Risk Factor</th>
<th>Number of recurrence</th>
<th>Total number of patients</th>
<th>Percentage</th>
<th>P-value</th>
<th>Odds ratio</th>
<th>95% confidence interval for odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gestational age:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Full term</td>
<td>3</td>
<td>370</td>
<td>0.81</td>
<td>0.058</td>
<td>1</td>
<td>(0.62 - 69.15)</td>
</tr>
<tr>
<td></td>
<td>b. Pre term</td>
<td>2</td>
<td>32</td>
<td>0.25</td>
<td></td>
<td>7.71</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rank of surgeon:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Consultant</td>
<td>2</td>
<td>177</td>
<td>1.12</td>
<td>NS</td>
<td>1</td>
<td>(0.07 - 1.33)</td>
</tr>
<tr>
<td></td>
<td>b. Resident</td>
<td>2</td>
<td>182</td>
<td>1.09</td>
<td>NS</td>
<td>1.03</td>
<td>(0.06 - 63.9)</td>
</tr>
<tr>
<td></td>
<td>c. Resident supervised by consultant</td>
<td>1</td>
<td>95</td>
<td>1.05</td>
<td>NS</td>
<td>1.12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urgency of operation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Elective</td>
<td>3</td>
<td>410</td>
<td>0.70</td>
<td>NS</td>
<td>1</td>
<td>(0.5 - 55.4)</td>
</tr>
<tr>
<td></td>
<td>b. Emergency</td>
<td>2</td>
<td>44</td>
<td>4.50</td>
<td>NS</td>
<td>6.2</td>
<td>(0.1 - 65.0)</td>
</tr>
<tr>
<td></td>
<td>Patient's age:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥1 year</td>
<td>1</td>
<td>191</td>
<td>0.52</td>
<td>NS</td>
<td>1</td>
<td>(0.38 - 192.6)</td>
</tr>
<tr>
<td></td>
<td>&lt;1 year</td>
<td>4</td>
<td>210</td>
<td>1.90</td>
<td></td>
<td>3.99</td>
<td></td>
</tr>
</tbody>
</table>
racial differences in the incidence or presentation of a childhood hernia.

A wide spectrum of syndromic and isolated conditions are known to be associated with an increased incidence of inguinal hernias, in particular those with anomaly of the abdominal wall e.g. omphalocele, and those which produce raised intraperitoneal pressure like ventriculo-peritoneal shunt, meconium peritonitis and intestinal atresia; certain urological anomalies such as hypospadias, cryptorchidism and cloaca, and conditions like cystic fibrosis are also commonly associated with hernia. This was reflected well in our material with an incidence of 24%.

In the presence of demonstrable physical signs, the diagnosis of an inguinal hernia is easily made, but, the signs of hernia are frequently absent when the child is first seen in the outpatient clinic. The diagnosis in these patients is, therefore, based solely on parental observations. However, some clinicians emphasise the need for the diagnosis to be documented at least by one physician before surgical repair is performed. Others suggest a second clinical examination to demonstrate the hernia before operation is attempted and if second examination is inconclusive they consider this an indication for invasive procedures like herniography or pneumoperitoneum. We do not feel that such invasive procedures are either desirable or necessary. Like most clinicians we rely on the parent's description of the problem; the parental diagnosis of inguinal hernia was always accurate. This doesn't negate the necessity to perform one or more adequate clinical examinations in order to confirm the diagnosis, detect the presence of hydrocoele, retractorcocele or undescended testis and varicocele, and to rule out lesions as torsion of the testis, trauma, lymphadenitis or tumor.

It is recognized that incarceration may develop in as many as 20 percent of inguinal hernias - a potential morbidity when a hernia is diagnosed but not electively operated. The child remains at a much greater risk of developing incarceration for the first six months of life, probably due to a narrow inguinal ring. There is no cut off age to advise parents that this complication is less likely in infants older than six months of age when they request to defer the operation. Fortunately, a vast majority (≥85%) can be reduced under sedation before an “elective” herniotomy. In our 58 children, the incidence of reducibility was recorded as low (56.9%). This probably is because a decision was made to operate on these children earlier than persisting with sedation and manual reduction longer than an hour. This may also explain a very low rate (0.2%) of bowel resection in our patients when compared with an average of 3% reported in the literature.

The morbidity after emergency procedure, however, tends to be much higher. This supports the universal view that hernia repair in infants and children should be carried out soon after the diagnosis is made in order to reduce an undesirable (at times serious) complications after herniotomy. Likewise, the demand by the parents, that a child be discharged after successful manual reduction of hernia, should be resisted because of a high rate of non-return for elective operation, with a persistent risk of strangulation. The hernia should be repaired in the same admission unless there are pressing reasons to defer the procedure.

The question of exploring contralateral groin for a potential inguinal hernia (even in females with a high frequency of bilateral hernia) is still debatable. Considering a small rate (3.6%) of contralateral inguinal hernia appearing in in our follow up patients, and the information on substantial number of reported complications of the cord and testis (injury to the vas of 1.6%, testicular atrophy 1-2%, decreased testicular size at 2.7%-13% and frequent testicular malposition during exploration) makes us think that contralateral groin exploration is neither desirable nor does it meet the acceptable risk-benefit ratio. Our policy is to operate on the obvious and the definitive, and no more.

Our overall complications rate of 5% lies within the reported and generally acceptable range of 1.7% and 8%,1-3,10,20 Our experience suggests that the complications rate is significantly and adversely influenced by two factors: low educational (training) level of the surgeon, and maturity of the child. All the complications are preventable and the rate can be further reduced by strictly following the correct technical details of herniotomy procedure, meticulous dissection and mandatory supervision of junior staff members by the consultants.

It is well to emphasise that the childhood hernia is not for the less experienced. It is also recognized that the childhood hernia, in a number of hospitals, will be dealt with by the general surgeons who must be familiar with literally a dozen problems which could arise during the procedure, sliding component especially in the female and the premature; inability to locate the cord; difficulty separating the sac off the vas deferens; inadvertent opening of the sac and tear in a delicate sac at the peritoneal level; difficult isolation of the sac at the internal ring; bleeding of the cord vessels; associated undescended testis; absent vas deferens; presence of ambiguous gonad in the sac; and accidental transaction of vas deferens.

We feel that most of these problems can be overcome by an adequate exposure and appreciation of differences in the inguinal canal of the child. The scarp fascia can be thick and mistaken for the external oblique aponeurosis. Although the inguinal canal in children is short and the two inguinal rings tend to superimpose, dissection at the external ring may be difficult because of excessive fat in children. It is not uncommon for the parents in our practice to request additional but concurrent procedures like circumcision and umbilical hernia repair under the same anesthesia. It is, therefore, essential that time...
under anesthesia be apportioned by precise and swift inguinal herniotomy.

For an institution with commitments to training, our recurrence rate of 1%, after herniotomy, compared to reported average of ≥ 2.0% is reasonably low. It is not possible to clearly define factors responsible for this figure. The four recognized factors, decreasing gestational age, decreasing age at primary operation, educational level of the surgeon, and incarceration were without statistical significance in our patients. We think that one explanation for this happy result is that incarcerated hernias and premature babies are usually operated upon by the consultant or qualified resident staff. It is relevant to remind again that there are other predisposing reasons for recurrence of a hernia: the question of hemorrhage, infection, errors in the identification of a hernia sac, and errors of low ligation and damage to the posterior wall of the inguinal canal make a vital list. A frequent yet under-recognized complication is the iatrogenic upwards dislocation of the testis (cryptorchidism) following herniotomy in children. In a recent report, more than 1% of infants (largely infants and toddlers) suffered this complication. Unusual position of the testis can cause considerable distress to the parents. Every effort must be made to avoid it happening. The exact mechanism is not clear but it could be the result of entrapment of a retractile testis in the scar tissue, or much more commonly the result of failure to bring an intraoperatively “pulled-up” testis down to the bottom of the scrotum at the end of the procedure. An inadvertent subaponeurotic location has also been reported. Various suggestions, to avoid this complication, including formal orchiopexy and division or both of all cremasteric muscle fibres in the groin have been made. We feel that a meticulous surgical technique in which dissection of the sac is performed without pulling the testis out of the scrotum, and examination of the scrotum at the conclusion of the procedure to ensure normal position of the testis and to pull the testis well down if it is not, are crucial steps to minimize this undesirable outcome.

References