Ultrasonographic Diagnosis of Potential Contralateral Inguinal Hernia in Children

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Background/Purpose: Several methods have been advocated to minimize the frequency of negative exploration of the contralateral side in children presenting with a unilateral congenital inguinal hernia (CIH). This study was carried out to investigate the accuracy of ultrasonography in recognition of an unapparent CIH or a patent processus vaginalis (PPV) in the contralateral side in children presenting with a unilateral CIH.

Materials and Methods: From November 2003 to March 2005, 173 children presented with a clinically apparent unilateral CIH. Their ages ranged between 1 week and 24 months (mean, 21.8 weeks). The contralateral inguinal region was examined by ultrasound using a 7.5 MHz transducer. Presence of potential CIH was considered if one or more of the following features were noted: 1. A well defined viscous is observed in the inguinal canal; 2. A cystic pattern is seen at the internal ring of inguinal canal; 3. The presence of a PPV that enlarges when abdominal pressure increases. The PPV contains moving material without enlargement. Only patients with positive ultrasonographic findings underwent exploration of the contralateral inguinal canal at the same session following repair of the clinically detected hernia. Follow up ranged from six to eleven months.

Results: Positive ultrasonographic findings were noted in 31 of the 173 patients (17.9%). Twenty seven of the 31 patients (87.1%) proved to have a PPV or a definite hernial sac, while 4 (12.9% false positive) showed no hernial sac on exploration. Two of the 142 patients who had negative ultrasonographic findings at the contralateral side, developed an inguinal hernia after 4 and 6 months respectively (1.4% false negative). The sensitivity and the specificity of ultrasonography in detecting a potential CIA or PPV in the contralateral side was 87.1% and 98.6% respectively. The positive and negative predictive values of this diagnostic tool were 93.1% and 97.2% respectively, and the accuracy rate reached 96.5%.

Conclusions: 1. Ultrasound is a non-invasive and relatively accurate method to determine which patient should have exploration of the contralateral side; 2. Routine contralateral inguinal exploration is not recommended anymore.

Index Word: Congenital Inguinal Hernia, Ultrasonography, Children

INTRODUCTION

Many pediatric surgeons are still performing a routine contralateral inguinal exploration for patients with unilateral CIH based on a presumed high incidence of PPV. A lot of controversies still exist regarding the necessity of this approach. The diagnosis of inguinal hernia by clinical signs such as inguinal bulging, and thickening of the spermatic cord is usually easy, but is not always possible especially in obese children. Likewise, many parents complain of observing a transient inguinal...
swelling in their child that could not be detected at the time of examination. In order to minimize the incidence of negative exploration of the contralateral side, many methods had been used such as herniography, diagnostic pneumoperitonium, intra-operative laparoscopy, and recently ultrasonography. This study was undergone to investigate the accuracy of ultrasonography in detection of an unapparent CIH or PPV in the contralateral side in children presented with a unilateral clinically evident CIH.

**MATERIALS AND METHODS**

This study included 173 children (148 males and 25 females) with unilateral CIH treated over 18 months period (from November 2003 to March 2005). Their ages ranged between 1 week and 24 months (mean: 21.8 weeks). Fourteen patients had history of prematurity.

All patients were examined by ultrasonography to detect unapparent CIH or PPV on the contralateral side. Patients with clinically evident bilateral inguinal hernia were excluded from this study. Ultrasonographic study was performed while the patient in the supine position using a 7.5 MHz transducer. The probe was initially placed on the scrotum to visualize the testis in male patients, and then moved parallel to the inguinal canal to visualize the internal ring. In female patients the probe was placed at the internal ring directly. The PPV was examined during both increasing and decreasing intra-abdominal pressure. The inguinal canal appeared as a tubular hypoechoic structure proximal to the peritoneal cavity. The width of the inguinal canal was measured, at the level of the internal ring, at the med-canal and at its end. All measurements were made while the patient is both at rest and during straining by inducing crying or light pressure on the abdomen.

The diagnosis of a potential inguinal hernia was considered if one or more of the following ultrasonographic findings were noted:

- **Type I**: Detection of a herniated intra-abdominal viscous in the inguinal canal with increment and decrement of the intra-abdominal pressure;
- **Type II**: The presence of a cyst like structure at the internal ring;
- **Type III**: The PPV and the inguinal canal are widened with abdominal pressure increment (the length of the PPV is longer than 20 mm and the width of the internal ring is more than 4 mm in diameter); and
- **Type IV**: The PPV contains moving material without enlargement.

Only patients with positive ultrasonographic findings undergone exploration of the contralateral inguinal canal at the same session following repair of the clinically detected hernia.

**RESULTS**

Positive Ultrasonographic findings were noted in 31 of the 173 patients (17.9%). The Ultrasonography findings of these cases are summarized in (Table 1).

<table>
<thead>
<tr>
<th>Types</th>
<th>Male (n=28)</th>
<th>Female (n=3)</th>
<th>Total (n=31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>9 (29%)</td>
<td>1 (3.2%)</td>
<td>10 (32.2%)</td>
</tr>
<tr>
<td>Type II</td>
<td>2 (6.5%)</td>
<td>0</td>
<td>2 (6.5%)</td>
</tr>
<tr>
<td>Type III</td>
<td>13 (41.9%)</td>
<td>2 (6.5%)</td>
<td>15 (48.4%)</td>
</tr>
<tr>
<td>Type IV</td>
<td>4 (12.9%)</td>
<td>0</td>
<td>4 (12.9%)</td>
</tr>
</tbody>
</table>

Among the thirty one patients who had exploration of the contralateral side, 27 had patent processus vaginalis and proved to have hernial sac. Four of the thirty one patients (12.9%) proved to have false positive ultrasonographic findings, and no hernial sac was found on exploration. All of these 4 patients were of type III. On the other hand, among the 142 patients who had no ultrasonographic findings, two patients presented with definite inguinal hernia after 4 and 6 months respectively (false negative, 1.4%).

The results of our study showed that the sensitivity and the specificity of ultrasonography in detecting a potential CIA or PPV in the contralateral side was 87.1% and 98.6% respectively. The positive and negative predictive values of this diagnostic tool were 93.1% and 97.2% respectively, and the accuracy rate reached 96.5%.
DISCUSSION

The management of the contralateral side in a child with a known unilateral CIH has been consistently debated in the literature. Routine bilateral exploration of the inguinal canal for CIH in children regardless of the clinical findings has been practiced by surgeons for many years to avoid exposing the child to another operation with its psychological and economic impact on the family. However, routine contralateral exploration may be accompanied by a high incidence of negative exploration, unnecessary lengthening of the operative time and possible increasing morbidity in those patients. Objective accurate evidence for the presence of a hernia becomes necessary in order to justify exploration of the other side.

Various strategies have been performed to identify particular patients who profit from a contralateral exploration. Herniography can delineate an inguinal hernia with a 90% accuracy. However; several complications such as intramural haematoma and intestinal perforation have been reported. Diagnostic pneumoperitonium has been advocated. Khairi found that intraoperative induced pneumoperitoneum is a valuable technique to detect the associated contralateral hernias, and recommended its selective use in high-risk children. Diagnostic pneumoperitonium has a sensitivity of 92% and a false negative result in 1.8% of cases.

The diagnostic yield of the laparoscopy for a contralateral PPV in children under the age of 1 year with unilateral CIH was assessed prospectively by Van Glabeke et al who recently studied a cohort of 91 consecutive children (78 boys, 13 girls) undergoing unilateral inguinal hernia repair. They reported a sensitivity of 73% and specificity of 92%. The only complication reported was wound infection in 2 patients. Miltenburg et al reported a sensitivity of 99.4%. They concluded that diagnostic laparoscopy is a simple, safe and accurate procedure to choose candidates for contralateral surgical exploration. Gardner et al reported that diagnostic peritoneoscopy performed with a flexible cystoscope introduced via the hernia sac into the peritoneal cavity is a safe, and simple method to evaluate the contralateral internal inguinal ring in patient with unilateral CIH. In practice, there still are few disadvantages that limit the use of laparoscopy for the
majority of pediatric surgeons. The laparoscopic set-up seems to be unnecessary for a short, straightforward inguinal hernia repair in a child. It is an invasive modality, which might not fit the delicate narrow hernia sac at the level of the internal ring, and it is time consuming, with the risk of iatrogenic complications.

The evaluation of the inguinal canal by ultrasonography was introduced in 1993.12 Chen et al13 showed that ultrasonography is more accurate than clinical assessment in diagnosing inguinal hernia in 244 children (97.9 versus 84%). When 4 mm width of the inguinal canal at the level of the internal ring as an upper limit for normal diameter of the inguinal hernia by ultrasonography was used in diagnosis of clinically undetected hernia, an accuracy rate of 95% was achieved.13 Likewise Uno et al reported an accuracy rate of 96.6%.14 In this series, there was 97.8% accuracy rate. False positive result was present in 12.9%, whereas false negative result was found in 1.4%. False negative result ranges between 1.5-2% in other series.15 16 Toki et al15 showed that the incidence of negative exploration before and after application of ultrasonography in diagnosis of contralateral hernia was 10.2% and 1.5% respectively and this difference was statistically significant.

The incidence of contralateral unapparent PPV in this series was 17.9%, this is similar to other series in which the rate has ranged between 10.3 to 22%.13 Although the presence of PPV does not imply that the patients will go on to develop a metachronous hernia, identification and ligation of a PPV should certainly prevent the development of indirect inguinal hernia.

CONCLUSION

Ultrasonography is a rapid, sensitive, convenient and non invasive method for screening patients with contralateral occult CIH. It is a reliable tool for preventing unnecessary exploration or additional operation at a later stage. Therefore we strongly recommend routine preoperative use of ultrasonography for all patients with unilateral CIH to determine which patient should be subjected to a contralateral exploration.

REFERENCES
