

Is Preoperative Ultrasound Examination Useful for Detecting Contralateral Patent Processus Vaginalis in the Groin Hernias of Children?

Hiroki KAI^{1),4)}, Yasuharu OHNO¹⁾, Shin-ichi HAYASHI¹⁾,
Toshiya MORIMURA¹⁾, Ken-ichi Ikebukuro³⁾, Kimie TAKEUCHI²⁾
and Akinori IWASAKI⁴⁾

¹⁾ *Department of Pediatric Surgery, Saitama Medical University, Japan*

²⁾ *Central laboratory of ultrasound, Saitama Medical University, Japan*

³⁾ *Ikebukuro Hospital, Kawagoe city, Saitama prefecture, Japan*

⁴⁾ *Department of General Thoracic, Breast and Pediatric Surgery, Faculty of Medicine, Fukuoka University, Japan*

Abstract

Background: Ultrasound (US) examination is a noninvasive method for scanning the body surface and abdominal structures. We performed preoperatively US examinations to detect contralateral patent processus vaginalis (CPPV) in children with clinically diagnosed unilateral groin hernias to evaluate the utility of US in the preoperative identification of a CPPV.

Patients and Methods: Between July 2008 and March 2011, 273 patients with groin hernias were treated surgically at our institution. Two hundred forty-eight patients with unilateral groin hernias underwent a preoperative US examination. During the US examination, we defined the patients as CPPV positive if an echo free structure related to the abdominal cavity with movable contents was observed in the contralateral groin region. Regarding the surgical findings, we interpreted patients to be positive for the condition if the CPPV was over 2 cm in length.

Results: In the 248 patients, 12 patients were diagnosed by US to be CPPV positive. They underwent contralateral exploration, and nine patients (75.0%) were surgically proven to be CPPV positive. On the other hand, five patients who underwent a preoperative US examination and were diagnosed to be CPPV negative had a contralateral hernia appear after a few months.

Conclusions: Preoperative US examination is useful for detecting CPPV. In US examinations, herniation of the viscus and fluid accumulation detected over the contralateral groin predicts the existence of a CPPV.

Key words: Groin hernia, Child, Contralateral patent processus vaginalis, Ultrasound

Introduction

The incidence of a contralateral hernia after unilateral groin herniorrhaphy in children has been reported to be 5.6% to 31%¹⁾. Some surgeons had preferred to perform a routine bilateral herniorrhaphy without considering the clinical findings²⁾. However, considering the disadvantages of the function of the testis on the opposite side, negative exploration is generally to be avoided. Although laparoscopic procedures are useful not only for unilateral herniorrhaphy, but also for contralateral exploration without the need to make a new wound³⁾, the procedures are more complicated than open herniorrhaphy, and require both a longer procedure and higher medical costs.

The use of preoperative ultrasound (US) examination for detecting contralateral patent processus vaginalis (CPPV) is an accurate and noninvasive examination^{1), 4), 5), 6)}. In this study, we evaluated the utility of the preoperative investigation of CPPV by US examination.

Patients and Methods

Between July 2008 and March 2011, 273 children with clinically suspected groin hernias were treated by herniotomy at Saitama Medical University. There were 144 males and 129 females, and their ages ranged from 1 month to 15 years. Of these, with the exception of 14 patients with clinically diagnosed bilateral hernias, nine patients with contralateral herniation after unilateral herniorrhaphy, and two patients who underwent an emergency operation, 248 patients with unilateral groin hernias underwent a preoperative US examination. The

US examinations were carried out on both groin areas by sonographers at a central laboratory using a Hitachi EUB-8500 sonography machine (Hitachi Medical Corporation, Tokyo, Japan) with a 10MHz linear transducer. We defined patients to be CPPV positive if an echo free structure related to the abdominal cavity with movable contents was observed in the contralateral groin region (Fig.1). A unilateral herniorrhaphy and contralateral exploration were performed within a month after US examinations, and we interpreted patients to be positive if their CPPV was detected to be over 2 cm in length during the operation⁷⁾.

Results

Of the 248 patients who underwent the preoperative ultrasound examination, 12 patients were diagnosed to be CPPV positive and underwent contralateral exploration (Table 1). Nine patients (75.0 %) were surgically confirmed to be positive for CPPV. These patients were two males and seven females, aged two to nine years. The other three patients had CPPV, but they were smaller than 1 cm, and we interpreted the surgical findings to be negative for these cases. On the other hand, contralateral

Table 1 US findings and surgical findings

	US findings	
	CPPV positive	CPPV negative
surgically CPPV positive	9	5
surgically CPPV negative	3	231

US: Ultrasound CPPV: contralateral patent processus vaginalis

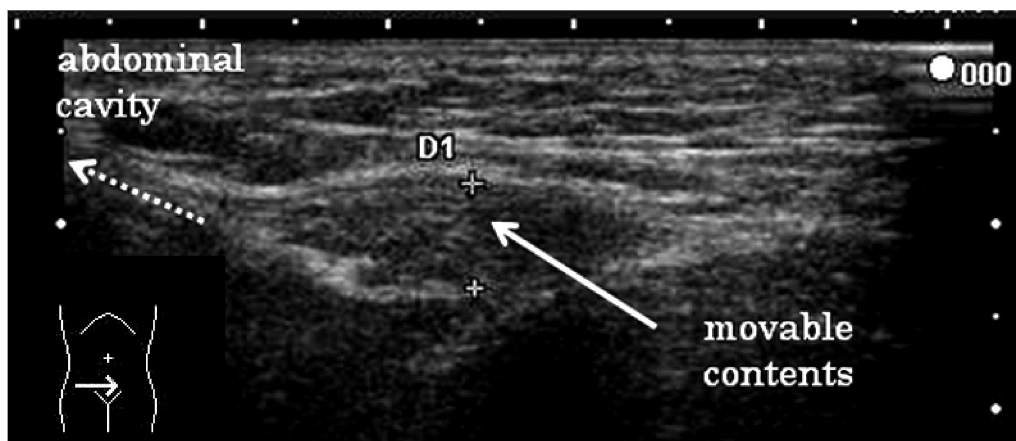


Fig. 1 The US examination showed herniation of the movable contents (bowel) into the patent processus vaginalis.

herniation occurred within a year after the primary operation in five patients who had received contralateral US examination and had been diagnosed to be CPPV negative. These patients were two males and three females, aged one to four years.

As a result, these data demonstrate that the accuracy of preoperative US examination is 0.750, its specificity is 0.979, and its sensitivity is 0.643. A contralateral hernia is likely to occur in young child, especially following a prior heriorrhaphy.

Discussion

Inguinal herniorrhaphy in children is among the most common procedures performed by pediatric surgeons, and the exploration of the contralateral side has been a long-standing controversy¹⁾. Rowe et al⁸⁾ indicated that the incidence of CPPV in children with unilateral hernias reaches approximately 40% at 2 years of age. However, some patent processus vaginalis (PPV) were demonstrated to undergo spontaneous closure or to remain patent. Du Bois et al⁹⁾ speculated that half of PPV cases may develop into true inguinal hernias. On the other hand, in cases of pediatric herniorrhaphy without contralateral exploration, 10.3% of children returned with a clinically apparent contralateral inguinal hernia within a mean duration of approximately 6 months after their initial operation¹⁰⁾. It is therefore considered to be worthwhile to examine the patients for a CPPV pre- or intra-operatively and to ligate it during the initial operation if necessary.

In the 1990's, 65% to 80% of pediatric surgeons reported that they routinely explored the contralateral groin in males with clinically apparent unilateral hernias, and 84% to 90% reported that they routinely explored the contralateral area in females²⁾. Additional contralateral exploration does not burden most patients, and considering the risk of complications such as incarceration of the contralateral hernia and the insignificance of cosmesis over the groin, open exploration was permitted. However, Sparkman et al¹¹⁾ reported in 1962 that routine exploration is associated with a 1.6% risk of vasal injury. By means of animal studies, Shandling and Janik¹²⁾ revealed that there was a 10% incidence of vasal luminal narrowing, even with gentle manipulation of the cord during dissection. As a result, open explorations without positive findings should therefore be avoided.

The use of laparoscopic herniorrhaphy has recently

been increasing. Transabdominal laparoscopy prevents the need for unnecessary exploration. It is also beneficial, because there is no additional wound compared with the conventional operation, and does not injure the contralateral cord³⁾. However, laparoscopic procedures are cost ineffective. As previously indicated, CPPVs will remain patent in about 40% of the 2-year-old children with unilateral hernias, and half of these will never develop into hernias⁹⁾. Therefore, routine laparoscopic examination may lead to over-treatment with surgery.

There have been some reports about the potential use of preoperative US evaluation for detecting CPPVs. The findings indicative of a CPPV by US include that the diameter of the inguinal canal or abdominal internal ring is more than 4 mm and/or that the length of the CPPV is more than 1 cm^{1), 4), 5), 6)}.

A CPPV cannot be seen when patients are in the supine position, but can be visualized as a hydrocele by the inflow of physiological ascites into the processus vaginalis when the patient is standing or crying¹⁾. The rate of CPPV positivity detected by US examination is reported to range from 7.8% to 32%^{1), 5), 6)}, and the previous studies concurred that the accuracy of US diagnosis as CPPV positive is about 95%. Hata et al.¹⁾ reported that the incidence of CPPV detected by US examination was 21.3%, which was about half of the number cases of CPPV detected by laparoscopy. The author concluded that a CPPV detectable by US examination will be one that permits the inflow of physiological ascites or viscus more easily, and thus would have a higher potential to become a hernia than a CPPV not detectable by US examination. Chen et al⁶⁾ reported that in the group of patients with bowel loops or omentum herniation or fluid accumulation detected by contralateral US examination, all patients demonstrated patent processus vaginalis by surgery. On the other hand, in the group of patients who had widening of the internal inguinal ring (> 4 mm), the accuracy of US was 92.1%. Therefore, we gave high priority to the presence of an echo free structure related to the abdominal cavity, but our accuracy was lower than in the previous study (75%). A possible explanation for the decreased accuracy may be that various sonographers evaluated the findings in our study, so there were likely differences in their level of skills for providing the best definition of the groin layer.

Negative exploration should be avoided whenever possible, so a high specificity is needed more specificity than high sensitivity in this examination. We therefore

recommend that this noninvasive examination should be performed before unilateral herniorrhaphy.

In conclusion, preoperative US examination is useful for detecting CPPVs. Herniation of the viscus and fluid accumulation detected over the contralateral groin predict the existence of CPPV. Our procedures has not entirely integrated, however, routinely performing this examination will therefore reduce both the number of unnecessary explorations and undetected contralateral herniation.

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(平成 26. 3. 18 受付, 平成 26. 6. 12 受理)