



## Usefulness of Preoperative Ultrasonography in diagnosis of the Contralateral Inguinal Hernias in Children

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**Abstract: Background:** Inguinal hernia repair is among the most common procedures performed by pediatric surgeons, the surgical management of the contralateral groin remains controversial. **Aim of the Work:** to verify the usefulness of preoperative ultrasonographic evaluation of contralateral patent processus vaginalis (PPV) at the level of the internal inguinal ring. This cohort study included 150 patients presented to our hospital with unilateral inguinal hernia for herniotomy underwent preoperative ultrasonography detecting diameter of patent processus vaginalis at internal ring with follow up period of 6 months to contralateral side whether the contralateral side will be with evident inguinal hernia need herniotomy or non evident hernia for more follow up period. **Results:** During follow up of 6 months to contralateral sides patients come with evident hernia were 15 (10%), with median age (1.5years), whereas those with non evident hernia were 135 (90%). **Conclusion:** ultrasonography plays an effective role in identifying the patent processus vaginalis in patients come with unilateral inguinal hernia and that could reduce the incidence of metachronous hernia by preoperative check, avoiding ascend anaesthesia, minimizing parental and patient inconvenience, avoiding the chance of incarceration, reducing costs, decrease un needed contralateral side exploration that accompanied with many complications and It could become an alternative to routine laparoscopic hernia repair in children.

[Ahmed M. Kamal, Ehab A. Elshafae, Ayman M. Allam, Asmaa A. Ali. **Usefulness of Preoperative Ultrasonography in diagnosis of the Contralateral Inguinal Hernias in Children.** *Nat Sci* 2020;18(1):1-4]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). <http://www.sciencepub.net/nature>. 1. doi:[10.7537/marsnsj180120.01](https://doi.org/10.7537/marsnsj180120.01).

**Key words:** Ultrasonography, diagnosis, contralateral Inguinal Hernias, children

### 1. Introduction

Congenital inguinal hernia is the protrusion of intra abdominal contents through a patent processus vaginalis, the processus vaginalis is an out pouching of the peritoneum through the internal inguinal ring, which normally closes spontaneously following testicular descent, incomplete obliteration of the processus vaginalis may result in abnormal communication between the abdominal cavity and the inguinal region, The incidence of contralateral inguinal hernias in children after undergoing unilateral hernia repair is (5,8-11, 6%).<sup>(1)</sup>

Although inguinal hernia repair is among the most common procedure performed by pediatric surgeons, the surgical management of the contralateral groin remain controversial, The exploration of asymptomatic side is intended to detect a patent processus vaginalis (ppv) or a non evident clinical hernia with the aim of avoiding ascend anaesthesia, minimizing parental and patient inconvenience, avoiding the chance of incarceration, and reducing costs.<sup>(2)</sup>; however Potential disadvantages of exploration the asymptomatic side include injury to contents of spermatic cord, wound infection, increased pain, increase costs, and prolonged procedure<sup>(2)</sup>.

Identifying methods that can be used for predicting contralateral inguinal hernias can aid in avoiding negative contralateral exploration, Therefore the preoperative evaluation of contralateral inguinal hernias by ultrasonography is important in patients with unilateral hernias that could prevent unnecessary contra lateral exploration and might reduce the incidence of children developing contralateral inguinal hernias and obviating the need for second operation and anaesthesia.

#### Aim of work

This study aimed to determine the usefulness of preoperative ultrasonography in diagnosis of contralateral inguinal hernia in pediatric patients with unilateral inguinal hernias by measuring diameter of patent processus vaginalis at internal ring.

### 2. Patients and methods

Cohort study carried out in Ain Shams University hospital and Beniswef health insurance hospital to all patients presented with unilateral inguinal hernia for the period from December 2018 till July 2019 with follow up period of 6 months.

The study included 150 children under 18 years old diagnosed with unilateral inguinal hernia who had no clinical signs of contralateral inguinal hernia. While patients associated with medical conditions like cystic fibrosis -connective tissue disorder, increased intra-abdominal pressure – ascites and peritoneal dialysis were excluded from the study.

#### Methods:

All patients were subjected to Recording of patient data:-Personal history-age, sex, side of hernia History of illness- swelling in inguinal region described by parents that increase in size with straining, crying and cough. Clinical evaluation including Examination, swelling in inguinal region increase in size with straining or cough, reducible.

#### Investigations:

Imaging study (Inguinal ultrasonography), inguinal ultrasonography was performed using a Toshibaaplio XG Scanner equipped with a 7.5 – MHZ Linear array probe (GE Medical Systems, Milwaukee, WI).

The probe was fixed directly to the internal inguinal ring when patients were at rest without increasing the abdominal pressure, for identifying the inguinal region:- There are three essential soft-tissue landmarks for orientation: the lateral margin of the rectus abdomen is, the inferior epigastric artery, and the inguinal ligament, during scanning, the linear transducer is placed short axis to one of the rectus abdominis muscles inferior to the umbilicus, If the transducer is moved slightly cephalad, this area is the location of the deep inguinal ring lateral to the inferior epigastric artery. The transducer can then be angled parallel to the inguinal canal to assess for an indirect

inguinal hernia during the Valsalva maneuver, Size of the defect, Hernia sac content and Compare both sides.

#### Operative details:

##### Open hernial repair

The classical open herniotomy is performed as follows: a lower abdominal skin crease incision is made about 1-3 cm, and then both Scarp's fascia and the external oblique are opened, The cremasteric fibers are bluntly dissected until the sac can be seen, The sac is then gently separated from the cord structures, dissected to the level of the internal inguinal ring, ligated, and divided at this level.

Post-operative follow up: the patient were asked to return to the outpatient department where physical examination used in the hospital for follow up at 1 week, 1 month, 2 months, 4 months, 6 months for a total follow up period of 6 months, to hematoma, wound infection or recurrence in herniotomy side and swelling in the contralateral side.

### 3. Results

The sex distribution was 117(78.0 %) male and 33 (22.0%) female. The median age at the time of the initial operation was 4.08 years (45 days to 18 years). Hernias occurred on the right side in 81 (54%) patients and on the left side in 69(46%) patients; 15 (10%) patients developed a contralateral inguinal hernia. There was no significant difference between the two groups regarding other factors such as the sex ( $p=0.84$ ), age ( $p = 0.16$ ), and initial operation side ( $p=0.30$ ) in a univariate analysis (Tables 2, 3).

The preoperative major axis of the contralateral PPV as determined using US was significantly wider in patients with a contralateral hernia than in those without a contralateral hernia ( $p = 0.001$ ) (Table 4).

**Table 1:** Demographic data:

	N	Min.	Max.	Mean	SD
<b>Age (years)</b>	150	0.25	18.00	4.08	3.79
		N		%	
<b>Sex</b>	<b>Male</b>	117		78.0	
	<b>Female</b>	33		22.0	
	<b>Total</b>	150		100.0	

**Table 2:** Relation between development of contralateral hernia and demographic data:

	evident hernia (N=15)		non-evident hernia (N=135)		Z*	P value	
	Median	IQR	Median	IQR			
<b>Age</b>	1.50	2.25	3.00	6.00	1.41	0.16 NS	
	N	%	N	%	X <sup>2**</sup>	P value	
<b>Sex</b>	<b>Male</b>	12	80.0	105	77.8	0.04	0.84 NS
	<b>Female</b>	3	20.0	30	22.2		

\*Mann Whitney U test\*\*Chi square test

**Table 3:** Relation between development of contralateral hernia and hernial side:

		evident hernia (N=15)		non-evident hernia (N=135)		X <sup>2</sup> *	P value
		N	%	N	%		
Hernial side	Left	5	33.3	64	47.4	1.08	0.30 NS
	Right	10	66.7	71	52.6		

\*Chi square test

**Table 4:** Relation between development of contralateral hernia and diameter of contralateral PPV:

		Evident hernia (N=15)		Non-evident hernia (N=135)		FE*	P value
		N	%	N	%		
Diameter	Obliterated	0	0.0	135	100.0	90.33	<0.001 NS
	3 mm	9	60.0	0	0.0		
	4 mm	6	40.0	0	0.0		

\*Fisher Exact test

The optimal cut-off point on the ROC curve was 3.0 mm. The 150 patients with unilateral hernia were divided into two groups according to cut-off values of depending on the preoperative major diameter of the contralateral PPV obtained using US (wide group: [3.0 mm, 4.0mm, narrow group: below 3.0 mm). Of these 105 patients, 15 were in the wide group. There was a significant statistical relationship between the preoperative major diameter of the contralateral PPV as determined using US and the incidence of contralateral hernia ( $p = 0.001$ ).

#### Postoperative complications:

During period of 6 months follow up to herniotomy side there were no haematoma formation, wound infection or recurrence post operatively at first week, first month, second month, fourth month, sixth month.

#### 4. Discussion

Inguinal hernia is one of the most common diseases that require surgery in children. Pediatric inguinal hernia surgery has been traditionally treated with herniotomy and high ligation of the hernia sac. Development of metachronous hernia after inguinal hernia surgery has been discussed in the field of pediatric surgery. Reported incidence of contralateral side metachronous inguinal hernia ranged from 3.0% to 14.7%<sup>(3)</sup>. In 2015, Kaneda et al, The incidence of contralateral inguinal hernias in children after undergoing unilateral hernia repair is 5.8–11.6%. The incidence of contralateral side metachronous inguinal hernia is higher in children than that in adults. Patency of processus vaginalis (PPV) is known to be the cause of pediatric inguinal hernia. The causes of contralateral side metachronous inguinal hernia is also assumed to be PPV<sup>(3)</sup>.

However, it is difficult to evaluate processus vaginalis on the contralateral side when it is asymptomatic. There is some controversy regarding the management of the contralateral groin in patients

with unilateral hernias. Physical examination findings (such as the ‘silk sign’), herniography findings<sup>(4)</sup>, the Goldstein test using the presence of pneumoperitoneum<sup>(5)</sup>, contralateral exploration<sup>(6)</sup>, laparoscopy<sup>(7)</sup>, Ultrasonography<sup>(8)</sup>, and preoperative risk scoring are reported methods for predicting contralateral occurrence.

Some surgeons have performed bilateral herniotomy in patients with high risk of bilateral inguinal hernia. However, there might be complications such as testicular atrophy and infertility<sup>(9)</sup>. Prophylactic surgery of PPV is also controversial because the lesion is not a true hernia<sup>(10)</sup>.

Ultrasonography is safe, non invasive, painless, less expensive method for detecting the presence of a contralateral PPV. The main advantage of this technique is that it can be used to diagnose the hernia prior to the initial operation.

In our study there was no significant difference between side of contralateral hernia development and other factors like age, sex even male or female, initial operation side. Patients presented with right side hernia and those with left side hernia.

This result matched also with the study done in 2015 by H Kaneda et al.<sup>(12)</sup> in which The incidence of metachronous hernia showed no significant difference with gender even male or female, age, or site of inguinal hernia right side or the left side.

We verified the accuracy of the preoperative ultrasonographic evaluation of the contralateral PPV at the internal inguinal ring for the prediction of contralateral inguinal hernia in children. We found that any patient with a contralateral PPV of diameter equal to or more than 3.0 mm at the level of the internal inguinal ring is likely at a risk for the development of a contralateral hernia.

This result matched with the result mentioned in 2015 by Kaneda et al.<sup>(12)</sup> evaluated the role of ultrasonography in detection diameter of patent processus vaginalis in contralateral side in unilateral

inguinal hernia before the herniotomy, Sonographic results showed that the incidence of metachronous hernia was higher when the size of the inner inguinal ring of PPV was 2 mm or more.

Also matched with the result of the study carried out in 1994, Lawrenz et al. <sup>(11)</sup> performed preoperative sonography in patients and bilateral herniotomy for all cases. Sonographic positive PPV was observed in most of the patients and bilateral herniotomy was confirmed it, false positive cases were observed with accuracy <sup>(11)</sup>.

And results from studies done by Hata et al <sup>(7)</sup>, about Ultrasound evaluation of contralateral groin has been reported for PPV detection reported an statistical relationship between inguinal hernia and width of groin, and Kervanciogiu <sup>(13)</sup> diagnosed a hernia using the criteria of PPV size 4 mm, reaching an accuracy of 95%.

In 2004, Hata et al. <sup>(7)</sup> performed sonography in their patients with unilateral inguinal hernia and bilateral herniotomy in sonographically positive PPV patients and results were compared with sonographic results. The patency was confirmed in the patients with the accuracy of sonography was 94.9%, In 2011, Hasanuzzaman et al. <sup>(14)</sup> performed sonography for cases of unilateral inguinal hernia to observe contralateral side PPV. They found that the cases with opened PPV and performed bilateral herniotomy. The accuracy of sonography was 91.7%.

In our study incidence of contralateral hernia reported during follow up of 6 months to contralateral sides patients come with evident hernia was (10%).

This result matched with the result mentioned in 2015 by Kaneda et al. <sup>(12)</sup> that mentioned that the incidence of contralateral inguinal hernias in children after undergoing unilateral hernia repair is 5.8–11.6 %.

And matched Also with the Reported incidence of contralateral side metachronous inguinal hernia ranged from 3.0% to 14.7% <sup>(3)</sup>.

In our study non of the included patients presented with a patent processusvaginalis diameter below 3mm come with evident hernia during our follow up period.

This study can be criticized by low number of cases, short period of follow up and missed cases at time for examination during follow up period.

### Conclusion:

The data in this study suggested that ultrasonography play an effective role in identifying the patent processusvaginalis in patients come with unilateral inguinal hernia and that could reduce the

incidence of metachronous hernia by preoperative check, avoiding ascend anaesthesia, minimizing parental and patient inconvenience, avoiding the chance of incarceration, reducing costs, decrease un needed contralateral side exploration that accompanied with many complications and It could become an alternative to routine laparoscopic hernia repair in children.

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