The Accuracy of Silk Glove Sign Compared with Ultrasonography in the Diagnosis of Inguinal Hernia in Children

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Background: *History taking and physical examination regarding the "Silk Glove Sign", are useful tasks to diagnose indirect inguinal hernia in children. The accuracy of silk glove sign however, varies among physician's experience. Recent studies demonstrated ultrasonography to play a role in the diagnosis of inguinal hernia.*
Objective: *To compare the accuracy between silk glove sign and ultrasonography.*
Material and Method: *36 patients (22 unilateral, 14 bilateral) with clinically diagnosed indirect inguinal hernia were included into a double-blinded trial. There were 25 boys and 11 girls enrolled, which median age was 12 months old (range 1 to 72 months). Silk glove sign was performed at both groins by the authors blinded to the clinical diagnosis followed by bedside ultrasonography. Correspondingly, herniotomy was performed in the diagnosed groin only. The results of ultrasonography were compared to silk glove sign. The gold standard was groin exploration.*
Results: *Of the 36 patients, there were 50 groins diagnosed as indirect inguinal hernia, which underwent herniotomy. Forty-eight hernial sacs were identified. The median size of the hernial sac was 3 mm (range 0.7 to 20 mm). The two negative findings; one had positive silk glove sign whereas the other negative in both silk glove sign and ultrasonography. The sensitivity of Silk Glove Sign was 89.6% and specificity was 50%. The sensitivity of ultrasonography was 95.8% and specificity was 100%. Total accuracy of silk glove sign was 88% and ultrasonography 96%. The important sign that suggested a hernial sac from ultrasound technique was the demonstration of a sac located above the inferior epigastric vessels at the level of internal inguinal ring, which became wider when we applied positive pressure to the abdomen.*
Conclusion: *Ultrasonography of the groin is a useful non-invasive technique in the diagnosis of inguinal hernia in children. It provides more accuracy than Silk Glove Sign and can be used for detection of metachronous lesion in unilateral inguinal hernias.*

Keywords: *Inguinal hernia, Metachronous inguinal hernia, Silk Glove Sign, Ultrasonography*

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Herniotomy of indirect inguinal hernia is the most common procedure in pediatric patients[1-5]. The incidence of inguinal hernia in children is 0.8 to 4.4%. Children presenting with clinical indirect inguinal hernia since 6 months old comprises one third of all the inguinal hernia patients[1,5]. It is 3 to 10 times more common in male than female[1]. The inguinal hernia is more often found on the right side accounting for 60%[1,5] and the left side 30%[5]. The incidence of bilateral lesions is 10%[1,5]. Pre-term infants are more susceptible with incidences up to 16 to 25%[1].

The etiology of indirect inguinal hernia in children is patent processus vaginalis, which descended into the scrotal sac along with the testes. The processus vaginalis normally obliterates when the child gets older. Since the etiology of pediatric indirect inguinal hernia is the processus vaginalis which does not obliterate, there is a chance that the contralateral processus vaginalis may not obliterate as well. The patent processus vaginalis on the contralateral side may develop into clinical inguinal hernia at a different time of the previous lesion so called a "Metachronous inguinal hernia".

From past studies, the incidence of developing

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a metachronous contralateral indirect inguinal hernia after the children had under gone herniotomy was 5.6 to 31%[6].

Recently there are 2 investigation tools to help confirm the diagnosis of indirect inguinal hernia in children. One is the "Silk Glove Sign" which refers to the thickening and silkiness of the spermatic cord palpated as the cord crosses the pubic tubercle examined by the physician[6,9]. Another tool is ultrasonography[7,8,10-17]. This study was designed to find out the proper tools to detect contralateral inguinal hernia in pediatric patients by comparing the accuracy between the silk glove sign and ultrasonography. Accordingly, if a contralateral hernia was detected, bilateral herniotomy may be performed, therefore, decreasing the risk of a second general anesthesia for another herniotomy procedure.

Material and Method

This prospective data studied were collected from January 2014 to May 2014. Patient age ranged from newborn to 14 years old from the outpatient and pediatric department, were diagnosed with inguinal hernia and scheduled for operation, and were included in this study.

Study procedures

1) The patients who were diagnosed with indirect inguinal hernia and scheduled for herniotomy from both the outpatient department and pediatric ward were included in this study.

2) In the operating room, each patient's groins were examined with silk glove sign and bedside ultrasound by the authors, blinded to the diagnosed, affected side of inguinal hernia.

The "Silk Glove Sign" is a physical examination technique. The examiner places the index finger to the lateral side of patient's pubic tubercle. The patent processus vaginalis or the hernial sac can be detected when it gives the sensation of rubbing on a silk glove,and accordingly results in a positive finding of "Silk Glove Sign".

The ultrasound technique is performed by placing the linear probe of a bedside ultrasound onto the lateral side of pubic tubercle at the same location as silk glove sign. The hernial sac locates above inferior epigastric vessels connecting the peritoneal cavity and the scrotal sac. The sac becomes larger by applying positive abdominal pressure thus demonstrating a positive finding from ultrasonography. The hernial sac was measured both before and after applying positive abdominal pressure.

3) Herniotomy was performed in the scheduled side only. The hernial sac was also measured intra-operatively.

4) The patients and measurement data were collected and the results analyzed.

Ethical approval

The study received the approval of Siriraj Institutional Review Board.

Statistical analysis

The characteristic data of patients such as age, sex and hernial sac size were analyzed in median value. The sensitivity, specificity and accuracy of "Silk Glove Sign" and "Ultrasound" were calculated. The measure of agreement of "Silk Glove Sign" and "Ultrasound" was analyzed by using Kappa-value.

Results

All 36 patients (25 males, 11 females) were diagnosed with indirect inguinal hernia and underwent herniotomy accordingly. The median age of the patients was 12 months old (range 1 to 72 months). There were 22 unilateral hernias and 14 bilateral hernias. Of the 22 unilateral hernias, 13 were on the right side (36%) and 9 on the left (25%). Of the 14 bilateral hernias, there were 7 males and 7 females.

Of the 36 patients, there were 50 groins explored, of which 48 hernial sacs were identified. Two right groins showed no hernial sac. The median size of hernial sac diameter measured intra-operatively was 3 mm (minimum 0.7 mm, maximum 20 mm).

The 2 groins which had no hernial sac, one was a 1 year old boy who presented with clinical left inguinal hernia and scheduled for bilateral herniotomy. The silk glove sign was positive on both sides, to it ultrasound finding was negative on the right. It showed a hernial sac-like structure 1.1 mm in diameter but the diameter did not expand when positive abdominal pressure was applied and the right groin exploration were negative. The other was a 5 months old girl who presented with clinical left inguinal hernia whose parents were aware of the risk of having bilateral inguinal hernia in female; thus her parents would like her to undergo bilateral herniotomy. In this case both silk glove sign and ultrasound showed negative findings on the right groin.

The "Silk Glove Sign" showed positive results in 43 out of 48 groins with identified hernial sac. There were 1 false positive and 5 false negative groins. The

sensitivity of silk glove sign was 89.5% and specificity was 50%. The accuracy of Silk Glove Sign was 88%. Ultrasonography showed positive results in 46 out of 48 groins with confirmed hernial sac. There were none false positive and 2 false negative findings. The median size of the hernial sac from the ultrasound before applying positive pressure to the abdomen was 1.65 mm (range 0.7 to 7.3 mm). The median hernial sac size after applying positive pressure to the abdomen was 2.8 mm (range 0.8 to 10 mm). The sensitivity of ultrasound was 95.8% and specificity was 100%. The accuracy of ultrasound was 96% (Table 1).

Discussion

Groin hernias are usually diagnosed clinically by the presence of a reducible mass which may be precipitated by increase intra-abdominal pressure such as coughing or crying. When there is a confirmed history of a clinical groin hernia with absent reducible mass, the Silk Glove Sign would be performed to aid the physicians in identifying the hernial sac. Since the Silk Glove Sign result depends highly on the physician's experience, its accuracy varies among children centers and there is rarely any feasible investigation tool to confirm the diagnosis of a groin hernia in difficult cases. Consequently, with Silk Glove Sign only, the diagnosis of a groin hernia is sometimes doubtful and inaccurate. Ultrasound is a non-invasive, low cost and high resolution investigation tool which can allow direct scanning and dynamic findings of the inguinal hernia. There is neither any risk of radiation exposure nor general anesthesia. Furthermore, with Doppler ultrasound we can identify the inferior epigastric vessels, which is the landmark for the hernial sac. If a hernial sac is present, it will be located above inferior epigastric vessels. This technique is practical and decreases the operator dependent factor.

According to a single surgeon experience with both techniques, the sensitivity, specificity and accuracy of ultrasound is higher than the Silk Glove Sign. Therefore, from this study, the ultrasound would be an interesting, alternative investigation to predict metachronous lesions of a unilateral inguinal hernia with high sensitivity and good accuracy.

Due to limitations of ethical consideration, we can only prove the effectiveness in the operated groins. The number of patients for specificity calculation is low; however the sensitivity of ultrasound is higher than Silk Glove Sign. The ultrasound can be considered as the tool for detection of a patent processus vaginalis in cases with questionable physical examination or every unilateral groin hernia to detect a metachronous lesion.

Table 1. The sensitivity, specificity and accuracy of Silk Glove Sign and Ultrasound

	Silk Glove Sign	Ultrasound
Sensitivity	89.5%	95.8%
Specificity	50%	100%
Accuracy	88%	96%

Conclusion

The presented study confirms that ultrasound is more accurate than silk glove sign. It may be used for detection of metachronous lesions of a unilateral inguinal hernia. It is non-invasive and practical which should be considered especially in doubtful cases when Silk Glove Sign cannot identify the precise hernia sac.

What is already known on this topic?

The metachronous inguinal hernia has been doubtful for surgeons for decades. To decrease the risk of anesthetic agents in children for the second inguinal hernia operation, this knowledge will be very useful. The common method to detect the contralateral inguinal hernia is Silk Glove Sign. But the accuracy depends on individual experience of the physician. So it is difficult to make a clear diagnosis in this point.

What this study adds?

This study demonstrated the accuracy and how to perform both techniques to identify the metachronous inguinal hernia in children. When there is any hesitation in the diagnosis of metachronous inguinal hernia from Silk Glove Sign technique then the ultrasonography could be helpful with the clear vision of the hernial sac.

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Potential conflicts of interest

None.

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ความแม่นยำของการตรวจร่างกาย Silk Glove Sign เปรียบเทียบกับการตรวจอัลตร้าซาวด์ในการวินิจฉัยภาวะไส้เลื่อนบริเวณขาหนีบของผู้ป่วยเด็ก

ปัฌฑารีย์ ต่ายทรัพย์, มงคล เลาหเพ็ญแสง

ภูมิหลัง: การซักประวัติและตรวจร่างกาย Silk Glove Sign นั้นมีประโยชน์ในการวินิจฉัยภาวะไส้เลื่อนขาหนีบในเด็ก แต่อย่างไรก็ตาม ความถูกต้องแม่นยำในการตรวจ Silk Glove Sign นั้นแตกต่างกันไปตามประสบการณ์ ของแพทย์ผู้ทำการตรวจในงานวิจัยปัจจุบัน จึงเริ่มมีการนำอัลตร้าซาวด์มาใช้ในการวินิจฉัยไส้เลื่อนขาหนีบในเด็กมากขึ้น

วัตถุประสงค์: เพื่อทำการเปรียบเทียบความแม่นยำระหว่างการตรวจร่างกาย Silk Glove Sign และการตรวจอัลตร้าซาวด์ในการวินิจฉัยไส้เลื่อนขาหนีบในเด็ก

วัสดุและวิธีการ: เป็นการเก็บข้อมูลจากประชากร 36 คน ที่ได้รับการวินิจฉัยว่าเป็นไส้เลื่อนขาหนีบ โดยเป็นไส้เลื่อนขาหนีบข้างเดียว 22 คน และเป็นไส้เลื่อนขาหนีบ 2 ข้าง จำนวน 14 คน ในจำนวนประชากรนี้มีเด็กผู้ชาย 25 คน และเด็กผู้หญิง 11 คน กลุ่มประชากรมีอายุตั้งแต่ 1 เดือน ถึง 72 เดือน อายุเฉลี่ยอยู่ที่ 12 เดือน ประชากรทุกคนได้รับการตรวจ Silk Glove Sign และอัลตร้าซาวด์โดยแพทย์ผู้ตรวจซึ่งไม่ทราบการวินิจฉัยว่าเป็นไส้เลื่อนขาหนีบข้างใด และประชากรจะได้รับการผ่าตัดไส้เลื่อนข้างที่ได้รับการวินิจฉัยมาก่อนเข้ารับการวิจัยเท่านั้น แล้วจึงนำผลการตรวจ Silk Glove Sign และอัลตร้าซาวด์มาวิเคราะห์เปรียบเทียบกับผลการผ่าตัดซึ่งถือเป็น gold standard ของงานวิจัยนี้

ผลการศึกษา: จากจำนวนประชากร 36 คน มีขาหนีบข้างที่เป็นไส้เลื่อนทั้งหมด 50 ข้าง ซึ่งได้รับการผ่าตัดทั้ง 50 ข้าง และพบถุงไส้เลื่อนในขาหนีบ 48 ข้าง ขนาดความกว้างของถุงไส้เลื่อนคือ 0.7 ถึง 20 มิลลิเมตร ขนาดโดยเฉลี่ย 3 มิลลิเมตร ในขาหนีบ 2 ข้างที่ไม่พบถุงไส้เลื่อนนั้น ข้างหนึ่งให้ผล Silk Glove Sign เป็นบวกในขณะที่อีกข้างหนึ่งให้ผลลบทั้ง Silk Glove Sign และอัลตร้าซาวด์ ดังนั้นค่าความไวของการตรวจ Silk Glove Sign คือ 89.5% ในขณะที่ค่าความเฉพาะคือ 50% และค่าความไวของอัลตร้าซาวด์คือ 95.8% ในขณะที่ค่าความเฉพาะคือ 100% โดยรวมแล้วค่าความถูกต้องของ Silk Glove Sign คือ 88% และของอัลตร้าซาวด์คือ 96% สิ่งสำคัญที่จะใช้บ่งบอกถึง การมีถุงไส้เลื่อนจากการตรวจอัลตร้าซาวด์คือ การเห็นถุงไส้เลื่อนวางอยู่เหนือเส้นเลือด inferior epigastric ที่บริเวณ internal ring ซึ่งถุงไส้เลื่อนจะมีขนาดใหญ่ขึ้นเมื่อเพิ่มแรงดันในช่องท้อง

สรุป: อัลตร้าซาวด์เป็นเครื่องมือที่ไม่ทำอันตรายต่อผู้ป่วยและมีประโยชน์ในการใช้หาไส้เลื่อนขาหนีบในเด็ก ซึ่งมีความถูกต้องแม่นยำมากกว่าการตรวจ Silk Glove Sign และสามารถนำมาใช้ตรวจหาถุงไส้เลื่อนอีกข้างที่ยังไม่มีอาการได้