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## OPERATIVE TREATMENT OF INGUINAL HERNIA ON CHILDREN USING MINIMALLY INVASIVE PIRS TECHNIQUE

### Operativno liječenje ingvinalne hernije kod djece pomoću minimalno invazivne PIRS tehnike

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#### Abstract

Inguinal hernia repair is one of the most frequently performed operative procedures in pediatric population and one of the most common reasons for pediatric surgical referral. The golden standard of treatment is an open surgical approach through a groin incision, however in recent years laparoscopic inguinal hernia repair in children has become more and more popular. In our case, we decided to perform the PIRS technique, invented by professor Dariusz Patkowski, which has not been successfully performed in our country so far. The advantages of this technique include the use of only one umbilical port, resulting in short operative times, relative simplicity of the procedure and excellent cosmetic results. The PIRS technique is already routinely performed in Poland on children aged up to 14.5 years.

#### Keywords

inguinal hernia, PIRS technique, minimally invasive surgery, children

#### Sažetak

Liječenje ingvinalne hernije jedan je od najčešće izvođenih operativnih zahvata u dječjoj dobi i jedan od najčešćih razloga za kirurško liječenje kod djece. Zlatni standard liječenja je otvoreni kirurški pristup kroz preponski rez, iako posljednjih godina laparoskopski pristup postaje sve popularniji. U našem slučaju, odlučili smo se za PIRS tehniku, koju je osmislio profesor Dariusz Patkowski i koja dosad u našoj zemlji nije bila uspješno izvedena. Prednosti ove tehnike uključuju korištenje samo jednog umbilikalnog porta, što rezultira kratkim vremenom operacije, relativnom jednostavnošću zahvata i izvrsnim kozmetičkim

rezultatima. PIRS tehnika već se rutinski izvodi u Poljskoj na djeci starosti do 14,5 godina.

#### Ključne riječi

ingvinalna hernija, PIRS tehnika, minimalno invazivna kirurgija, djeca

#### Introduction

Inguinal hernia is a protrusion of contents of the abdominal cavity through the inguinal canal. Most hernias diagnosed in childhood are indirect and a result of a patent *processus vaginalis* in boys or its analogue in girls – *canalis Nucki* [1]. The exact incidence is unknown, it ranges from 0.8% to 4.4% [2], of these 60% are right-sided [1]. In order to avoid complications (incarceration, strangulation) operative treatment is indicated [1, 3]. The traditional surgical approach is through an inguinal incision. In children we do not open the inguinal canal. The hernia sac is resected from the spermatic cord or *lig. teres uteri* and other structures [3, 4]. Despite excellent results of this classical approach, laparoscopic hernia repair is becoming more and more popular with the progress in pediatric surgery in recent years. It mostly involves only the suturing of the internal inguinal ring. There are many different techniques described [1–6]. In our case, we chose a minimally invasive PIRS technique (Percutaneous Internal Ring Suturing), invented by professor Dariusz Patkowski from the Medical University of Wrocław in Poland. It was for the first time successfully performed in 2004. The advantage of this method is that it requires only one umbilical port and the suture is placed at the level of the internal inguinal ring through the puncture-point access with an injection needle [6]. This way intra-abdominal suturing is avoided and the procedure leaves only a minimal scar in the area of the umbilicus

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[ibid 6]. The procedure is simple and operative times are short [ibid 6]. This procedure has not been successfully performed in Slovenia so far.

### Case report

Four-year-old L. C. was admitted to the Department of Pediatric Surgery in the General Hospital Celje on the 17<sup>th</sup> of December 2013 at 6.30 am for operative treatment of a bilateral inguinal hernia and an umbilical hernia. The patient had no other problems and did not receive any regular therapy. Preoperative laboratory results were within normal limits.

Beforehand, the patient was examined at our clinic on the 13<sup>th</sup> of November, 2013, for a right inguinal hernia. She was referred to our clinic by her pediatrician. At the examination we also noticed a left inguinal hernia and an umbilical hernia (0.5 x 0.5 cm). All the hernias were easily reducible.

The procedure was performed on the day of the admission. It started at 9 am. The patient was put under general endotracheal anesthesia. We used a 40% mixture of oxygen/air, sevoflurane, fentanyl and a muscle relaxant rocuronium. For postoperative analgesia the patient was given a diclofenac suppository, paracetamol and piritramide i.v. During the operation a complete standard monitoring was performed; blood pressure, electrocardiogram (ECG) monitoring, pulse, saturation, exhaled carbon dioxide, body temperature). From the anesthesiological point of view, the procedure was carried out without any complications.

After a sterile preparation of the operative field and sterile covering, we made a 5 mm transverse incision in the upper part of the umbilicus. Then we dissected subcutaneous tissue and placed Mikulicz clamps on the fascia. We entered the abdominal cavity using the Hasson technique for trocar insertion. For the repair of umbilical hernia and simultaneous fixation of the port, which we inserted without a cannula, we placed a purse-string suture (Vicryl Rapide 3.0, UCL needle 13 mm, Johnson & Johnson). We used a 5 mm port (Dexide 5 mm Threaded Trocar, MM SURGICAL). We insufflated the abdominal cavity with a pressure of 6–10 mmHg. After the inspection of the whole peritoneal cavity with a 5 mm telescope (zero degree optics, Olympus) we located the internal inguinal rings. The procedure was first performed on the right and then on the left side. To assess the location for the needle puncture we pressed the tip of a Pean forceps against the inguinal region from the outside. Then we introduced an injection needle (18G, 1.2 x 40 mm BD Microlance) into the abdominal cavity. Beforehand, the injection needle

was curved into an appropriate shape to enable easier manipulation. Inside the barrel of the needle we inserted a nonabsorbable thread (Ethibond Excel 0, Johnson & Johnson) in the shape of a loop. By moving the tip of the needle we passed the thread under the peritoneum and included a part of the lateral wall under the *lig. teres uteri*. The second thread was inserted into the barrel of the needle and introduced into the peritoneal cavity, this time medially under the peritoneum and through the loop of the first thread. The loop was then pulled out of the abdomen. This way only one thread was placed around the inguinal ring under the peritoneum and both ends of the thread exited the skin through the same puncture point. We tied the ends of the thread and hid the knot under the skin. The same procedure was performed on the contralateral side. During the introduction of the second thread on the left side we were a little imprecise, which led to a formation of a 1 mm skin bridge. We had to interrupt it with a scalpel. After completing the hernioplasty we inspected the whole abdominal cavity once more, removed the umbilical port, and tied the purse-string suture. Puncture points were locally infiltrated and the umbilical wound was closed with absorbable stitches. All the wounds were covered with dressings.

The entire operative time was 80 minutes. The patient did not receive any antibiotic treatment. She was monitored for one hour in the recovery room and then moved to the ward. Three hours after surgery, the patient normally urinated and defecated in the ward.

With a consent from the anesthesiologist, the patient was discharged from the hospital on the same day at 4 pm. At the time of the discharge, the patient's abdomen was soft and minimally tender to palpation in the area of postoperative wounds. At home, she required analgesic therapy (on the first day diclofenac suppository every eight hours, on the second day only one small spoon of paracetamol suspension).

On the third day after surgery, the patient came for a check-up. The wounds were minimal and without any complications (Fig. 1, Fig. 2). The inguinal area was a little tender to palpation on both sides. The patient had no problems at home.

Figure 1. Postoperative wounds at check-up on the third day after surgery (with dressings).

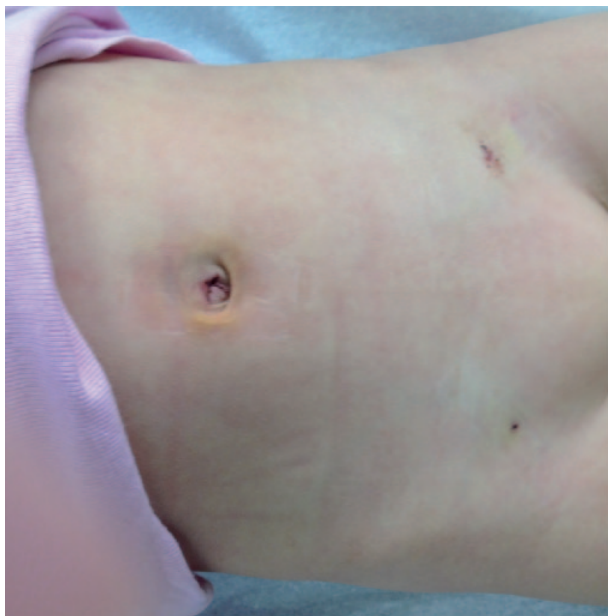


Figure 2. Postoperative wounds at check-up on the third day after surgery (without dressings).



On the tenth day after surgery, we contacted the patient's parents over the phone. In their opinion, the child looked completely healthy on the third day after surgery. She began with her normal activities about a week after surgery.

### Discussion

The advantages of the PIRS technique in comparison with the open surgical approach, which is the golden standard for inguinal hernia repair in children, are numerous. The procedure is minimally invasive and

does not require an inguinal incision, which is the main cause of postoperative pain [6]. It also enables a diagnosis of a possible contralateral hidden hernia and its repair within the same procedure [ibid 6]. The risk of cord structures injury is minimal and the cosmetic results are far better than with an open approach or other standard laparoscopic techniques [ibid 6].

In comparison with other laparoscopic techniques, the PIRS technique avoids the need for intra-abdominal suturing, which requires a very skilled surgeon with a lot of experience and is very time consuming [ibid 6]. In Poland, the PIRS technique is one of the first laparoscopic procedures on children that surgical residents learn. This technique is also much cheaper than other laparoscopic techniques for inguinal hernioplasty [ibid 6].

Recurrence rate for open hernia repair ranges from 0.8 to 3.8 % [4]. The numbers are a bit higher for laparoscopic repair techniques, from 0.7 to 4.5 % [ibid 4]. When using the PIRS technique recurrence rate is 2.5 %, but it significantly decreases with refinement of the technique and gaining experience to 1%\*.

Due to the proximity of the vessels, there is a risk of puncturing them with the tip of the injection needle. These bleedings are limited and can be stopped by applying pressure to the abdominal wall from the outside in the inguinal area. We try to avoid this risk by curving the shape of the needles before the procedure and by constantly following the movement of the tip of the needle [6]. In boys, transient hydrocele may develop occasionally after surgery. It spontaneously reabsorbs within a couple of months [ibid 6]. In literature, one case of adhesive ileus has been described as a complication of the PIRS procedure [ibid 6].

The first attempt of performing the PIRS technique in Slovenia was made at the University Medical Centre in Ljubljana on the 18<sup>th</sup> of October, 2012. The patient was 16 years old at the time and her abdominal wall was too thick for the attempt to be successful. During the procedure we punctured a vein in the abdominal wall and a hematoma was formed. The procedure was completed as a laparoscopic hernioplasty with intra-abdominal suturing of the internal inguinal ring. The patient was discharged the next day.

We then waited for the "perfect" patient. We decided to try to perform the technique on smaller children, and girls first. The technique is easier to perform on a patient with a thinner abdominal wall.

In the case of L. C. the entire procedure went smoothly without any complications. It was performed as a day surgery, the patient was discharged the same day. The results were excellent. The scar in the area of the

\* current data from Prof. Patkowski, December 2013

umbilicus was barely visible and we expect it to continue shrinking with time.

With the successful performance of the technique we would like to share some of our observations. If the patient is older and has a thicker abdominal wall, the procedure can still be performed using longer injection needles (18G, 1.2 x 50 mm, BD Microlance). When inserting the second thread into the

barrel of the needle, a short portion of the thread should pass through the opening of the tip of the needle. This way there is less chance for the thread to become stuck in the abdominal wall when manipulating the needle. When placing the second thread, caution should be put on entering the abdominal cavity always through the same puncture point and this way avoiding the formation of skin bridges. If placement of the second thread is not successful in the first attempt, the procedure does not need to be performed from the beginning. The loop of the first thread can be released with manipulation of the second needle if the first thread gets stuck in the medial part.

### Conclusion

The PIRS technique was successfully performed in Slovenia for the first time. The results were extremely satisfying for us as well as for the patient and her parents. We believe that this technique could be a valuable alternative to an open surgical approach in inguinal hernia repair due to its simplicity, short operative times, minimal invasiveness and excellent cosmetic results.

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