Heminephrectomy in the pediatric population – single-center comparison of the open versus transperitoneal laparoscopic approach

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ABSTRACT

Introduction: Heminephrectomy is considered the method of choice in the treatment of symptomatic or poorly working moiety of a duplex kidney as well as in oncology.

Aim: The study aims to retrospectively analyze the laparoscopic approach to heminephrectomy (LHN) in comparison with the open approach (OHN).

Material and methods: From 2011 to 2020, 28 heminephrectomies were performed in the Clinical Ward of Pediatric Surgery and Urology of the Regional Specialized Children’s Hospital in Olsztyn: 10 with the laparoscopic transperitoneal method (LHN), and 18 with the open method (OHN). The mean age was 37.4 months (1–197 months). In total, 20 patients were female, and 8 were male. Loss of function of the moiety was a prerequisite for surgery. Hydronephrosis, dysplasia of the moiety, and vesicoureteral reflux were the most prevalent in both groups. Data regarding patients were collected based on available medical documentation and retrospectively analyzed.

Results and discussion: There was no significant difference between the LHN and OHN groups regarding mean operating time (157 vs 128 minutes; $P = 0.226$) and mean postoperative hospital stay (5.20 vs 6.53; $P = 0.64$). The refeeding time is comparable and not statistically significant (1.90 vs 1.83 days; $P = 0.555$). Postoperative analgesic intake was found to be significantly lower (10.4 vs 17.5 doses, $P = 0.004$).

Conclusions: Both open and laparoscopic approaches are safe and feasible in the pediatric population. Both are comparable in operative time, hospital stay and refeeding time. LHN displays a better cosmetic effect and requires significantly lesser analgesic use.

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1. INTRODUCTION

The first laparoscopic heminephrectomy conducted in the pediatric population was reported in 1993 by Jordan and Winslow. It rapidly became the method of choice both in the treatment of symptomatic and poorly working moiety of a duplex kidney as well as in oncology. Laparoscopy, in comparison with open surgery, displays similar or shorter operating time and hospital stay, better cosmesis, and reduction of analgetic use. Its safety and efficacy were proven in both children and infants. Rapid advancements in minimally invasive surgery brought the implementation of single-incision and robotic methods to heminephrectomy in pediatric urology. However, minimally invasive surgery remains technically challenging and involves a learning curve. Implementation of such methods is limited to specialized centers, which reduces the scope of its usability despite the obvious benefits. Few studies had been published in recent years comparing transperitoneal laparoscopic and open approaches.

2. AIM

The study aims to retrospectively review the single-center experience in the laparoscopic approach to heminephrectomy (LHN) in comparison with the open approach (OHN).

3. MATERIAL AND METHODS

From 2011 to 2020, 28 heminephrectomies were performed in the Clinical Ward of Pediatric Surgery and Urology of the Regional Specialized Children's Hospital in Olsztyn – 10 with the laparoscopic transperitoneal (LHN) method, and 18 with the open (OHN) method. Ultrasonography, scintigraphy, voiding cystourethrography, and in selected cases, magnetic resonance urography were used for diagnosis and evaluation. Loss of function of the moiety was a prerequisite for surgery. Surgical indications accompanying the loss of function are presented in Table 1. Hydronephrosis, dysplasia of the moiety, and vesicoureteral reflux were the most prevalent in both groups. In choosing the surgical method, both the advantages and limited experience in performing laparoscopic surgery were considered during the decision-making process. Each method was presented to the patient's parents or legal guardians, their advantages and disadvantages were explained.

3.1. Patients

The mean age was 37.4 months (1–197). In total, 20 patients were female, and 8 were male. All surgeries performed were unilateral; 18 were performed on the right kidney, and 10 on the left. The upper pole was affected in 22 cases, the lower in 6. Data regarding patients are presented in Table 2. Information about sex, age, indications, operation time, refeeding time, postoperative analgesic use, and follow-up time were collected based on available medical documentation and retrospectively analyzed. Statistical analysis was performed in SPSS 27.0 using the Mann-Whitney U test.

3.2. Surgical methods

3.2.1. Open method

The patient was placed in the lateral decubitus position. Bergmann-Israel or Simon's approach was used to access the kidney. Ureters were dissected. After ligation, the ureteric stump was left with vasculature intact. Bipolar coagulation or a harmonic scalpel was used to close the vessels of the moiety. The demarcation line was used to resect the moiety using a harmonic or electric scalpel. A hemostatic sponge and drain were applied.

3.2.2. Laparoscopic transperitoneal method

The patient was placed in the 30° lateral decubitus position. Hasson’s method was used to insert the 5 mm trocar in the umbilical area. Pneumoperitoneum was established with a target pressure of 8 mm Hg. Two additional trocars were placed under visual control in the midclavicular line: in the epigastric region, and in the iliac fossa. The colon was mobilized and retracted. The kidney was exposed. Bipolar coagulation was used to selectively cauterize vessels of the non-functioning moiety. Following the demarcation line, the pole was excised. Typically, two-thirds of the ureteric stump was preserved. The resected specimen was removed in the entrapment sack through the umbilicus.

4. RESULTS

There was no significant difference between the LHN and OHN groups regarding mean operating time (157 vs 128 minutes; $P = 0.226$) and mean postoperative hospital stay (5.20 vs 6.53 days; $P = 0.64$). The refeeding time was com-
The study presents several limitations. The patient groups are not age-matched, the sample size is limited, and the study is retrospective and non-randomized, which limits its clinical use. Despite those disadvantages, it reflects the benefits of the laparoscopic approach in heminephrectomy. What is more, the operations were carried out by different surgeons. However, the analysis of the available documentation displays similar pre- and intraoperative procedures, which suggest the homogeneity of the groups. We believe that laparoscopic heminephrectomy is a safe and effective method in institutions with professionals untrained to perform more advanced minimally invasive surgical methods.
6. CONCLUSIONS

(1) Both open and laparoscopic approaches are safe and feasible in the pediatric population.
(2) Both are comparable in operative time, hospital stay and refeeding time.
(3) LHN displays a better cosmetic effect and requires significantly lesser analgesic use.

Conflict of interest
None declared.

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References