

Analysis of esthetic assessment scales in two surgical approaches for hypertrophic pyloric stenosis

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ABSTRACT

Introduction. Hypertrophic pyloric stenosis (HPS) is a frequent pathology in neonates, with extramucosal pyloromyotomy being a healing surgery. It may be performed through a transverse subcostal incision (TSI) or a transumbilical incision (TUI).

Objective. To compare complications, operating times, hospital stay, and esthetic results between both techniques.

Materials and Methods. A retrospective, descriptive study of patients undergoing HPS surgery between January 2010 and January 2020 was carried out. Qualitative variables (sex and complications) were expressed as absolute frequency and percentage, whereas quantitative variables (age at surgery, operating time, hospital stay, and scar esthetic assessment scales: MVSS [Modified Vancouver Scar Scale] and P-SAS [Patient Scar Assessment Scale]) were expressed as median and interquartile range.

Results. 107 patients were analyzed: TSI (60.7%, n = 65) vs. TUI (39.3%, n = 42). Male patients: 89.2%, n = 58 vs. 83.3%, n = 35; age (days): 31 (24.5-39.5) vs. 34.5 (29.5-47.25); operating time (minutes): 41 (33.75-60) vs. 46 (38.5-60); and hospital stay (days): 2 (2-4) vs. 3 (2-3). Clavien-Dindo grade II complications were more frequent in the TUI Group (1.54%, n = 1 vs. 23.81%, n = 10; p < 0.001), with most of them being wound infections. The opinion regarding the scar according to the MVSS scale was better in the TUI Group (1.5 [0-4] vs. 0 [0-2]; p = 0.022). No significant differences were found in the P-SAS scale (10 [6-18] vs. 6 [6-9]; p = 0.060).

Conclusions. TUI is preferred from an esthetic point of view, and even though surgical wound infections are more frequent, it is not associated with longer operating times, longer hospital stay, or severe complications.

KEY WORDS: Hypertrophic pyloric stenosis; Pyloromyotomy; Scar; P-SAS; MVSS.

EVALUACIÓN DE ESCALAS DE VALORACIÓN ESTÉTICA EN DOS ABORDAJES QUIRÚRGICOS PARA LA ESTENOSIS HIPERTRÓFICA DE PÍLORO

RESUMEN

Introducción. La estenosis hipertrófica de píloro (EHP) es una patología frecuente en neonatos donde la piloromiotomía extramucosa es una cirugía curativa. Puede realizarse a través de una incisión transversa subcostal (IT) o una incisión transumbilical (ITU).

Objetivo. Comparar complicaciones, tiempo quirúrgico y de hospitalización y resultado estético entre ambas técnicas.

Material y métodos. Estudio descriptivo retrospectivo en pacientes intervenidos de EHP entre enero 2010-2020. Variables cualitativas (sexo y complicaciones) expresadas mediante frecuencia absoluta y porcentaje; y cuantitativas (edad en cirugía, tiempo operatorio, días de hospitalización y escalas de estética de cicatrices: MVSS (*Modified Vancouver Scar Scale*) y P-SAS (*Patient Scar Assessment Scale*)) expresadas mediante mediana y rango intercuartílico.

Resultados. Se analizaron 107 pacientes: IT (60,7%, n = 65) vs. ITU (39,3%, n = 42): varones (89,2%, n = 58 vs. 83,3%, n = 35), días de vida (31 [24,5-39,5] vs. 34,5 [29,5-47,25]), tiempo quirúrgico (41 [33,75-60] vs. 46 [38,5-60] minutos) y días de hospitalización (2 [2-4] vs. 3 [2-3]). Las complicaciones Clavien-Dindo II fueron más frecuentes en el grupo ITU (1,54%, n = 1 vs. 23,81%, n = 10; p < 0,001), siendo la mayoría infecciones de la herida. En el grupo ITU presentaban una mejor opinión sobre la cicatriz en la escala MVSS (1,5 [0-4] vs. 0 [0-2]; p = 0,022). La escala P-SAS no alcanzó diferencias significativas (10 [6-18] vs. 6 [6-9]; p = 0,060).

Conclusiones. La ITU es mejor aceptada a nivel estético y, aunque presenta más infecciones de herida quirúrgica, no precisa más tiempo quirúrgico o de ingreso, ni asocia complicaciones graves.

PALABRAS CLAVE: Estenosis hipertrófica de píloro; Piloromiotomía; Scar; P-SAS; MVSS.

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INTRODUCTION

Hypertrophic pyloric stenosis (HPS) is one of the most frequent pathologies in neonates, with a prevalence of 2 in 1,000 live newborns. Male:female ratio is 4:1^[1]. Even

though etiology is unknown, there seem to be genetic and environmental factors associated with its occurrence^[2].

The only treatment that has been demonstrated to heal HPS in these patients is extramucosal pyloromyotomy, which was first conducted through a transverse subcostal incision (TSI)^[3]. Subsequently, various minimally invasive approaches have been described, such as transumbilical incision (TUI) and the laparoscopic approach^[4,5].

In today's society, and especially in pediatric surgery, the esthetic sequels of a surgical procedure can have a tremendous impact on children's psychical and social development, especially during adolescence. Antiesthetic scars are a frequent reason for consultation, which is demanded both by parents and patients themselves. When it comes to pyloromyotomy, transverse subcostal laparotomy may leave a large, retracted scar, with changes in color, and might even cause pain or itchiness.

In our study, the two aforementioned approaches (TSI and TUI) were compared in order to contrast objective aspects such as complication rate, operating times, and hospital stay, as well as subjective aspects such as the esthetic results perceived by patients or their parents through the use of objective scar assessment scales. This makes ours the first publication in this field.

MATERIALS AND METHODS

A retrospective, transversal study of patients undergoing HPS surgery through open extramucosal pyloromyotomy (TSI or TUI) between January 2010 and January 2020 was carried out.

Study variables included sex, complications according to the Clavien-Dindo classification, age at surgery (days), operating time (minutes), hospital stay (days), and esthetic result according to the MVSS (Modified Vancouver Scar Scale) and the P-SAS (Patient Scar Assessment Scale) (Fig. 1)^[6,7]. The MVSS scale consists of 6 items (pigmentation, pliability, height, vascularity, pain, and itchiness), with a total score of 0-18 points – 0 being the closest to a normal skin. The P-SAS scale comprises 6 items (pain, itchiness, color, stiffness, thickness, and irregularity), with a total score of 6-60 points – 6 being the closest to a normal skin. Results in both scales were achieved from the telephone replies provided by the parents of the patients who had undergone surgery.

For statistical analysis purposes, the SPSS software, version 25 (IBM, Armonk, NY, USA), was used. Qualitative variables were expressed as percentage and absolute frequency, whereas quantitative variables were expressed as median and interquartile range. Mann-Whitney U test was used for quantitative variables, and analysis of contingency tables through the Chi-squared test was used for qualitative variables. Statistical significance was established at $p < 0.05$.

RESULTS

A total of 107 patients undergoing open pyloromyotomy – 60.7% (n = 65) through TSI and 39.3% (n = 42) through TUI – were included in the study. Patient characteristics were comparable in terms of sex, age, operating time, hospital stay, and complications (Table 1).

In the TUI Group, Clavien-Dindo grade I complications (no treatment required beyond antiemetics, antipyretics, analgesics, diuretics, electrolytes, or physical therapy. They also include dehiscence as a result of surgical wound infection) were: 3 cases of seroma or wound exudate. Grade II complications (greater pharmacological treatment than grade I, including antibiotics or parenteral nutrition) were: 2 cases of pyloric mucosa perforation, identified and repaired through primary suture during surgery itself, with subsequent intravenous antibiotic therapy and parenteral nutrition; and 8 cases of surgical wound infection treated with antibiotic therapy. Grade III complications (requiring surgical, endoscopic, or interventional treatment) were: 1 case of incomplete pyloromyotomy and 1 of evisceration. No grade IV (patient's life at risk or ICU care required) or grade V (death of a patient) complications were recorded in any group. Only one statistically significant difference was noted in the percentage of grade II complications between both groups.

Regarding esthetic results, 46.2% (n = 30) of patients undergoing TSI and 47.6% (n = 20) of patients undergoing TUI replied to the surveys and provided pictures (Fig. 2). Median age (years) at survey completion was 8 (5.6-8.7) vs. 4 (2.3-6.4) ($p < 0.001$). Parents of patients who had undergone TUI had a better opinion regarding the scar in the MVSS scale: 1.5 (0-4) vs. 0 (0-2) ($p = 0.022$). However, no statistically significant differences were found in the P-SAS scale (10 (6-18) vs. 6 (6-9); $p = 0.060$).

DISCUSSION

More than 100 years have gone by since Rammstedt first described extramucosal pyloromyotomy for the treatment of HPS^[3]. Although various surgical approaches have been developed, this technique remains virtually intact.

In our setting, two open approaches have been used – classic TSI described by Rammstedt and TUI described by Tan and Bianchi^[3,4]. Initially, we wished to compare complication rates between both techniques to confirm safety and effectiveness. Even though some previous studies report a higher complication rate in TUI (patients over 18: 22.2% vs. 2.6%; patients under 18: 44.4% vs. 2.6%), others demonstrate the safety of the TUI approach^[8,9].

In our series, only grade II complications were more frequent. 20% were pyloric mucosa perforations that were

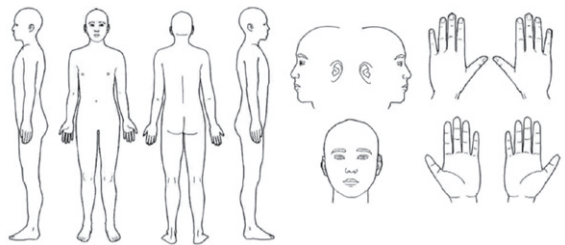
| MODIFIED VANCOUVER SCAR SCALE (MVSS) | P-SAS PATIENT SCALE | | | | | | | | | | | | | | | | | | | | | |
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| <p>Patient name: ID number: Date of birth: Date of surgery: Date of assessment:</p> | <p>Patient name: ID number: Date of birth: Date of surgery: Date of assessment:</p> | | | | | | | | | | | | | | | | | | | | | |
| <p>1. Pigmentation</p> <p><input type="checkbox"/> (0) Normal <input type="checkbox"/> (1) Hypo-pigmentation <input type="checkbox"/> (2) Mixed pigmentation <input type="checkbox"/> (3) Hyper-pigmentation</p> <p>2. Pliability</p> <p><input type="checkbox"/> (0) Normal <input type="checkbox"/> (1) Supple (flexible with minimal resistance) <input type="checkbox"/> (2) Yielding (giving way to pressure) <input type="checkbox"/> (3) Firm (inflexible, not easily moved, resistant to manual pressure) <input type="checkbox"/> (4) Banding (rope-like tissue that blanches with extension of the scar) <input type="checkbox"/> (5) Contracture (permanent shortening of scar, producing deformity or distortion)</p> <p>3. Height</p> <p><input type="checkbox"/> (0) Flat <input type="checkbox"/> (1) <2 mm <input type="checkbox"/> (2) 2-5 mm <input type="checkbox"/> (3) >5 mm</p> <p>4. Vascularity</p> <p><input type="checkbox"/> (0) Normal <input type="checkbox"/> (1) Pink <input type="checkbox"/> (2) Red <input type="checkbox"/> (3) Purple</p> <p>5. Pain</p> <p><input type="checkbox"/> (0) None <input type="checkbox"/> (1) Occasional <input type="checkbox"/> (2) Requires medication</p> <p>6. Itchiness</p> <p><input type="checkbox"/> (0) None <input type="checkbox"/> (1) Occasional <input type="checkbox"/> (2) Requires medication</p> | <div style="text-align: center; margin-bottom: 10px;">  </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"></th> <th style="width: 15%; text-align: center;">1 = No, not at all</th> <th style="width: 15%; text-align: center;">10 = Yes, very much</th> </tr> </thead> <tbody> <tr> <td>Has the scar been painful the past few weeks?</td> <td></td> <td></td> </tr> <tr> <td>Has the scar been itching the past few weeks?</td> <td></td> <td></td> </tr> <tr> <td>Is the scar color different from the color of your normal skin at present?</td> <td></td> <td></td> </tr> <tr> <td>Is the stiffness of the scar different from your normal skin at present?</td> <td></td> <td></td> </tr> <tr> <td>Is the thickness of the scar different from your normal skin at present?</td> <td></td> <td></td> </tr> <tr> <td>Is the scar more irregular than your normal skin at present?</td> <td></td> <td></td> </tr> </tbody> </table> | | 1 = No, not at all | 10 = Yes, very much | Has the scar been painful the past few weeks? | | | Has the scar been itching the past few weeks? | | | Is the scar color different from the color of your normal skin at present? | | | Is the stiffness of the scar different from your normal skin at present? | | | Is the thickness of the scar different from your normal skin at present? | | | Is the scar more irregular than your normal skin at present? | | |
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Figure 1. A) MVSS scale. Total score = sum; 0 (best scar imaginable) – 18 (worst scar imaginable). B) P-SAS scale. Total score = sum; 6 (best scar imaginable) – 60 (worst scar imaginable).

Table 1. Patient characteristics

| | N = 107 | TSI = 60.7% (n = 65) | TUI = 39.3% (n = 42) | p |
|--------------------------|---------|----------------------|----------------------|-------|
| Sex | Male | 89.2% (58) | 83.3% (35) | 0.377 |
| | Female | 10.8% (7) | 16.7% (7) | |
| Age (days) | | 31 (24.5-39.5) | 34.5 (29.5-47.3) | 0.098 |
| Operating time (minutes) | | 41 (33.75-60) | 46 (38.5-60) | 0.520 |
| Hospital stay | | 2 (2-4) | 3 (2-3) | 0.808 |
| Complications | CV I | 0 | 7.1% (3) | 0.058 |
| | CV II | 1.54% (1) | 23.81% (10) | 0.001 |
| | CV III | 0 | 4.8% (2) | 0.152 |
| | CV IV-V | 0 | 0 | |

TSI: Transverse Subcostal Incision; TUI: Transumbilical Incision; CV: Clavien-Dindo.

repaired during surgery itself, but required postoperative intravenous treatment; and 80% were surgical wound infections treated with antibiotic therapy on an outpatient basis.

Grade I and III complications were comparable between both groups, and no severe grade IV-V complications were recorded.

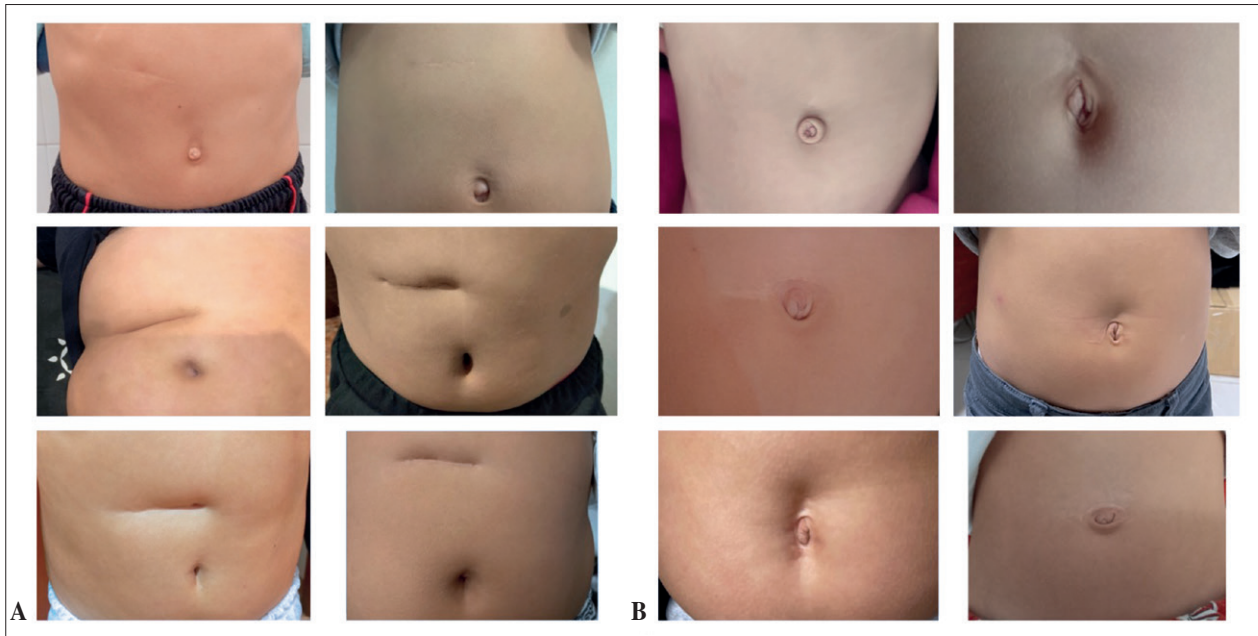


Figure 2. Selection of scar pictures provided by patients. A) Transverse subcostal incision. B) Transumbilical incision.

Various publications report a similar complication rate between both techniques, with a better esthetic result but higher costs and longer operating times^[10,11]. However, other series describe surgical wound infection rates of up to 20% in TUI, similar to the findings from our series^[12]. One of the factors that could contribute to this difference is the fact strong traction has to be exerted on the abdominal wall to exteriorize the pyloric olive, which may cause hematoma or ischemia in the rectus muscles, thus favoring infection^[13]. Such traction can be significantly reduced by enlarging the incision in an omega shape both at the cutaneous and the aponeurosis levels^[14]. Another important factor is umbilical anatomy itself, which makes it more difficult to clean and more prone to humidity and dirt^[12]. Thorough hygiene of the area preoperatively and during postoperative dressings could reduce infections. Preoperative administration of antibiotic prophylaxis might also contribute to this, but there is no consensus on the use of antibiotics in clean surgeries such as pyloromyotomy^[12,15,16].

Today, the occurrence of scars as a result of a surgical procedure remains inevitable. Pathological scars may lead to a significant reduction in quality of life, either due to motor dysfunction or psychological or social disorders in the short- and long-term. In addition, they account for a very large number of medical consultations, which means they have an enormous economic impact. Even though the understanding of scar formation is growing and the number of treatments available is increasing, our objective is to reduce patient morbidity as much as possible. Therefore, although minimally invasive techniques are widely accepted to be superior esthetically speaking, this is the

first publication comparing the esthetics between these two types of approaches.

There are multiple scar assessment scales, but none of them is optimal, since they do not cover all physical, functional, cosmetic, and psychological aspects^[17]. In this study, two esthetic result scales (MVSS and P-SAS) were used. Patients were able to easily complete them by phone – this is how the whole analysis was carried out in order to reduce the risk of contracting COVID-19. Consequently, even though no scales analyzed by an independent qualified observer – such as the OR-SAS (Observer Scar Assessment Scale) – were used, the subjective results highlight the importance parents grant to their children’s scar in relation with an acute pathology. A statistically significant difference was found in the MVSS scale ($p = 0.022$), but not in the P-SAS scale ($p = 0.060$). However, we believe the latter could have been statistically significant with a larger sample size.

Our study has two main limitations. On the one hand, the percentage of surveys completed was approximately 50%, and replies were provided by parents, not by patients themselves – due to their young age. In addition, patients were of different ages when completing the survey. Even though TSI children were older than TUI children, comparisons were always made with a normal skin, and the umbilicus is not a normal piece of skin, but a scar from birth. Therefore, this significantly helps in hiding the scar, even when children are older. However, the TSI scar considerably changes with the patient’s size and fat distribution, with truly antiesthetic scars. To counteract this limitation, a prospective study carried out in patients of a similar age

and over a longer follow-up period would help confirm the data found in this study.

On the other hand, the laparoscopic approach is getting growing traction, to the extent it is regarded as the technique of choice by some physicians^[18-20]. However, it is not always available, and it requires a learning curve of around 35 procedures^[21]. A recent review of the Cochrane guide (2021) suggests a higher incidence of mucosal perforation (RR: 1.6; 95% CI: 0.49-5.26) and incomplete pyloromyotomy (RR: 7.37; 95% CI: 0.902-59.11), and does not demonstrate the superiority of laparoscopy in terms of surgical wound infection (RR: 0.59; 95% CI: 0.24-1.45), incisional hernia (RR: 1.01; 95% CI: 0.11-9.53), operating time, hospital stay, or days required to achieve full enteral nutrition^[22].

CONCLUSIONS

Both open approaches are safe in the treatment of HPS, and they do not require longer operating times or a longer hospital stay. However, the esthetic result is better accepted by parents when transumbilical incision is used.

REFERENCES

1. Schechter R, Torfs CP, Bateson TF. The epidemiology of infantile hypertrophic pyloric stenosis. *Paediatr Perinat Epidemiol*. 1997; 11: 407-27.
2. Jobson M, Hall NJ. Contemporary management of pyloric stenosis. *Semin Pediatr Surg*. 2016; 25: 219-24.
3. Rammstedt C. Zur Operation der angeborenen Pylorusstenose. *Med Klin*. 1912; 8: 1702-5.
4. Tan KC, Bianchi A. Circumbilical incision for pyloromyotomy. *Br J Surg* 2005; 73: 399.
5. Alain JL, Grousseau D, Terrier G. Extramucosal pylorotomy by laparoscopy. *J Pediatr Surg*. 1991; 26: 1191-2.
6. Verhaegen PDHM, van der Wal MBA, Middelkoop E, van Zuijlen PPM. Objective scar assessment tools: A clinimetric appraisal. *Plast Reconstr Surg*. 2011; 127: 1561-70.
7. Draaijers LJ, Tempelman FRH, Botman YAM, Tuinebreijer WE, Middelkoop E, Kreis RW, et al. The patient and observer scar assessment scale: A reliable and feasible tool for scar evaluation. *Plast Reconstr Surg*. 2004; 113: 1960-5.
8. Carrera N, Cerdá JA, Cañizo A, Parente A, Laín A, Fanjul M, et al. Estenosis hipertrófica de pílora: comparación entre la incisión transversa y la supraumbilical. *Cir Pediatr*. 2010; 23: 77-81.
9. El-Gohary Y, Yeap B, Hempel G, Gillick J. A 9-Year single center experience with circumumbilical Ramstedt's pyloromyotomy. *Eur J Pediatr Surg*. 2010; 20: 387-90.
10. Blümer RME, Hessel NS, van Baren R, Kuyper CF, Aronson DC. Comparison between umbilical and transverse right upper abdominal incision for pyloromyotomy. *J Pediatr Surg*. 2004; 39: 1091-3.
11. Kim SS, Lau ST, Lee SL, Schaller R, Healey PJ, Ledbetter DJ, et al. Pyloromyotomy: A comparison of laparoscopic, circumumbilical, and right upper quadrant operative techniques. *J Am Coll Surg*. 2005; 201: 66-70.
12. Leinwand MJ, Shaul DB, Anderson KD. The umbilical fold approach to pyloromyotomy: is it a safe alternative to the right upper-quadrant approach? *J Am Coll Surg*. 1999; 189: 362-7.
13. Besson R, Sfeir R, Salakos C, Debeugny P. Congenital pyloric stenosis: a modified umbilical incision for pyloromyotomy. *Pediatr Surg Int*. 1997; 12: 224-5.
14. Lambert A, O'Brien M, Surana R, Hutton K. Circumbilical incision for Ramstedt's pyloromyotomy. *Ann R Coll Surg Engl*. 2002; 84: 431.
15. Herman TF, Bordoni B. Wound classification. *Treasure Island (FL)*; 2022.
16. Katz MS, Schwartz MZ, Moront ML, Arthur LG, Timmapuri SJ, Prasad R. Prophylactic antibiotics do not decrease the incidence of wound infections after laparoscopic pyloromyotomy. *J Pediatr Surg*. 2011; 46: 1086-8.
17. Nguyen T, Feldstein S, Shumaker P, Krakowski A. A review of scar assessment scales. *Semin Cutan Med Surg*. 2015; 34: 28-36.
18. Gilna GP, Saberi RA, Huerta CT, O'Neil CF, Ramsey WA, Parreco JP, et al. Laparoscopic versus open pyloromyotomies: Outcomes and disparities in pyloric stenosis. *J Pediatr Surg*. 2022; 57: 932-6.
19. Ismail I, Elsherbini R, Elsaied A, Aly K, Sheir H. Laparoscopic vs. Open pyloromyotomy in treatment of infantile hypertrophic pyloric stenosis. *Front Pediatr*. 2020; 8: 426.
20. Zampieri N, Corato V, Scirè G, Camoglio FS. Hypertrophic pyloric stenosis: 10 years' experience with standard open and laparoscopic approach. *Pediatr Gastroenterol Hepatol Nutr*. 2021; 24: 265.
21. Oomen MWN, Hoekstra LT, Bakx R, Heij HA. Learning curves for pediatric laparoscopy: how many operations are enough? The Amsterdam experience with laparoscopic pyloromyotomy. *Surg Endosc*. 2010; 24: 1829-33.
22. Staerkle RF, Lunger F, Fink L, Sasse T, Lacher M, von Elm E, et al. Open versus laparoscopic pyloromyotomy for pyloric stenosis. *Cochrane Database Syst Rev*. 2021; 3: CD012827.