Comparison of Laparoscopic and Open Pyloromyotomy

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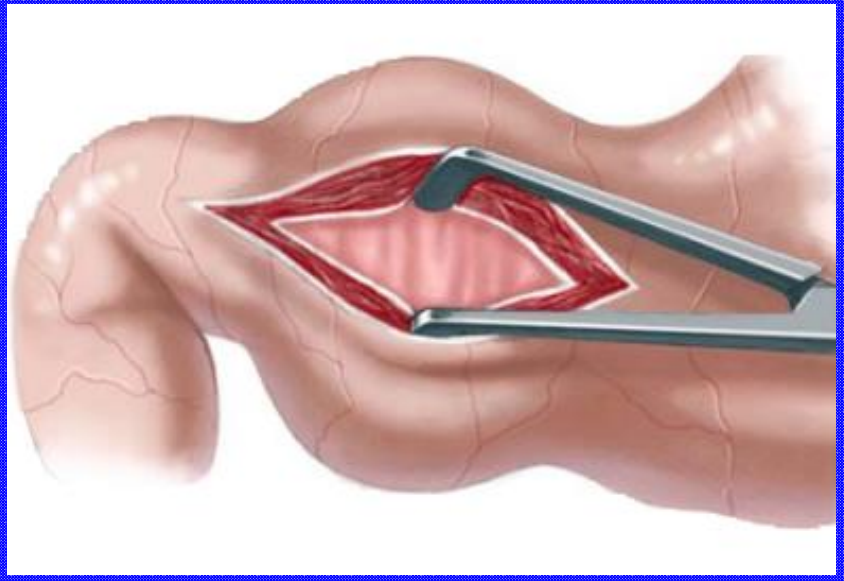
BACKGROUND

- The first complete description: Hirschsprung 1888.
- Fredet 1907: splitting the hypertrophied pyloric muscle to the submucosa and closing the muscle transversely
- Ramsted 1912: closing the muscle is unnecessary
- Laparoscopic: Alain and coworkers 1990

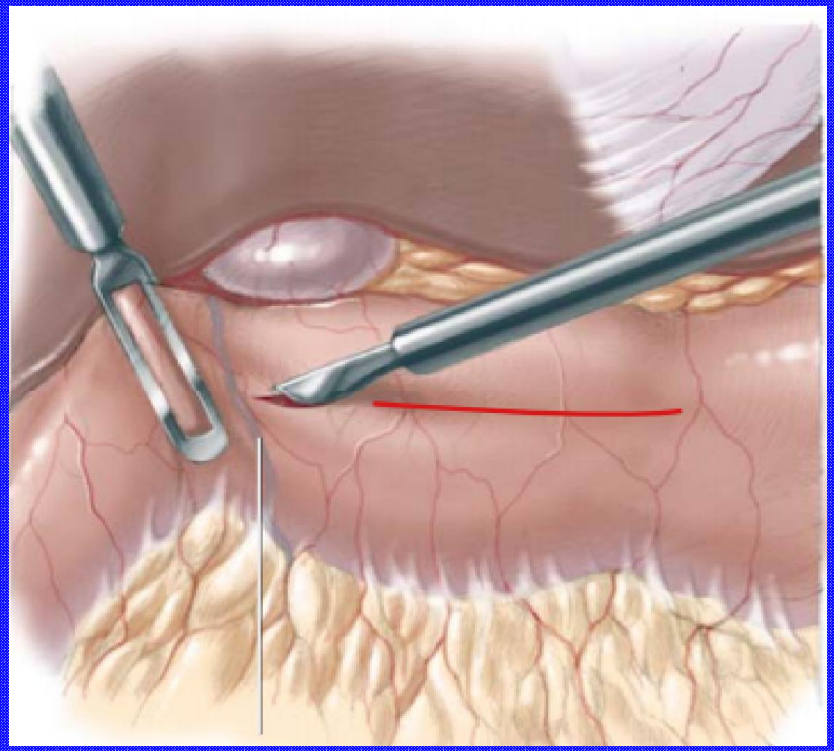
Ito năm 2000

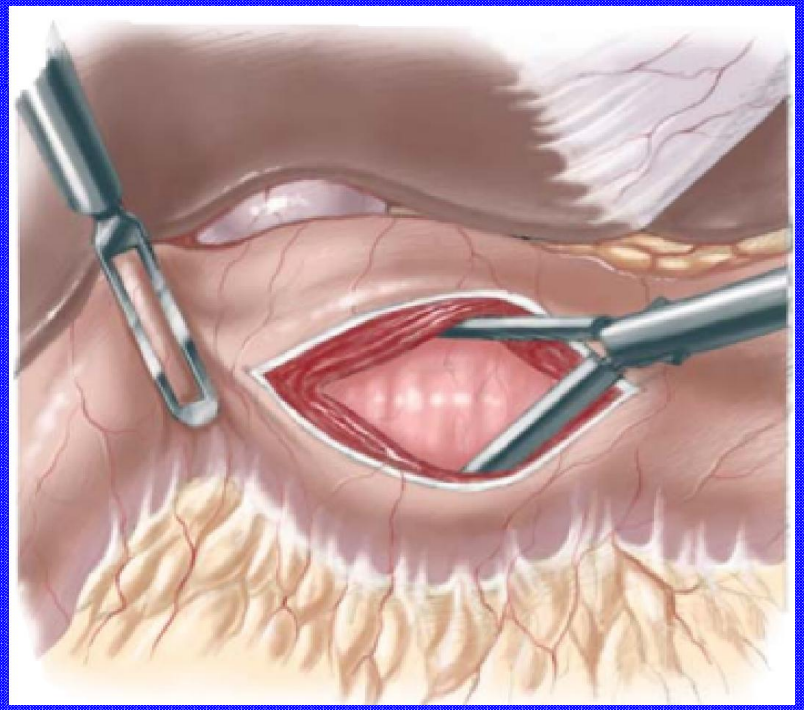
	Measurements (mm)	Score
Pyloric diameter	≤10	0
	>10 – 15	1
	>15 – 17	2
	>17	3
Pyloric muscle thickness	≤2.5	0
	> 2.5 – 3.5	1
	> 3.5 – 4.5	2
	> 4.5	3
Pyloric length	≤13	0
	>13 – 19	1
	>19 – 22	2
	>22	3

Pyloromyotomy



Laparoscopic pyloromyotomy





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Laparoscopic pyloromyotomy for hypertrophic pyloric stenosis: a prospective, randomized controlled trial

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Table 2 Surgical complications

	Open (n = 52)	Laparoscopy (n = 50)	*P*
Intraoperative complications	1 (1.9)	3 (6)	.35
Mucosal perforation	1	1	
Duodenal injury	0	1	
Hemodynamic instability	0	1	
Postoperative complications	2 (3.8)	4 (8)	.43
Wound infection[a]	1	1	
Wound dehiscence	1	0	
Revision pyloromyotomy	0	3	
Duration of surgery (min)	23 ± 7	30 ± 10	10^{-4}
Duration of anesthesia (min)	82 ± 20	91 ± 20	.02
Time to full feeding (h)	31 ± 10	30 ± 6	.34
Prolonged hospital stay	7 (13.5)	11 (22)	.38
Postoperative length of stay (d)	3.3 ± 0.9	3.5 ± 1.5	.38

Quantitative data are expressed as mean ± SD, and categorical data are expressed as number (percentage).

[a] Those requiring antibiotics.

Table 3 Postoperative vomiting

	Open (n = 52)	Laparoscopy (n = 50)	*P*
Vomiting overall incidence	41 (79)	37 (74)	.56
Prokinetics prescription[a]	28 (54)	29 (58)	.67
Complete antireflux regimen prescription[b]	18 (35)	24 (48)	.24
Vomiting >5 episodes	8 (15)	13 (26)	.19
No. of episodes	3 (1-4)	3 (1-4)	.97
GER at 1 mo postoperatively	16 (31)	12 (24)	.44

Data are expressed as number (percentage), mean ± SD, or median (25th-75th centile). GER indicates gastroesophageal reflux.

[a] More than 2 episodes of vomiting (domperidone 1 mg every 8 hours).

[b] More than 4 episodes of vomiting (domperidone + thickened formula + upright positioning).

Table 4 Postoperative pain scores

	β	SD (β)	95% CI (β)	P
Intercept	18.98	0.14	18.71-19.25	<.0001
Open	0			
Laparoscopy	.60	0.20	0.21-1	.0031
Slope estimate	.023	0.005	0.013-0.033	<.0001
Open	0			
Laparoscopy	−.017	0.007	−0.03 to −0.002	.026

Results of the mixed linear regression model. CI indicates confidence interval.

2.3. Postoperative pain

Pain scores and their postoperative evolution with time were significantly different between the groups, with a tendency for higher scores (less pain) in the LP group, as shown in Table 4.

Laparoscopic Extramucosal Pyloromyotomy Versus Open Pyloromyotomy for Infantile Hypertrophic Pyloric Stenosis: Which Is Better?

By Takao Fujimoto, Geoffrey J. Lane, Osamu Segawa, Saori Esaki, and Takeshi Miyano
Tokyo, Japan

Background/Purpose: The aim of this study was to evaluate the advantages or disadvantages of laparoscopic pyloromyotomy compared with open transumbilical fold pyloromyotomy.

Methods: Thirty consecutive laparoscopic extramucosal pyloromyotomies (LP) performed from 1994 to 1997 were compared with 30 consecutive open pyloromyotomies (OP) performed during the same period with regard to age at operation, body weight, thickness of hypertrophied pyloric muscle, operating time, time of return to full feeding, frequency of postoperative emesis, surgical complications, and degree of surgical stress reflected by interleukin-6 (IL-6). LP was performed according to conventional techniques, and OP was performed using a transumbilical fold approach.

Results: The groups were matched for age at operation, preoperative clinical and physical status, laboratory data, and size of the hypertrophied pylorus assessed by ultrasonography. There was a learning curve with LP; the average operating time required for the first 10 cases was significantly longer than the time required for OP, but later cases took just as long as OP cases. Time taken to full feeding was significantly shorter in the LP group than the OP group (LP, 38 hours *v* OP, 64 hours). One case was converted from LP to OP because of mucosal perforation. The incidence of postoperative emesis was significantly higher in the OP group than in the LP group (OP, 25% *v* LP, 3%). The mean length of hospitalization was significantly shorter in LP ($P < .01$). The intraoperative peak values of IL-6 in LP were significantly lower than those in the OP group ($P < .01$).

Conclusions: The advantages of LP are improved cosmesis, decreased surgical stress with earlier postoperative recovery, and shorter hospitalization. Because LP uses reusable devices, and the mean period of hospitalization is shorter, average operating costs could be reduced, representing a net saving in total hospital charges.

INDEX WORDS: Infantile hypertrophic pyloric stenosis, laparoscopic pyloromyotomy, transumbilical fold incision.

Table 1. Preoperative Status of the Patients

	Laparoscopic (n = 30)	Open (n = 30)	*P* Value
Age at admission (d)	44.23 ± 15.74	43.63 ± 18.85	.96
Duration of emesis (d)	20.91 ± 13.12	12.19 ± 8.57	.05
Weight at admission (kg)	4061 ± 604	3805 ± 5611	.76
Serum Na (mEq/dL)	138 ± 3.8	139 ± 2.0	.19
Serum Cl (mEq/dL)	97 ± 11.9	101 ± 7.3	.21

Table 3. Operative and Postoperative Data

	Laparoscopic (n = 29)	Open (n = 30)	*P* Value
Operating time (min)	27.38 ± 10.4	31.87 ± 8.01	.01
Time to restart feeding (h)	3.61 ± 0.88	13.57 ± 6.43	<.0001
Time to full feeding (h)	34.79 ± 5.6	61.23 ± 5.1	<.0001
Postoperative emesis (vomit per feeding)	1/313 (0.3%)	160/631 (25%)	

One infant had mucosal perforation in the LP group, which was treated by converting the LP to an OP. The mucosal defect was approximated and covered with omentum using fibrin glue. Three serosal lacerations (10%) and two wound infections (7%) occurred in the OP group.

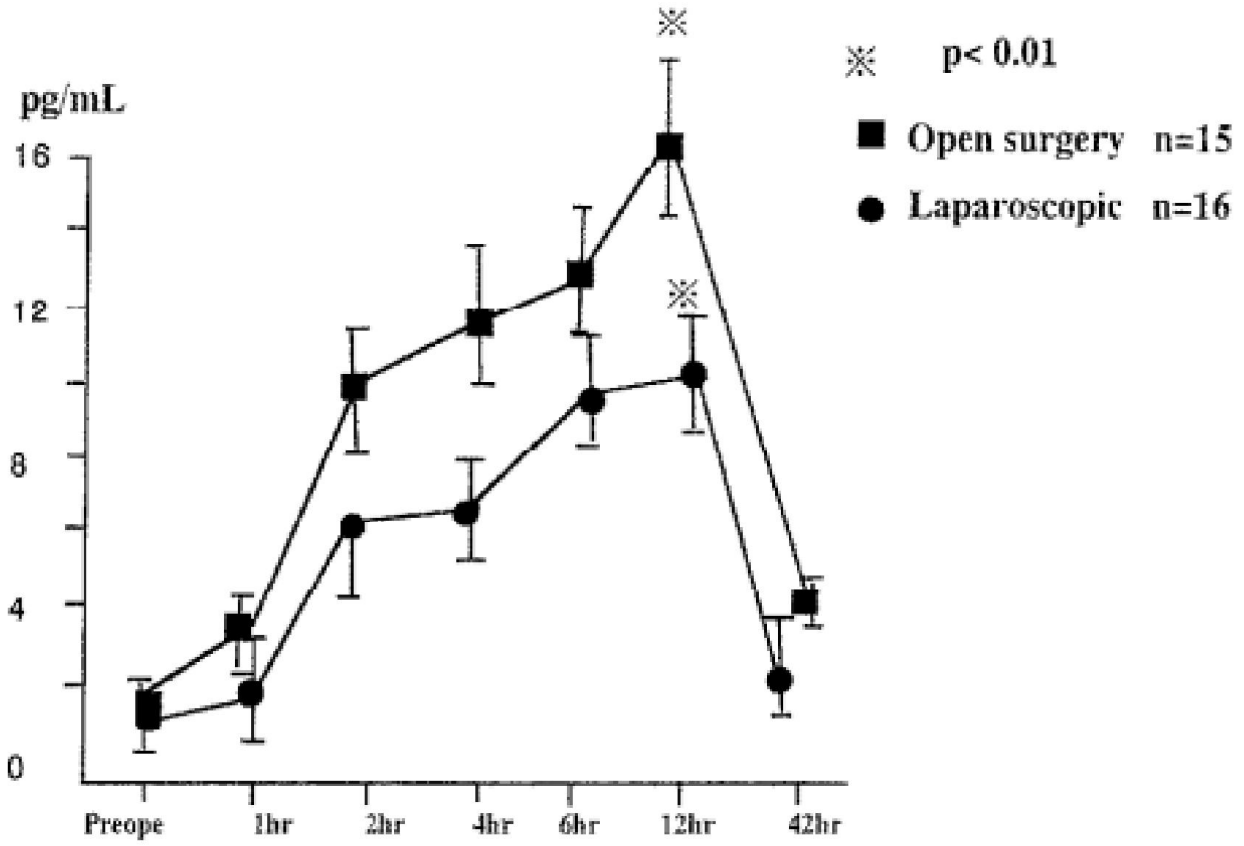

Fig 1. IL-6 response during laparoscopic pyloromyotomy. The peak value of IL-6 is lower in the laparoscopic pyloromyotomy group than in the open pyloromyotomy group.

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Pyloromyotomy: randomized control trial of laparoscopic vs open technique

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Key words:
Hypertrophic pyloric stenosis;
Laparoscopic surgery;
Cosmesis

Abstract

Purpose: Open pyloromyotomy remains as the criterion standard treatment for hypertrophic pyloric stenosis with the laparoscopic approach rapidly gaining adoption. We present a prospective, randomized trial between the 2 approaches.

Methods: After institutional review board approval, 98 patients with hypertrophic pyloric stenosis were consecutively randomized to either open or laparoscopic pyloromyotomy. Postoperative and hospital course were evaluated by review of the hospital records and long-term follow-up with scripted telephone survey using Likert scales. The length of operating room time, surgical procedure, postoperative stay, time to refeeding, and complications were evaluated. Secondary outcomes of cosmetic results and parental satisfaction were determined.

Results: Ninety-eight patients were enrolled during a 4-year period. There were no significant differences between 2 groups on all primary outcomes. There were 3 complications in the open group—a wound dehiscence, a surgical site infection, and a gastric serosal tear—and 2 complications in the laparoscopic group—mucosal perforation and a suture granuloma. In long-term follow-up on 72 patients (56 months), parents described significant cosmetic results with laparoscopic approach.

Conclusions: There was no difference in operating time, hospital stay, or refeeding patterns between open and laparoscopic pyloromyotomy. The complication rates were similar between the 2 methods. However, long-term cosmetic results were significantly superior in the laparoscopic group.

Table 2 Patient demographics

	Total (n = 98)	Open (n = 42)	Laparoscopic (n = 56)	*P*
Sex (males) [a]	74	33	41	.8771
Age (d) [b]	Mean, 36 Range, 15-91	Mean, 37 Range, 20-88	Mean, 36 Range, 15-91	.5454
Weight (kg) [b]	mean 4.0 Range, 2.7-6.2	Mean, 3.8 Range, 2.7-6.2	Mean, 4.0 Range, 3.0-5.4	.4909
All comorbid conditions [a]	20	7	13	.6219
GERD [a]	16	5	11	.4259
Premature [a]	15	6	9	1.0000

GERD indicates gastroesophageal reflux disease.

[a] Fisher exact test.

[b] Student *t* test.

Table 3 Intraoperative data

	Total (n = 95)	Open (n = 40)	Laparoscopic (n = 54)	*P*
Procedure time [a] (minutes:seconds)	24:05	23:55	24:12	.4741
Total OR time [a] (minutes:seconds)	54:23	52:43	55:34	.3695

[a] Student *t* test.

Table 4 Immediate postoperative outcomes

	Total (n = 98)	Open (n = 42)	Laparoscopic (n = 56)	*P*
Length of stay [a] (d)	1.21	1.11	1.28	.4923
Time to refeeding [a] (h)	6.02	6.04	6.0	.5018
Complications [b]	5	3	2	.6486

[a] Student *t* test.

[b] Fisher exact test.

Table 5 Body Image Questionnaire results

	Total (n = 72)	Open (n = 28)	Laparoscopic (n = 44)	*P*
Body image score (maximum score, 30)	26.2	24.1	28.2	.0463
Cosmetic score (maximum score, 30)	23.0	17.2	26.7	.0361

[a]Student *t* test.

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Review

Laparoscopic vs open pyloromyotomy: a systematic review and meta-analysis

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Key words:
Hypertrophic pyloric stenosis;
Laparoscopic pyloromyotomy;
Open pyloromyotomy;
Meta-analysis;
Neonatal surgery

Abstract

Purpose: The aim of the study was to determine whether laparoscopic pyloromyotomy (LP) or open pyloromyotomy (OP) is the most effective intervention in infants with hypertrophic pyloric stenosis.

Methods: A systematic review of the published literature was undertaken in February 2009. Prospective studies comparing LP and OP were selected. Age, weight, complications, duration of operation, time to full feedings, postoperative vomiting, and postoperative length of stay (LOS) data were extracted.

Results: Six prospective studies (5 level I, 1 level II) with 625 (303 LP, 322 OP) participants met selection criteria. Combined estimates indicated that LP had a lower total complication rate (odds ratio [OR], 0.58 [0.35, 0.97]; $P = .04$), mostly due to a lower wound complication rate (OR, 0.42 for LP [0.20, 0.91]; $P = .03$). Patients who underwent LP also had shorter time to full feedings (mean difference [MD], −11.52 hours [−12.77, −10.27]; $P < .00001$) and shorter postoperative LOS (MD, −5.71 hours [−8.90, −2.52]; $P = .0005$). No statistically significant differences were noted in the rates of mucosal perforation, wound infection, postoperative emesis, or operating time. Incomplete pyloromyotomy occurred in 6 patients who underwent LP (OR, 7.74 [0.94, 63.38]; $P = .06$).

Conclusions: This meta-analysis favors the laparoscopic approach with significantly reduced rate of total complications, which is mostly due to a lower wound complication rate.

Result

Table 2 Comparison summary of included studies LP vs OP

Comparison	Studies (n)	Patients (n)	Statistical method	*P*
Total complications	6	625	OR (M-H, fixed, 95% CI)	.04
Mucosal perforations	6	625	OR (M-H, fixed, 95% CI)	NS
Incomplete myotomy	6	625	OR (M-H, fixed, 95% CI)	.06
Wound complications	6	625	OR (M-H, fixed, 95% CI)	.03
Wound infections	6	625	OR (M-H, fixed, 95% CI)	NS
Operating time, min	6	625	MD (IV, fixed, 95% CI)	NS
Time to full feeding, h	6	625	MD (IV, fixed, 95% CI)	<.00001
Postoperative emesis	5	425	OR (M-H, fixed, 95% CI)	NS
Postoperative LOS, h	5	565	MD (IV, fixed, 95% CI)	.0005
Gestational age, d	6	625	MD (IV, fixed, 95% CI)	NS
Weight, g	5	425	MD (IV, fixed, 95% CI)	NS

OR indicates odds ratio; M-H, Mantel-Haenszel; IV, inverse variance; NS, not significant.

Total complication

Study or Subgroup	Laparoscopic Events	Total	Open Events	Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Fujimoto et al	1	30	5	30	12.1%	0.17 [0.02, 1.58]
Greason et al	0	10	1	10	3.6%	0.30 [0.01, 8.33]
Hall et al	16	87	29	93	57.4%	0.50 [0.25, 1.00]
Leclair et al	7	50	3	52	6.3%	2.66 [0.65, 10.93]
Scorpio et al	1	26	3	37	6.0%	0.45 [0.04, 4.62]
St Peter et al	3	100	6	100	14.6%	0.48 [0.12, 1.99]
Total (95% CI)		**303**		**322**	**100.0%**	**0.58 [0.35, 0.97]**
Total events	28		47			

Heterogeneity: $Chi^2 = 6.06$, $df = 5$ ($P = .30$); $I^2 = 17\%$

Test for overall effect: $Z = 2.08$ ($P = .04$)

Wound complication

Study or Subgroup	Laparoscopic Events	Total	Open Events	Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Fujimoto et al	0	30	2	30	11.2%	0.19 [0.01, 4.06]
Greason et al	0	10	0	10		Not estimable
Hall et al	6	87	11	93	44.9%	0.55 [0.19, 1.56]
Leclair et al	1	50	2	52	8.7%	0.51 [0.04, 5.81]
Scorpio et al	0	26	3	37	13.0%	0.19 [0.01, 3.76]
St Peter et al	2	100	5	100	22.2%	0.39 [0.07, 2.05]
Total (95% CI)		**303**		**322**	**100.0%**	**0.42 [0.20, 0.91]**
Total events	9		23			

Heterogeneity: $Chi^2 = 0.84$, $df = 4$ ($P = .93$); $I^2 = 0\%$

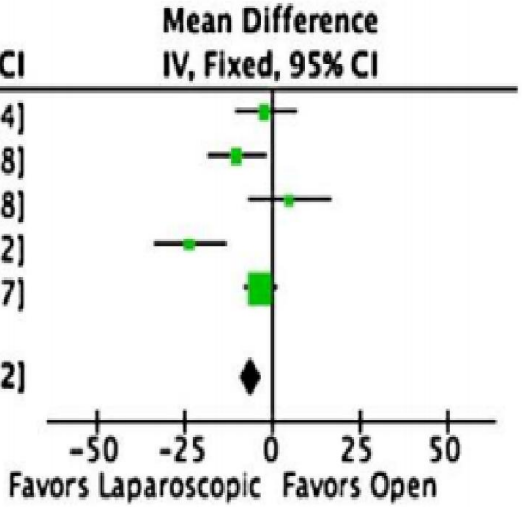
Test for overall effect: $Z = 2.21$ ($P = .03$)

Postoperative length of stay

A

Study or Subgroup	Laparoscopic Mean	SD	Total	Open Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
Greason et al	23	10	10	25	9	10	14.6%	-2.00 [-10.34, 6.34]
Hall et al	33.6	25.2	87	43.8	30.3	93	15.4%	-10.20 [-18.32, -2.08]
Leclair et al	84	36	50	79.2	21.6	52	7.6%	4.80 [-6.78, 16.38]
Scorpio et al	40.9	21.8	26	64.4	17.4	37	10.0%	-23.50 [-33.58, -13.42]
St Peter et al	29.63	16	100	33.17	15.8	100	52.4%	-3.54 [-7.95, 0.87]
Total (95% CI)			**273**			**292**	**100.0%**	**-5.71 [-8.90, -2.52]**

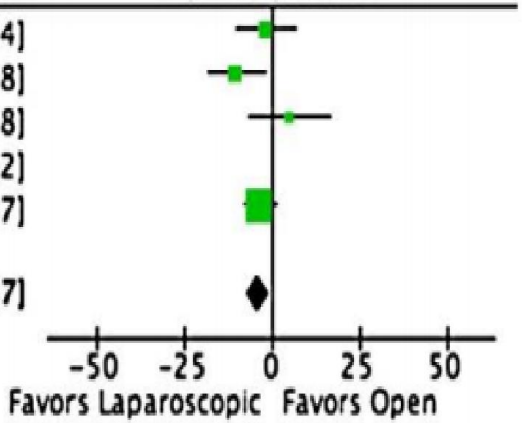
Heterogeneity: Chi² = 17.99, df = 4 (P = .001); I² = 78%
Test for overall effect: Z = 3.51 (P = .0005)



B

Study or Subgroup	Laparoscopic Mean	SD	Total	Open Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
Greason et al	23	10	10	25	9	10	16.3%	-2.00 [-10.34, 6.34]
Hall et al	33.6	25.2	87	43.8	30.3	93	17.1%	-10.20 [-18.32, -2.08]
Leclair et al	84	36	50	79.2	21.6	52	8.4%	4.80 [-6.78, 16.38]
Scorpio et al	40.9	21.8	26	64.4	17.4	37	0.0%	-23.50 [-33.58, -13.42]
St Peter et al	29.63	16	100	33.17	15.8	100	58.2%	-3.54 [-7.95, 0.87]
Total (95% CI)			**247**			**255**	**100.0%**	**-3.73 [-7.09, -0.37]**

Heterogeneity: Chi² = 4.70, df = 3 (P = .20); I² = 36%
Test for overall effect: Z = 2.17 (P = .03)



Research in Children hospital 2

- 8 cases
- Opearting time: first cas 45 minutes, four last cases 15 minutes, *mean 22,5 minutes*
- *No complication*
- Time to full feeding: 24-48h
- Postoperative length of stay: 48-96h
- Cosmetic value

10 days after operation

THANK YOU