Journal of Pediatric Surgery 52 (2017) 498–503

Contents lists available at ScienceDirect

Journal of Pediatric Surgery

journal homepage: www.elsevier.com/locate/jpedsurg

Review Articles

Is laparoscopic surgery better than open surgery for the repair of congenital duodenal obstruction? A review of the current evidences☆

Patrick Ho Yu Chung [a], Carol Wing Yan Wong [a], Dennis Kai Ming Ip [b], Paul Kwong Hang Tam [a], Kenneth Kak Yuen Wong [a,*]

[a] Department of Surgery, Li Ka Shing Faculty of Medicine, The University of Hong Kong
[b] School of Public Health, Li Ka Shing Faculty of Medicine, The University of Hong Kong

ARTICLE INFO

Article history:
Received 28 April 2016
Received in revised form 11 August 2016
Accepted 21 August 2016

Key words:
Duodenoduodenostomy
Congenital duodenal obstruction
Duodenal atresia
Laparoscopy
Neonatal surgery

ABSTRACT

Background/purpose: Whether laparoscopic surgery is superior to open surgery in the repair of congenital duodenal obstruction remains controversial. The objective of this study is to systematically review the literatures, which compare the outcomes of these two operative approaches.
Methods: A systematic review of the studies comparing these two surgical approaches since 2000 was carried out.
Results: Four retrospective cohort studies comprising 180 patients were eligible for analysis. Duodenal atresia was the most common diagnosis (62.3%). Overall, there were no statistically significant differences in terms of operative duration (SMD: 0.75, 95% CI: 0.46–1.04), ventilator dependence (SMD: 0.04, 95% CI: −0.22 to 0.29), time to initial enteral feeding (SMD: 0.12, 95% CI: −0.14 to 0.38), time to full enteral feeding (SMD: 0.18, 95% CI: −0.15 to 0.50) and hospital stay (SMD: −0.03, 95% CI: −0.29 to 0.22). The overall incidences of anastomotic complications in laparoscopic vs open groups were 4.4% vs 1.8%. Two cases of missed distal pathology were reported in the laparoscopic group.
Conclusions: Laparoscopic surgery is feasible in the repair of CDO. Study with larger sample size is needed for further analysis to examine whether open or laparoscopic approach is superior. Meanwhile, it is still safe to practice laparoscopic repair of CDO in skilled surgeons, with attention to the possibility of distal pathology.

Congenital duodenal obstruction (CDO) is a common cause of upper intestinal obstruction in neonates and infants, with an estimated incidence around 1:2500 to 1:10,000 live births [1]. CDO can be intrinsic because of atresia or luminal stenosis or extrinsic because of annular pancreas or pre-duodenal portal vein. Regardless of the underlying cause, surgical repair is usually required and should be carried out once the diagnosis is confirmed. Traditional operation for CDO (duodenoduodenostomy or duodenojejunostomy) is performed via a transverse laparotomy. With the advancement in laparoscopy in neonatal surgery, cases of laparoscopic repair of CDO have been reported. However, after an initial transient period of success, results from subsequent series are generally disappointing [2]. This situation lasted from the early 2000s to late 2000s until recently, with the development of new techniques as well as small-sized instruments, reports of successful experience appeared again. Nonetheless, there is a lack of randomized trial or large sample size study to provide definitive evidence supporting either laparoscopic or open surgery. The aim of this study is to conduct a systematic review of the current literatures, which compare the outcomes of laparoscopic vs open surgery for the management of CDO.

1. Materials and methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used as an assessment tool when selecting literatures for review.

1.1. Searches

Two authors (PC and CW) conducted independent systematic searches of articles in four databases (MEDLINE, PubMed, EMBASE and the Cochrane database) published since 2000. The searches were limited to the English language literature. Keyword searches included congenital duodenal obstruction, duodenal atresia, duodenal obstruction(s), annular pancreas, duodenoduodenostomy, and duodenojejunostomy. The two searches were subsequently combined, and duplicated searches were excluded. Finally, reference lists of all included studies were hand searched for further relevance.

1.2. Inclusion/exclusion criteria

Studies that are comparative in nature were included in the current review. Exclusion criteria included noncomparative case series, case reports and articles with incomplete or missing data. The corresponding author was invited to screen all the selected publications to ensure their compliance to the inclusion criteria.

☆ Funding source/conflicts of interest: nil to report.
* Corresponding author at: Queen Mary Hospital, 102 Pokfulam Road, Hong Kong. Tel.: +852 22553549; fax: +852 28173155.
E-mail address: kkywong@hku.hk (K.K.Y. Wong).

http://dx.doi.org/10.1016/j.jpedsurg.2016.08.010
0022-3468/

1.3. Extraction of data

Data from selected publications were extracted by two authors (PC and CW) and were entered in a predesigned proforma. When there was a difference in the data extraction, the corresponding author would make the final decision. Data regarding publication year, study design, and sample size were extracted. Demographic data including sex ratio, principal diagnosis, age and body weight at operation were collected. Outcomes of interest included operative duration, postoperative ventilator dependence, time to initiate and achieve full enteral feeding, total hospital stay and complication rate. Fixed effect model was performed for the relevant outcomes. Under the constraint of the way that they are reported, we estimated mean effect size by the medium and the standard deviation a quarter of the range, under the distributional assumption of normality for these outcomes.

1.4. Quality assessment

The Newcastle–Ottawa Scale (NOS) for case-control and cohort studies was used to assess the quality of the selected paper by two authors (PC and CW) and the ratings are presented in Table 1.

2. Results

2.1. Searches and data extraction

The summary of data searches and extraction was shown in Fig. 1. The initial searches yield 515 potentially related articles with the keywords listed above. After screening and removal of duplication searches, 23 met the eligibility criteria and the full texts were studied in depth. Seventeen were excluded because they were either noncomparative case series or case reports. One study was excluded because it compared two surgical approaches from the anesthetic point of view and not relevant for the current meta-analysis. Another study was excluded because it contained incomplete data for analysis. Thus, there were four eligible studies available for analysis in the final review [3–6].

2.2. Study characteristics

Details of the four included studies were listed in Table 1. Except the study by Jensen et al. being a multicenter study, the other three were single-centered ones. The study period lasted from 2001 to 2014. Overall, a total of 180 patients were analyzed in which 67 were operated laparoscopically. All the 4 studies reported comparable age and body weight at operation (except Parmentier et al. who did not report body weight). Three studies (Spilde et al., Jensen et al. & Parmentier et al) reported the underlying diagnosis and duodenal atresia was consistently the most common one (76/122, 62.3%).

2.3. Outcomes measured

2.3.1. Operative duration

All the four studies reported operative durations for both approaches except Parmentier et al. who did not include data for open surgery (Table 2). In the three studies, which compared operative duration, a longer duration was found in laparoscopic approach and these results were statistically significant ($p < 0.05$) in two studies (Hill et al. & Jensen et al). Analysis using fixed effect model revealed that the standardized mean difference between studies by Hill et al. and Jensen et al. was 0.75 (95% CI: 0.46–1.04) (Fig. 2).

2.3.2. Ventilator dependence

Three studies (Hill et al., Jensen et al. & Parmentier et al) compared ventilator dependence but results were comparable between laparoscopic and open surgery (Table 2). None of the studies reported a significant difference in the duration of ventilator usage. Analysis using fixed effect model revealed that the standardized mean difference of the 3 studies was 0.04 (95% CI: −0.22 to 0.29) (Fig. 2).

2.3.3. Time to initial enteral feeding

All the four studies reported the timing to initial enteral feeding (Table 2). Except Jensen et al. reporting a slightly longer duration to initiate feeding in laparoscopic group (median days 10:9, $p = 0.24$), results from the other three studies were in favor of laparoscopic surgery. Spilde et al. and Parmentier et al. were able to demonstrate statistically significant shorter timing in the laparoscopic group. Analysis using fixed effect model revealed that the standardized mean difference of the studies by Hill et al., Jensen et al. and Parmentier et al. was 0.12 (95% CI: −0.14 to 0.38) (Fig. 2).

2.3.4. Time to full enteral feeding

Three studies (Spilde et al., Jensen et al. & Parmentier et al) compared the timing for the establishment of full enteral feeding (Table 2). While Parmentier et al. reported a longer time period in the laparoscopic group, Jensen et al. found similar result in their study. However, results from both studies did not reach statistical significance. On the other hand, Spilde et al. reported a significantly shorter time period for the establishment of enteral feeding in the laparoscopic group (9.0 vs 16.9 days, $p = 0.007$). Analysis using fixed effect model revealed that the standardized mean difference of the studies by Jensen et al. and Parmentier et al. was 0.18 (95% CI: −0.15 to 0.50) (Fig. 2).

2.3.5. Hospital stay

All the four studies compared the duration hospital stay (Table 2). Conflicting results existed between different studies. While Spilde et al. and Jensen et al. reported a shorter hospital stay in laparoscopic group, Hill et al. and Parmentier et al. reported the opposite. However, among these studies, only the result from Spilde et al. was statistically significant (12.9 vs 20.1 days, $p = 0.01$). Analysis using fixed effect model revealed that the standardized mean difference of the studies by Hill et al., Jensen et al. and Parmentier et al. was −0.03 (95% CI: −0.29 to 0.22) (Fig. 2).

2.3.6. Complications

All the four studies reported complications and we classified them into anastomotic and nonanastomotic related as shown in Table 3. The overall incidences of reported anastomotic complication (stenosis/stricture/leakage) were 4.4% (3/67) in the laparoscopic group and 1.8% (2/113) in the open group. While there was no leakage reported in the laparoscopic group, 3 cases of stenosis/strictures were reported. The overall incidences of nonanastomotic-related complications were 20.9% (14/67) in the laparoscopic group and 15.0% (17/113) in the open group. Among these nonanastomotic complications, the most common one in the laparoscopic group was infection related (6/14) while the most common complication in the open group was ileus (10/17).

3. Discussion

The surgical treatment of CDO can be dated back to 1931 when Ladd reported his experience in managing this condition [7]. In 1977, Kimura described his anastomotic technique for duodenoduodenostomy, which subsequently became the most popular operation [8,9]. Apart from improvement in neonatal management, there has been no significant advancement in the surgical treatment for CDO until more than 20 years later when Bax et al. reported the first successful repair of duodenal atresia laparoscopically [10]. This initial enthusiastic experience aroused the interest of some surgeons in performing similar operation for CDO. Thus, in the next few years, a few case reports and case series emerged alongside with the development of laparoscopic surgery in other areas [11–17]. This operation has even been successfully performed in a preterm baby [2]. However, it was recognized a few years later that the outcomes were not satisfactory with a high leakage rate,