



Clinical Research Paper

Surgical approach to the management of biliary atresia in the United States



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ARTICLE INFO

Article history:

Received 30 January 2026

Received in revised form

7 April 2026

Accepted 26 April 2026

Keywords:

Biliary atresia

Kasai portoenterostomy technique

National survey

ABSTRACT

Background: The Kasai portoenterostomy (KPE) is the only option to achieve native liver survival for patients with biliary atresia and yet technical variations exist. We surveyed members of three American pediatric surgery research consortia regarding their approach to the KPE.

Methods: Members from the Eastern Pediatric Surgery Network (EPSN), Midwestern Pediatric Surgery Consortium (MWPSRC), and Western Pediatric Surgery Research Consortium (WPSRC) developed the survey which was distributed via REDCap to consortia member institutions.

Results: The survey was completed by 44/45 institutions. KPE is performed by pediatric surgeons at 41 sites (93%), a transplant surgeon at one (2%), and both at two (5%). Twenty-six sites (59%) transected into the liver capsule, 10 (23%) into the liver, two (5%) into the fibrous cord, and 6 (14%) reported variance. One site (2%) reported use of cautery in addition to sharp dissection for porta hepatis transection. The most common length for the Roux limb was 25–35 cm (16, 36%), with 14 sites (32%) creating a Roux limb < 25 cm, eight sites (18%) > 35 cm, and 6 sites (14%) responding that length varies between surgeons. Surgical diagnosis with intraoperative cholangiogram (IOC) was always performed at 33 sites (75%), and twenty-eight sites (64%) obtain both preoperative percutaneous and intraoperative biopsies. Two sites (5%) offer partially laparoscopic KPE.

Conclusion: In the first survey of American surgical practices for KPE, we found consensus regarding some technical aspects of the operation. However, the responses to most questions demonstrated variability. Future studies will analyze how technical variations impact national KPE outcomes.

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HIGHLIGHTS

- BA care in the U.S. occurs across a range of institutions.
- Procedural diagnosis of BA using IOC and biopsy varies between centers.
- The technical approach varies at almost all steps of the operation in the U.S.
- Analyzing outcomes tied to differences in care may help identify best practice.

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¹ See Appendix A.

1. Introduction

Biliary atresia (BA) is a rare hepatic disease of infancy resulting in fibrous obliteration of the bile ducts. Diagnosis was uniformly fatal until the development of hepatic portoenterostomy in Japan in the 1950s. The original clinical series describing the procedure was reported by Kasai and Suzuki in 1959 [1]. The Kasai Portoenterostomy (KPE) operation involves excision of the fibrosed porta hepatis and anastomosis to a Roux limb of the jejunum [2,3]. The primary goal of the operation is to remove the obstructed extrahepatic biliary tract restoring bile flow thereby preserving the native liver [4]. The KPE operation successfully achieves initial biliary drainage in 45–80% patients, with 5–20-year native liver survival (NLS) rates ranging from 20 to 70% [5–11].

Prior to performing the KPE, an intraoperative cholangiogram (IOC) may be completed to ascertain diagnosis [2,12,13]. Once the decision is made to proceed with KPE, key steps of the procedure include resection of the bile duct remnant, creation of a Roux-en-Y jejunojejunostomy, and portoenterostomy [2,4]. Various technical variations to performing the KPE operation have been reported related to the degree of liver mobilization, depth of porta hepatis transection, length of roux limb, and creation of an anti-reflux valve [4,14]. The KPE is almost always performed via an open approach in the United States, although utilization of a laparoscopic approach is increasing internationally [2,15].

Understanding the current national landscape of technical approaches to the KPE operation could facilitate studies investigating which approach leads to the best outcomes. We surveyed members of the three American pediatric surgery consortia regarding the technical approach to patients undergoing KPE for BA.

2. Methods

A working group comprised of members from the Eastern Pediatric Surgery Network (EPSN), Midwest Pediatric Surgery Consortium (MWPS), and Western Pediatric Surgery Research Consortium (WPSRC) developed the survey. The survey was distributed via REDCap to all 45 participating institutions in the three consortia. The goal of the survey was to capture institutional practice and so was completed by the site content expert and/or via group consensus based on input from surgeons and hepatologists. Responses were aggregated. Non-parametric values were reported as median and interquartile range (IQR). Categorical values were compared via χ^2 and continuous values via t-test. $P < 0.05$ was considered significant.

3. Results

3.1. Location and characteristics of surgeons from participating institutions

The survey was completed by 44/45 institutions surveyed. Of the 44 institutions that completed the survey, geographically 12 centers (27%) were located in the North, 11 (25%) in the Midwest, 13 (30%) in the South, and 8 (18%) in the West. The median annual number of KPEs performed was 4 (IQR 2, 6), with 17 sites (39%) performing ≥ 5 per year. At most sites (38, 86%), 2–5 surgeons perform the KPE operation. However, at five sites (11%) KPE is performed by only one surgeon. At a single site (2%), KPE is performed by > 5 surgeons. Pediatric surgeons perform the KPE operation at 41 sites (93%), with a transplant surgeon performing the KPE at 1 site (2%) and either a pediatric or transplant surgeon at 2 sites (5%).

3.2. Preoperative decision-making regarding minimum weight and age for KPE

Three sites (7%) had a minimum age for KPE eligibility. Seven sites (16%) had a minimum weight requirement before offering a KPE. The reported minimum age was a corrected age of 30 weeks or gestational age of 28 or 32 weeks (Table 1). The reported minimum weight for operative intervention ranged from 1500 to 3000 g (Table 1).

3.3. Intraoperative diagnosis

The most common preoperative antibiotic for IOC was cefazolin (22, 50%) (Table 1). Intraoperative cholangiograms and liver biopsies are commonly performed by surgeons. Three-quarters of the sites (33, 75%) always used IOC, 4 (9%) used IOC when percutaneous cholangiogram was not feasible, and 7 (16%) used IOC selectively (Table 1). Twenty-five sites (47%) performed IOC via an open approach with only four sites (9%) routinely performing it laparoscopically and four (9%) via a hybrid approach (Table 1). Two-thirds of sites (30, 68%) never perform fluorescent cholangiography, while 6 sites (14%) always use it (Table 1).

Thirty-one sites (75%) performed an intraoperative biopsy, either core (4, 9%) or wedge (29, 66%). Five sites (11%) did not obtain an intraoperative biopsy (all five of these sites obtained a preoperative percutaneous biopsy) while biopsy choice was situational in the remaining 6 (14%). Twenty-eight sites (64%) obtain both a preoperative percutaneous biopsy and an intraoperative biopsy (Table 1).

Table 1
Preoperative workup of biliary atresia and intraoperative diagnostic approach.

Survey Question	N (%)
Number of institutions	44
Preoperative screening protocol	17 (39%)
Minimum age for KPE	3 (7%)
Minimum age type in weeks	
Corrected age	1 (33%)
Gestational age	2 (67%)
Procedure age value, median (IQR)	30 (28, 32)
Minimum weight for KPE	7 (16%)
Minimum weight value in grams, median (IQR)	2000 (2000, 2500)
Intraoperative cholangiogram utilization	
Always (when feasible)	33 (75%)
Only when perc cholangiogram not possible or inconclusive	4 (9%)
Selectively	7 (16%)
Antibiotic choice for intraoperative cholangiogram	
Cefazolin	22 (50%)
Ceftriaxone/Flagyl	2 (5%)
Piperacillin-tazobactam	5 (11%)
Cefoxitin	12 (27%)
Other	3 (7%)
Intraoperative cholangiogram technique	
Open	25 (57%)
Hybrid	4 (9%)
Laparoscopic	4 (9%)
Variable	11 (25%)
Fluorescent cholangiogram used	
Always (if equipment available)	6 (14%)
Sometimes	8 (18%)
Never	30 (68%)
Intraoperative biopsy sent	
Yes, core needle	4 (9%)
Yes, wedge	29 (66%)
No, percutaneous preop	5 (11%)
Situational	6 (14%)

KPE: Kasai portoenterostomy; IQR: interquartile range.

3.4. Technical considerations

After the decision has been made to proceed with KPE, the approach to liver mobilization was evenly distributed between complete, partial, and no liver mobilization. The depth of the porta hepatis transection is the most nuanced technical aspect of the operation. Sharp transection of the porta hepatis, either with knife or scissors, is used by most sites (34, 77%) with only one site reporting use of cautery in addition to sharp dissection. Two sites (5%) transect into the fibrous cord (Fig. 1, A), 26 sites (59%) transect into the capsule (Fig. 1, B), 10 sites (23%) transect into the liver (Fig. 1, C), and the remaining 6 sites (14%) reported variance among surgeons for transection depth. One site (2%) sends intraoperative pathology to determine final transection depth. Seventeen sites (39%) use stay sutures, and 15 (34%) expose the Rex recess (Table 2). Twenty sites (45%) always perform an extended dissection at the porta (Table 2).

Following dissection of the porta hepatis, a Roux-en-Y jejunojejunostomy is created. The most common technique for creating the jejunojejunostomy was a hand-sewn end-to-side approach (26, 59%). Seven sites (23%) create a layered anastomosis (Table 2). Choice of suture type and suturing style (running versus interrupted) was highly varied. No sites create a reflux valve. Almost all sites (40, 91%) locate the bile draining anastomosis between the hilar plate and jejunum as opposed to creating a cholecysto-jejunostomy or cyst-enterostomy (Table 2).

The most common technique for the portoenterostomy anastomosis was interrupted end-to-side (21 sites, 48%) (Table 2). The majority of sites used 5/0 or 6/0 PDS (39 sites, 89%) sutures (33, 75%). The most common length for the Roux limb was 25–35 cm (16, 36%), with 14 sites (32%) creating a Roux limb < 25 cm, eight sites (18%) creating a Roux limb > 35 cm, and 6 sites (14%) responding that length of the Roux limb varies between surgeons (Table 2). Forty-two sites (95%) place the Roux limb in a retro-colic position. At all but two sites, a Ladd procedure is performed when malrotation is discovered intraoperatively. At the case termination, twenty sites (45%) leave a peritoneal drain. Nearly three-quarters of sites (32, 73%) routinely place a nasogastric tube at case end.

3.5. Use of a minimally invasive technical approach

Forty-two sites (95%) do not offer laparoscopic KPE (Table 3). Two sites (5%) offer laparoscopic KPE, with one site performing a portion of the portal dissection laparoscopically and one site performing all of the portal dissection laparoscopically. One of these two sites uses laparoscopy to perform a hybrid IOC and the other site sometimes performs open versus laparoscopic IOC.

3.6. Utilization of revision KPE

Indications for when to offer KPE revision, rather than proceeding to OLT, remain a subject of debate. Over half (25, 57%) of

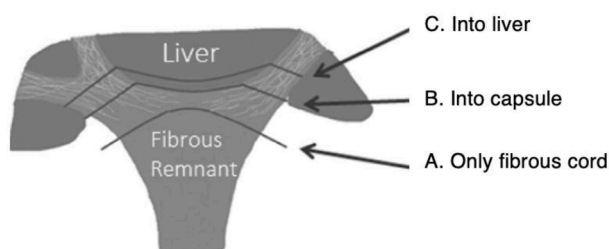


Fig. 1. Depth of transection at porta hepatis. A description of the depth was not provided on the survey. Figure adopted from "Technical standardization of Kasai portoenterostomy for biliary atresia" by M. Nio, 2016 [28].

Table 2

Technical approach to the kasai portoenterostomy.

Survey Question	N (%)
Number of institutions	44
Location of bile anastomosis	
Always between the hilar plate/porta hepatis and jejunum	40 (91%)
Sometimes between the hilar plate/porta hepatis and jejunum	3 (7%)
Varies among surgeons	1 (2%)
Liver mobilization	
The liver is mobilized completely	10 (23%)
The liver is mobilized partially	8 (18%)
The liver is not mobilized	11 (25%)
Mixed (some mobilize completely, some mobilize partially, or some do not mobilize)	15 (34%)
Instrument to transect porta hepatis	
Only a knife	24 (55%)
Knife and cautery	1 (2%)
Scissors	10 (23%)
Varies among surgeons	9 (20%)
Depth of transection (see Fig. 1)	
C - into liver	10 (23%)
B - into capsule	26 (59%)
A - fibrous cord only	2 (5%)
Varies among surgeons	6 (14%)
Stay sutures used	17 (39%)
Intraoperative pathology sent for transection depth	1 (2%)
Rex recess exposed	15 (34%)
Extended dissection	
Always	20 (45%)
Sometimes	16 (36%)
Never	8 (18%)
Roux length	
< 25 cm	14 (32%)
25–35 cm	16 (36%)
> 35 cm	8 (18%)
Varies among surgeons	6 (14%)
Jejunojunction technique	
Hand-sewn side-to-side	4 (9%)
Hand-sewn end-to-side	26 (59%)
Stapled side-to-side	2 (5%)
Varies among surgeons	12 (27%)
Jejunojunction performed in layers	7 (23%)
Jejunojunction suture type	
Braided running suture	2 (5%)
Monofilament running suture	6 (14%)
Braided interrupted suture	8 (18%)
Monofilament interrupted suture	6 (14%)
Varies among surgeons	8 (18%)
N/A (Stapled anastomosis)	14 (32%)
Roux position	
Retro-colic	42 (95%)
Varies among surgeons	2 (5%)
Portoenterostomy technique	
Side-to-side interrupted	11 (25%)
Side-to-side running	2 (5%)
End-to-side interrupted	21 (48%)
End-to-side running	2 (5%)
Varies among surgeons	8 (18%)
Portoenterostomy suture type	
Polydioxanone suture (PDS)	39 (89%)
Vicryl	1 (2%)
Other monofilament	2 (5%)
Varies among surgeons	2 (5%)
Portoenterostomy suture size	
4/0	4 (9%)
5/0	21 (48%)
6/0	12 (27%)
Varies	7 (16%)

sites offer revision KPE, with elevated bilirubin following initial normalization as the most common indication (18, 41%) (Table 3). Other indications include recurrent cholangitis (5, 11%), persistently elevated bilirubin (3, 7%), bilirubin plateauing or increasing after having down trended with no response to steroids or antibiotics (one site) and bile lakes (one site) (Table 3).

Table 3
Availability of minimally invasive Kasai portoenterostomy and revision.

Survey Question	N (%)
Number of institutions	44
Laparoscopic KPE performed	2 (5%)
Extent of laparoscopic dissection	
Some of the portal dissection	1 (50%)
All of the portal dissection	1 (50%)
Revision KPE performed	25 (57%)
Revision indication – persistently elevated bilirubin	3 (7%)
Revision indication – recurrence in elevated bilirubin	18 (41%)
Revision indication – recurrent cholangitis	5 (11%)
Other revision indication	7 (16%)

KPE: Kasai portoenterostomy.

4. Discussion

The results of our survey provide context to the technical aspects of how the KPE operation is performed for BA in the United States. We also report on distribution of KPE surgeons and cases across centers. We found that pediatric surgeons perform the KPE operation at most sites (93%), with a combined team used at two sites and a transplant surgeon only at a single site. This is consistent with a recent international consensus report which recommended that all pediatric liver surgeries were and should be performed by pediatric surgeons [16].

Superior long-term outcomes (clearance of jaundice and native liver survival) have been seen from both high-volume regions (i.e. Japan and Taiwan) and centralization of care in Europe [17]. Both high-volume experience and establishment of a national BA registry led to improved BA outcomes in Japan [18]. Native liver survival among high-volume East Asian centers was reported as >55% at 5-years [19]. Clearance of jaundice has been reported to be greater than 65% in some high-volume Asian countries versus 50% or less for centers from the United States [11,17]. In addition, several European countries have studied the effect of centralized BA care. Following the centralization of BA care in England and Wales, 40–45 infants with BA are managed annually across designated centers [20–22]. Centralization of BA care resulted in reduced age at KPE, improved clearance of jaundice, and improved NLS [20–22]. Subsequently, other countries including Finland and the Netherlands implemented centralization for BA care [23]. In contrast, decentralized BA management in France even with implementation of a national registry and systems to enhance communication between low-volume and higher-volume centers resulted in inferior jaundice clearance rates (<40%) [24]. Presently, BA care is not centralized in the United States. We found that sites performed a median of four KPEs per year, with only 40% of sites performing ≥5 KPE annually. Furthermore, the establishment of an all-encompassing national registry to examine standards of care and BA outcomes has proven to be a challenge in the United States due to data sharing barriers and fragmented healthcare.

The KPE operation has evolved over the last 70 years. A key step in the KPE operation is the transection of the porta hepatis/hilar plate (Fig. 1). In theory, cutting the remnant too close to the liver can injure or close off bile ductules, leading surgeons to aim for transection at the level of the liver capsule while avoiding entry into liver parenchyma [2,4]. However, cutting the remnant too superficially leaves fibrous tissue in place that can block bile drainage [4]. The procedure as described and performed by Dr. Kasai called for a transection that leaves a thin fibrous remnant connecting the right and left bile ducts, an approach that entails transection at levels A and B (Figure 1) [2]. Our results show that 59% of sites reported transection into the capsule but not into the liver, which draws attention to the 41% of sites employing a deeper

transection technique than what was originally described by Dr. Kasai. The method for transection can also influence viability of the bile ductules, with concern that cautery may transmit thermal injury [25–27]. Only one site surveyed reported using cautery, demonstrating near consensus among sites in this regard.

Following dissection of the hilar plate, a Roux-en-Y limb is created. The ideal length of the Roux limb in order to prevent cholangitis is controversial. Roux limb lengths range from a fixed length between 20 and 50 cm or 10 cm/kg. Alternatively, individualized length can be created by securing one end of the jejunal loop and measuring the distal end to three centimeters below the xiphoid process or by measuring the distance between the umbilicus and hepatic hilum [2,25,28,29]. Consistent with the heterogeneity in the literature, our sites reported creating a Roux limb less than 25 cm (32%), between 25 and 35 cm (36%), greater than 35 cm (18%), and variable length (14%). Despite the theoretical risks of biliary reflux and kinking, Xiao et al. found no differences in rates of jaundice, cholangitis, overall complications, or NLS when comparing long (30–40 cm) and short (umbilicus to hepatic hilum) Roux limbs [30]. This suggests that either the optimal length has not yet been identified or potentially that Roux limb length does not play a significant role in outcomes.

Following the creation of a Roux limb, the portoenterostomy anastomosis is performed. The original technique described a two-layer anastomosis with shallowly placed sutures at the 2 o'clock and 10 o'clock positions to avoid extending into the edges of the transected biliary remnant [2]. Subsequent evolution has reported both one- and two-layer techniques using both interrupted and running sutures [2,25,26,31]. While an international survey of hospitals found that all surgeons used an end-to-side portoenterostomy, slightly more than half of institutions in our study reported an end-to-side configuration, while others reported alternative techniques including side-to-side anastomosis [25].

Liver mobilization may or may not be employed to gain exposure during the KPE. This can include complete mobilization with division of triangular ligaments on the right and left lobe and externalization of the liver, partial liver mobilization where the falciform is divided but the left triangular ligament is left in place, or no liver mobilization at all [25]. We found that the extent of liver mobilization was evenly split between complete, partial, and no mobilization among survey respondents. For BA patients, dense intestinal adhesions are frequently encountered at the time of liver transplantation [32]. The rationale for a limited liver mobilization through a small incision is to minimize adhesions, but definitive evidence that extended liver mobilization increases transplant-related complications is lacking. While neither the diagnosis of BA nor history of prior laparotomy are independent risk factors for transplant-related complications, it is worth noting that bowel perforation is more likely at the time of liver transplant if prolonged adhesiolysis is required and in patients who have undergone revision KPE [33–36].

Benefits of the laparoscopic approach to the KPE remain uncertain. The International Pediatric Endoscopic Group (IPEG) released a consensus statement in 2016 that laparoscopic KPE should only be performed at specialized centers with expertise in the technique, but also made a strong commitment to ongoing research [2]. The statement from IPEG reflects the mixed outcomes that have been reported following laparoscopic KPE, with some centers finding equivalent length of stay and BA outcomes while other have found inferior drainage and inferior NLS [15,26,27,37–41]. Only two centers in our survey performed laparoscopic KPE, which may be a reflection of low case volume or due to the lack of established advantages for the laparoscopic approach.

While not a part of the KPE operation itself, diagnostic surgery can confirm or exclude BA as the etiology for cholestasis. Intraoperative cholangiography is considered the gold standard for BA diagnosis, but some studies have suggested a misdiagnosis rate of 7–20% [12,25,42–44]. Cholangiography can be technically challenging or impossible when the gallbladder is small and atretic. At times, retrograded cholangiography may fail to visualize the upstream ducts [2,13,25]. Given these challenges, fluorescent cholangiography using indocyanine green (ICG) has been introduced as a novel technique to assess biliary patency with a reported specificity of 100% and sensitivity of 64% [13]. This method reduces radiation exposure and eliminates the need for cannulation of the gallbladder [12]. It also can be used to visualize the biliary anatomy during dissection [12]. We found that the majority of respondents (75%) always perform intraoperative cholangiography while only a third of sites (32%) always or sometimes utilize fluorescent cholangiography to assess biliary patency. This number may grow as the technology to perform fluorescent cholangiography becomes more widely available and more broadly validated. As utilization increases, fluorescent cholangiography will require careful interpretation and further study.

Identification of areas of technical divergence represents a critical first step toward defining optimal surgical strategy. Future collaborative studies across American pediatric surgery consortia will evaluate whether or not specific technical approaches correlate with improved jaundice clearance, reduced cholangitis, and overall improved NLS. While this is the first study to assess the current surgical practices for BA from over 40 diverse institutions across the United States, there are limitations. As a survey-based study, the findings are limited by the descriptive nature and are not directly tied to patient outcomes. Patient-level outcomes such as jaundice clearance and NLS were not collected. However, the identification of technical variance across the United States provides a framework to directly evaluate the impact of technical differences on outcomes in the future. Technical aspects to surgical care for BA remain heterogeneous. As surgeons continue to strive to improve biliary drainage and NLS following the KPE operation, the identified areas of technical divergence warrant investigation in hopes of defining which strategies can be employed to optimize BA outcomes. Future studies will focus on tying practice variation to clearance of jaundice and NLS outcomes in the United States.

5. Conclusion

We conducted the first national survey on the surgical approach to BA across the United States. There was consensus regarding some nuanced aspects of surgical BA care such as retrocolic placement of the Roux limb, use of sharp dissection for the porta hepatis, location of the biliary anastomosis, and performing a Ladd procedure if malrotation is found intraoperatively. However, the responses to the majority of questions overall demonstrated major heterogeneity, specifically pertaining to porta hepatis transection depth, the use of stay sutures, the length of the Roux limb, the use of peritoneal drains and nasogastric tubes, as well as indications for KPE revision. Further, only two sites perform the KPE laparoscopically in totality or partially. The data presented here serves as a foundation for future studies in which technical aspects of the KPE procedure will be evaluated in the context of patient outcomes with the ultimate goal of defining the best technical approach for the KPE operation. These findings highlight an opportunity to develop a national prospective registry for BA in the United States that could integrate operative technique with patient outcomes to identify best practices.

Previous communication

None.

Financial support statement and disclosures

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Dr. Ignacio is a consultant for Critical Innovations and holds stock in Abbot Laboratories and AbbVie. Dr. Diaz-Miron serves on the board of MedCore Technologies Corp. Dr. Kohli is a consultant for Mirum, Ipsen, Sanofi Rare Disease.

Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jpedsurg.2026.163179>.

References

- [1] Kasai M, Suzuki M. A new operation for non-correctable biliary atresia: hepatic portoenterostomy. *Shujutsu* 1959;733–9.
- [2] Cazares J, Koga H, Yamataka A. Advances in the surgical technique of Kasai portoenterostomy. *Semin Pediatr Surg* Dec 2024;33(6):151481. <https://doi.org/10.1016/j.sempedsurg.2025.151481>.
- [3] Garcia AV, Cowles RA, Kato T, Hardy MA, Morio Kasai: a remarkable impact beyond the Kasai procedure. *J Pediatr Surg* May 2012;47(5):1023–7. <https://doi.org/10.1016/j.jpedsurg.2012.01.065>.
- [4] Wildhaber BE. Biliary atresia: 50 years after the first kasai. *ISRN Surg* 2012;2012:132089. <https://doi.org/10.5402/2012/132089>.
- [5] Fanna M, Masson G, Capito C, et al. Management of biliary atresia in France 1986 to 2015: Long-term results. *J Pediatr Gastroenterol Nutr* Oct 2019;69(4):416–24. <https://doi.org/10.1097/MPG.0000000000002446>.
- [6] Shinkai M, Ohhama Y, Take H, et al. Long-term outcome of children with biliary atresia who were not transplanted after the Kasai operation: >20-year experience at a children's hospital. *J Pediatr Gastroenterol Nutr* Apr 2009;48(4):443–50. <https://doi.org/10.1097/MPG.0b013e318189f2d5>.
- [7] Degtyareva A, Razumovskiy A, Kulikova N, et al. Long-term effects of Kasai portoenterostomy for biliary atresia treatment in Russia. *Diagnostics* Sep 11 2020;10(9):686. <https://doi.org/10.3390/diagnostics10090686>.
- [8] Superina R, Magee JC, Brandt ML, et al. The anatomic pattern of biliary atresia identified at time of Kasai hepatportoenterostomy and early postoperative clearance of jaundice are significant predictors of transplant-free survival. *Ann Surg* Oct 2011;254(4):577–85. <https://doi.org/10.1097/SLA.0b013e3182300950>.
- [9] Pandurangi S, Kim S, Asai A, et al. Customized postoperative therapy improves bile drainage in biliary atresia: a single center preliminary report. *J Pediatr Surg* Aug 2023;58(8):1483–8. <https://doi.org/10.1016/j.jpedsurg.2022.10.050>.
- [10] Farooqui ZA, Hartman SJ, Stetson AE, et al. Real-world multi-institutional data from the midwest pediatric surgery consortium (MWPSC) to assess the effect of delayed Kasai procedure on biliary drainage in patients with biliary atresia. *J Pediatr Surg* Feb 18 2025;60(5):162250. <https://doi.org/10.1016/j.jpedsurg.2025.162250>.
- [11] Chung PHY, Chan EKW, Yeung F, et al. Life long follow up and management strategies of patients living with native livers after Kasai portoenterostomy. *Sci Rep* May 27 2021;11(1):11207. <https://doi.org/10.1038/s41598-021-90860-w>.
- [12] Zhao J, Zhao Y, Zhang Y, et al. Preliminary exploration of the efficacy of laparoscopic fluorescence cholangiography (LFC) in the diagnosis of biliary atresia compared with intraoperative cholangiography (IOC). *Photodiagnosis Photodyn Ther* Mar 2023;41:103241. <https://doi.org/10.1016/j.pdpdt.2022.103241>.
- [13] Shirota C, Hinoki A, Togawa T, et al. Intraoperative indocyanine green fluorescence cholangiography can rule out biliary atresia: a preliminary report. *Front Pediatr* 2022;10:1005879. <https://doi.org/10.3389/fped.2022.1005879>.
- [14] Nakajo T, Hashizume K, Saeki M, Tsuchida Y. Intussusception-type antireflux valve in the Roux-en-Y loop to prevent ascending cholangitis after hepatic portojejunostomy. *J Pediatr Surg* Mar 1990;25(3):311–4. [https://doi.org/10.1016/0022-3468\(90\)90074-j](https://doi.org/10.1016/0022-3468(90)90074-j).

- [15] Shirota C, Hinoki A, Tainaka T, et al. Laparoscopic Kasai portoenterostomy can be a standard surgical procedure for treatment of biliary atresia. *World J Gastrointest Surg* Jan 27 2022;14(1):56–63. <https://doi.org/10.4240/wjgs.v14.i1.56>.
- [16] Lemoine CP, Madadi-Sanjani O, Petersen C, Chardot C, de Ville de Goyet J, Superina R. Pediatric liver and transplant surgery: results of an international survey and expert consensus recommendations. *J Clin Med* Apr 30 2023;12(9):3229. <https://doi.org/10.3390/jcm12093229>.
- [17] Tam PKH, Wells RG, Tang CSM, et al. Biliary atresia. *Nat Rev Dis Primers* Jul 11 2024;10(1):47. <https://doi.org/10.1038/s41572-024-00533-x>.
- [18] Nio M. Japanese biliary atresia registry. *Pediatr Surg Int* Dec 2017;33(12):1319–25. <https://doi.org/10.1007/s00383-017-4160-x>.
- [19] Chung PHY, Harumatsu T, Nakagawa Y, et al. Cholestasis after Kasai operation predicts portal hypertension in native liver survivors of biliary atresia: a multicenter study. *Pediatr Surg Int* Jul 17 2024;40(1):196. <https://doi.org/10.1007/s00383-024-05775-0>.
- [20] Davenport M, Ong E, Sharif K, et al. Biliary atresia in England and Wales: results of centralization and new benchmark. *J Pediatr Surg* Sep 2011;46(9):1689–94. <https://doi.org/10.1016/j.jpedsurg.2011.04.013>.
- [21] Durkin N, Davenport M. Centralization of pediatric surgical procedures in the United Kingdom. *Eur J Pediatr Surg* Oct 2017;27(5):416–21. <https://doi.org/10.1055/s-0037-1607058>.
- [22] Davenport M, Makin E, Ong EG, Sharif K, Dawrant M, Alizai N. The outcome of a centralization program in biliary atresia: twenty years and beyond. *Ann Surg* Apr 01 2025;281(4):608–14. <https://doi.org/10.1097/SLA.0000000000006273>.
- [23] Lampela H, Ritvanen A, Kosola S, et al. National centralization of biliary atresia care to an assigned multidisciplinary team provides high-quality outcomes. *Scand J Gastroenterol* Jan 2012;47(1):99–107. <https://doi.org/10.3109/00365521.2011.627446>.
- [24] Serinet MO, Broué P, Jacquemin E, et al. Management of patients with biliary atresia in France: results of a decentralized policy 1986–2002. *Hepatology* Jul 2006;44(1):75–84. <https://doi.org/10.1002/hep.21219>.
- [25] Davenport M, Madadi-Sanjani O, Chardot C, Verkade HJ, Karpen SJ, Petersen C. Surgical and medical aspects of the initial treatment of biliary atresia: position paper. *J Clin Med* Nov 07 2022;11(21). <https://doi.org/10.3390/jcm11216601>.
- [26] Ure BM, Kuebler JF, Schukfeh N, Engelmann C, Dingemann J, Petersen C. Survival with the native liver after laparoscopic versus conventional kasai portoenterostomy in infants with biliary atresia: a prospective trial. *Ann Surg* Apr 2011;253(4):826–30. <https://doi.org/10.1097/SLA.0b013e318211d7d8>.
- [27] Sun X, Diao M, Wu X, Cheng W, Ye M, Li L. A prospective study comparing laparoscopic and conventional Kasai portoenterostomy in children with biliary atresia. *J Pediatr Surg* Mar 2016;51(3):374–8. <https://doi.org/10.1016/j.jpedsurg.2015.10.045>.
- [28] Nio M, Wada M, Sasaki H, Kazama T, Tanaka H, Kudo H. Technical standardization of Kasai portoenterostomy for biliary atresia. *J Pediatr Surg* Dec 2016;51(12):2105–8. <https://doi.org/10.1016/j.jpedsurg.2016.09.047>.
- [29] Onishi S, Murakami M, Ishimaru T, et al. Current practice of laparoscopic surgery for choledochal cyst in children –A survey on opinion and experience among IPEG members. *J Pediatr Surg* Dec 2024;59(12):161683. <https://doi.org/10.1016/j.jpedsurg.2024.08.023>.
- [30] Xiao H, Huang R, Chen L, Diao M, Li L. The application of a shorter loop in Kasai portoenterostomy reconstruction for ohi type III biliary atresia: a prospective randomized controlled trial. *J Surg Res* Dec 2018;232:492–6. <https://doi.org/10.1016/j.jss.2018.07.002>.
- [31] Hashimoto T, Orobe Y, Shimizu Y, et al. A modification of hepatic portoenterostomy (Kasai operation) for biliary atresia. *J Am Coll Surg* Dec 1997;185(6):548–53. [https://doi.org/10.1016/s1072-7515\(97\)00104-x](https://doi.org/10.1016/s1072-7515(97)00104-x).
- [32] Parolini F, Boroni G, Betalli P, et al. Extended adhesion-sparing liver eversion during Kasai portoenterostomy for infants with biliary atresia. *Children* Sep 17 2021;8(9):820. <https://doi.org/10.3390/children8090820>.
- [33] Yanagi Y, Matsuura T, Hayashida M, et al. Bowel perforation after liver transplantation for biliary atresia: a retrospective study of care in the transition from children to adulthood. *Pediatr Surg Int* Feb 2017;33(2):155–63. <https://doi.org/10.1007/s00383-016-4008-9>.
- [34] Kasahara M, Umeshita K, Sakamoto S, Fukuda A, Furukawa H, Uemoto S. Liver transplantation for biliary atresia: a systematic review. *Pediatr Surg Int* Dec 2017;33(12):1289–95. <https://doi.org/10.1007/s00383-017-4173-5>.
- [35] Sanada Y, Mizuta K, Wakiya T, et al. Bowel perforation after pediatric living donor liver transplantation. *Pediatr Surg Int* Jan 2011;27(1):23–7. <https://doi.org/10.1007/s00383-010-2722-2>.
- [36] Urahashi T, Ihara Y, Sanada Y, et al. Effect of repeat Kasai hepatic portoenterostomy on pediatric live-donor liver graft for biliary atresia. *Exp Clin Transplant* Jun 2013;11(3):259–63. <https://doi.org/10.6002/ect.2012.0188>.
- [37] Martinez-Ferro M, Esteves E, Laje P. Laparoscopic treatment of biliary atresia and choledochal cyst. *Semin Pediatr Surg* Nov 2005;14(4):206–15. <https://doi.org/10.1053/j.sempedsurg.2005.06.003>.
- [38] Hussain MH, Alizai N, Patel B. Outcomes of laparoscopic Kasai portoenterostomy for biliary atresia: a systematic review. *J Pediatr Surg* Feb 2017;52(2):264–7. <https://doi.org/10.1016/j.jpedsurg.2016.11.022>.
- [39] Hinojosa-Gonzalez DE, Bueno LC, Roblesgil-Medrano A, et al. Laparoscopic vs open portoenterostomy in biliary atresia: a systematic review and meta-analysis. *Pediatr Surg Int* Nov 2021;37(11):1477–87. <https://doi.org/10.1007/s00383-021-04964-5>.
- [40] Huang SY, Yeh CM, Chen HC, Chou CM. Reconsideration of laparoscopic Kasai operation for biliary atresia. *J Laparoendosc Adv Surg Tech* Feb 2018;28(2):229–34. <https://doi.org/10.1089/lap.2017.0535>.
- [41] Son TN, Mai DV, Tung PT, Liem NT. Laparoscopic versus open Kasai procedure for biliary atresia: long-term results of a randomized clinical trial. *Pediatr Surg Int* Feb 10 2023;39(1):111. <https://doi.org/10.1007/s00383-023-05391-4>.
- [42] Li Y, Rong L, Tang J, et al. Re-evaluation of laparoscopic hepatic subcapsular spider-like telangiectasis sign: a highly accurate method to diagnose biliary atresia in infants. *Front Pediatr* 2022;10:850449. <https://doi.org/10.3389/fped.2022.850449>.
- [43] Sira MM, Taha M, Sira AM. Common misdiagnoses of biliary atresia. *Eur J Gastroenterol Hepatol* Nov 2014;26(11):1300–5. <https://doi.org/10.1097/MEG.0000000000000198>.
- [44] Altman RP, Abramson S. Potential errors in the diagnosis and surgical management of neonatal jaundice. *J Pediatr Surg* Oct 1985;20(5):529–34. [https://doi.org/10.1016/s0022-3468\(85\)80481-4](https://doi.org/10.1016/s0022-3468(85)80481-4).