Editorial Commentary

# Kasai procedure or liver transplantation: how should we choose in biliary atresia?

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We read with interest the article by Hirobe *et al.* on using the infant biliary atresia liver fibrosis (iBALF) score to identify children with biliary atresia (BA) who have poor biliary drainage outcomes after the Kasai procedure (1). We also reviewed a prior publication by the same group, which suggested that the iBALF score is a reliable noninvasive marker for liver fibrosis in BA children under 1 year of age (2).

The evaluation of liver fibrosis in children with BA involves both invasive (liver biopsy) and non-invasive assessments. Because liver biopsy carries a higher risk of bleeding, early non-invasive evaluation of liver fibrosis in BA is generally preferred. The primary non-invasive methods include two-dimensional shear wave elastography (2D SWE) and the AST-to-platelet ratio index (APRI) (3,4). The new non-invasive method proposed by the authors, based on Japanese multicenter data, could provide a valuable reference for clinical decision-making and may improve treatment outcomes for children with BA.

The authors concluded that patients with a preoperative iBALF score greater than 5.27 exhibited poor biliary drainage outcomes and might be candidates for primary liver transplantation. The cutoff point of 5.27 not only demonstrates high sensitivity but also identifies a subset of BA patients more suitable for liver transplantation, as the Kasai procedure outcomes in these patients were unfavorable. This finding is fascinating because the decision between the Kasai procedure and liver transplantation for treating children with BA has long been debated (5).

Intestinal adhesions resulting from a previous Kasai procedure are a significant concern for surgeons during liver resection in recipients. As pediatric liver transplantation has advanced, its efficacy in children with BA has significantly improved, leading scholars to reconsider the role of the Kasai procedure in BA treatment. However, liver transplantation is not without its disadvantages, and as summarized in our previous work, both the Kasai procedure and liver transplantation have their advantages and disadvantages (6). Our meta-analysis also found that a prior Kasai procedure does not adversely affect major clinical outcomes and may even delay the timing of liver transplantation in BA children, thereby improving their preoperative condition. Therefore, we recommend prioritizing the sequential treatment of the Kasai procedure followed by liver transplantation for children with BA, provided there are no clear contraindications. However, with advancing technology, this conclusion remains subject to change. Previous studies have indicated that rescue liver transplantation is not uncommon in BA patients under

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one year of age (7-10). Therefore, if a subgroup of BA patients with a poor prognosis after the Kasai procedure can be accurately identified, liver transplantation should be considered when the timing is appropriate.

Accurately identifying the subgroup of BA patients with poor prognosis after Kasai surgery is indeed challenging, and the authors' team has made commendable efforts in this regard. While the 5.27 value has been validated in Japan, its generalizability to other regions remains unverified, which may restrict its international applicability. Among 68 children with BA in our center over 3 years, iBALF scores exceeded 5.27 in 5 cases. Two of these patients died or required liver transplantation and similar outcomes occurred in 31 of the remaining 63 patients (13 patients) (11). Therefore, further research is necessary to confirm the validity of this indicator for broader adoption.

First, single-center surgical volumes of fewer than three cases could introduce technical variability, potentially leading to biased results. Restricting the study to centers that perform at least ten Kasai surgeries annually would enhance the reliability of the results.

Second, the time range for the Kasai procedure in the study spans from four to 183 days. While performing the Kasai procedure before 30 days of age is known to improve autologous liver survival in BA patients (12). However, whether the timing of surgery is too early on the fourth day after birth and whether such children recover well are worthy of attention. Additionally, when the age at surgery exceeds 90 days, the autologous liver survival time decreases with increasing surgical age, and these patients may be more inclined toward liver transplantation (13). Therefore, we recommend including BA children of various ages to assess the reliability of this index across all age groups.

Third, we argue that relying solely on the iBALF score to determine the surgical approach for BA children is overly subjective and not sufficiently robust. In some special cases, some BA patients with a preoperative assessment of cirrhosis still achieved good results after the Kasai procedure. Therefore, liver fibrosis cannot fully represent the prognosis. We should consider more factors [such as the number/area of ductules, severe bile duct proliferation, hepatic artery diameter, gallbladder length, spleen size, and absence of biliary cysts (11,14,15)], which are also closely related to the prognosis of BA children. Integrating iBALF with these indicators would eliminate collinearity and enable a more comprehensive, detailed, and personalized assessment, enhancing predictive accuracy and clinical applicability.

In conclusion, while the iBALF score presents a promising non-invasive marker for assessing liver fibrosis and guiding treatment decisions, several concerns remain. We advocate for integrating iBALF with additional prognostic indicators to improve the accuracy and applicability of the score, ultimately facilitating more personalized treatment approaches for BA patients. Further validation of more regions' data is necessary to ensure the generalizability of these findings.

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