

Screening for Biliary Atresia

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Biliary atresia is a severe progressive cholangiopathy which leads to early liver cirrhosis and is uniformly fatal. Early surgical intervention (the Kasai procedure) is needed for an improved outcome. However, early recognition and diagnosis is not easy during the neonatal period because of the high incidence of neonatal jaundice, ill-informed and less than urgent appraisal of the clinical manifestations among jaundiced neonates. A mass screening program for biliary atresia using a stool color card was conducted in Taiwan from March 2002 (in 49 hospitals and clinics) to December 2003 (in 95 hospitals and clinics). The stool color card for infants has proved to be a sensitive and specific screening method for biliary atresia in infants younger than two months of age. (*Chang Gung Med J 2006;29:231-3*)

Key words: biliary atresia, stool color card, mass screening.

Biliary atresia (BA) is a severe progressive cholangiopathy, which is the most common cause of liver failure and is uniformly fatal in children.⁽¹⁾ Dr. Kasai introduced the hepatic portoenterostomy (The Kasai procedure), which is an effective surgical method to drain the bile from the liver of patients with BA. Although the option of liver transplantation exists, many children in the world die from the complications of BA while waiting for liver transplantation due to the shortage of liver donation. The Kasai procedure has remained the current standard first line surgical procedure for infants with BA.

Early diagnosis and surgery correlates positively with an improved outcome

Previous studies in Japan by Dr. Kasai demonstrated that the bile flow rate after the Kasai procedure will be higher (91%), if the procedure can be performed before the infant reaches two months of age. Studies by Dr. Ohi report that the postoperative 10-year survival rate will be optimal if the Kasai procedure can be performed before two months of age. Using the Kasai procedure, before the aforementioned period expires improves the prognosis signifi-

cantly. Ohi et al. report a 10-year survival rate of 73%, 35%, 23% and 11% in children with BA after the Kasai procedure was performed on infants grouped as before 60-days-old; between 60 to 70-days-old; between 70 to 90-days-old, and over 90-days-old, respectively.⁽²⁾ Effective surgery is highly dependent on the early recognition of affected infants, and specifically, affected infants younger than two months of age.^(3,4) Therefore the success of the Kasai procedure correlates with the age of the infant before surgery. In order to achieve the goal of early intervention, early detection of biliary atresia is needed. However, early detection is not easy because jaundice is common in the neonatal period. Breast feeding promotes an increased rate of prolonged jaundice in infants. It is crucial to differentiate between cholestatic infants and a large number of infants with prolonged breast feeding related jaundice. It is particularly urgent to distinguish and recognize BA in infants as early as possible. The early signs of BA are mainly prolonged jaundice and pale-colored stools. However, ill-informed caretakers lack the alertness to recognize abnormal stool colors in infants, consequently delaying the detection of BA.

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Even medical professionals may overlook an abnormal pale-colored stool.⁽⁴⁾

Careful observation of infant stool color enhances early diagnosis of biliary atresia

In Taiwan, infants show a significant prevalence for BA.⁽⁵⁾ In order to achieve an improved outcome and save more lives, a good screening method for early detection and management of infants before 60 days of age is needed. Although urinary or serum bile acids have previously been used to screen BA, these methods are not applicable as a mass screening method.⁽⁶⁾ Our previous pilot study revealed that 95.2% of infants with BA had clay – colored or light yellowish stools.⁽⁷⁾ Careful observation of stool color can promote the early detection of BA. However, the lack of knowledge and alertness in recognizing abnormal stool color significantly delays the detection of BA.

Incidence of BA

In Taiwan, the incidence rate of BA in screened newborns is estimated to be 3 per 10,000.⁽⁵⁾ Compared to the incidence rate of BA in other countries, Taiwan's is among one of the highest incidence populations for BA in the world.

Establishment of a mass screening method using an infant stool color card in Taiwan

Matsui et al. carried out a mass screening for BA in some areas of Japan using a stool color card. They concluded that screening with stool color cards appears to be effective for the identification of infants with suspected BA.⁽⁸⁾ Based on this experience, we have designed our own stool color card in Taiwan, which uses a series of stool pictures to educate the caretakers and the medical personnel. The first edition stool color card illustrated 7 stool colors.

As of March 2002, we have conducted a pilot study screening for BA using the stool color card for the early screening of BA in Taiwan. We educated the caretakers and medical personnel about the importance of early diagnosis and intervention in affected babies.

We have established an infant stool card center in Taiwan to bring to the attention of the public and to assist caretakers or medical personnel in the early identification and prompt medical care of infants with BA. An infant stool color card was given to the

caretakers of every neonate born at hospitals or clinics included in the mass screening program. The parents / caretakers were instructed to observe the stool color daily and report to the infant stool card center within 24 hours if an abnormal stool color was observed. The stool card center would then provide assistance. At one month old on returning to the hospital, clinic, or health station for health checks and hepatitis B immunization, the stool color card was handed in, irrespective of normal or abnormal stool color.

In 2002, 49 hospitals and clinics in the northern and middle part of Taiwan participated in the study. In 2003, a total of 95 hospitals and clinics participated in this study in eight different counties and cities of northern, middle, southern and eastern Taiwan.⁽⁵⁾ Ninety-four infants were reported to have abnormal stool color, and 91 of them were screened before 60 days of age. Twenty-nine (30.9%) of the 94 infants were identified as having BA. Eleven infants (11.7%) were diagnosed to have cholestasis caused by other etiologies. The remaining 57.4% with transient pale-colored stool turned out to be normal after follow-up checks.⁽⁵⁾

Our infant stool color card had sensitivity, specificity, positive, and negative predictive values to detect BA before 60 days old of 89.7%, 99.9%, 28.6%, and 99.9% respectively. Our pilot study demonstrated that a stool color card is simple and effective in identifying infants with BA needing the Kasai procedure within 60 days of age, thus improving the outcome of the Kasai procedure. Our stool-color card can be used as an effective tool for the mass screening of BA in infants.

Stool color card screening enhances the Kasai procedure

Following the early diagnosis by stool color card screening for BA in our pilot study, 58.6% of the infants with BA received the Kasai procedure before 60-days-old. This rate is higher than the recorded rates of 23% reported by Lin et al. and 41% reported by Hung et al. respectively.^(5,9-10) In Japan, a report from the Japanese Biliary Atresia Registry (JBAR) between 1989 and 1999 proved that 505 patients (43%) underwent the Kasai procedure at the age of 60 days or before, and there was no remarkable change in the trend of the age the patient undergoes the Kasai procedure since 1990. The rate

of disappearance of jaundice was around 56% to 62%.⁽¹¹⁾

Among the 28 affected infants from our stool color card screening, multi-centered study, who had received the Kasai procedure within the 60-days-old period, 19 (67.9%) became jaundice-free after the Kasai procedure. The jaundice-free rate after the Kasai procedure in those operated before 60-days-old was 82.4% (14/17), but dropped to 45.5% (5/11) in those operated on later than 60-days-old ($p = 0.095$). Although 62.5% (5/8) of those operated on at the age of 61~90 days still became jaundice-free, three infants that underwent the Kasai procedure beyond 91-days-old did not experience restored bile drainage and remained icteric.

National screening program for biliary atresia in Taiwan

In order to enhance the early diagnosis of BA in Taiwan, a nation wide screening program for BA using a infant stool color card was launched in January 2004. We are expecting an improvement in the early diagnosis and therapy for BA through this screening program.

Conclusions

We have successfully established a simple, effective screening method for the early diagnosis and intervention of BA using an infant stool color card. In Taiwan the goal of the screening method is to enhance the rate of necessary Kasai procedures before 60 days of age. This pilot study is very helpful in establishing a national reporting system focused on abnormal stool color in early infancy. The estimated annual incidence of BA in Taiwan is approximately 3 per 10,000 infants. Our pilot study demonstrated that a stool color card is simple and effective in identifying a larger number of infants with BA who can benefit from an enhanced Kasai procedure outcome performed within the 60 days of

age period.

In Taiwan, as from January 2004, the national screening program of BA by infant stool color card was started. The infant stool color card has been included in a children's health booklet, which is given to every neonate's caretaker after birth.

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