Review Article

Hemoglobin E disorder: Newborn screening program

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Hemoglobin E (Hb E) disorder is an important kind of hemoglobinopathy. It can be seen around the world with the highest prevalence in Southeast Asia. The screening for this disorder becomes the public health policies in many countries. The screening can be performed in several population groups. The newborn screening program for Hb E disorder is an important issue in pediatric genetics. In this brief review, the author discusses on important laboratory tests for screening for Hb E disorder in newborn.

Key words: Hemoglobin E, newborn, screening

Introduction

The congenital hemoglobin disorder is an important group of a genetic disorder.[1] This becomes an important pediatric genetic problem that can be seen around the world. The considerable high incidence of the congenital hemoglobin disorder, comparing with other genetic disorders, draws the attention of the pediatricians to focus on this disorder.[2]

There are several kinds of congenital hemoglobin disorders. Hemoglobin E (Hb E) disorder is an important kind of hemoglobinopathy.[2] It can be seen around the world with the highest prevalence in Southeast Asia.[3] Although the disease form of this disease is not severe, only anemic presentation, it can be deadly if co-present with beta-thalassemia.[4,5] The screening for this disorder becomes the public health policies in many countries.[6,7]

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The screening can be performed in the several population groups. The newborn screening program for Hb E disorder is an important issue in pediatric genetics.[8,9] In this brief review, the author discusses on important laboratory tests for screening for Hb E disorder in newborn.

High Performance Liquid Chromatography Screening

In general, High Performance Liquid Chromatography (HPLC) can be used for testing for the presence of abnormal hemoglobin.[10] Several hemoglobinopathies including to Hb E can be identified by HPLC. Dried blood spot specimens can be tested by HPLC.[11,12] The HPLC is presently used in some countries like USA for neonatal screening for Hb E disorder.[11,12] The screening is set due to the influx of migrant from Southeast Asia to USA in the recent years.[11,12] Focusing on the technique, the automated HPLC can be available.[11,12] In general, the positive result usually requires further investigation by pediatric hematologist for further assessment and ruling out the possible thalassemic co-presentation.[13] For discrimination, Lorey *et al*. studied the "Hb F and Hb E relative percentages obtained in the newborn's HPLC result" and reported that "the percentage of Hb E was markedly lower in neonates with Hb E/beta-thalassemia versus those, which were homozygous EE."[14]

Hemoglobin Electrophoresis Screening

Hemoglobin electrophoresis is a classical tool for determination of Hb E. This tool is still the present gold standard for screening in the several populations in the endemic areas.[15-17] The cord blood can be collected for classical gel electrophoresis and used in screening.[18] However, the use of this technique in the

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neonatal screening for Hb E disorder is not widely used because the present policy in an endemic country shifts to the pregnancy screening.[17]

DichlorophenolIndophenol Precipitation Test Screening

DichlorophenolIndophenol Precipitation (DCIP) is the simple test that can be used for determining unstable hemoglobinopathies including to Hb E.[19] In Thailand, the endemic area of Hb E, DCIP becomes that main tool for screening for Hb E disorder. However, as noted, the screening is recommended for the pregnant.[17,20]

Complete Blood Count Screening

The use of Complete Blood Count (CBC) screening for Hb E in the newborn is also mentioned. There are some reports on the use of automated CBC analyzer for assessment of red blood cell parameters and usefulness in screening Hb E disorder. For the endemic area, very good screening result is reported.[21] However, the specificity is very poor.[21] For screening, the cord blood is required and this might be inconvenient. Furthermore, the availability of the automated analyzer is the main obstacle to implement this technique widely.

Polymerase Chain Reaction Test Screening

The molecular genetics analysis the new hope for screening for congenital genetic disorder including to hemoglobinopathy.[22] For Hb E screening, it is no doubt that post-coital test provides more reliable result comparing with those previously mentioned. Direct analysis of patient deoxyribonucleic acid samples can be performed and give rapid and highly accurate result.[23] However, focusing on the cost-effectiveness, the PCR test screening is not appropriate.[17]

Other Screenings

In addition to the already mentioned methods, there are also other alternative for screening of Hb E disorders. Isoelectric focusing, an adapted electrophoresis test, is the first alternative to be mentioned.[24,25] It is proved for its reliability in cord blood testing.[24] The other method is tandem mass spectrometry.[25] The reliable result can be derived.[25] However, these two techniques are limitedly used in screening for any hemoglobinopathies due to the difficulty of the technique.

Conclusion

Hb E disorder is an important hemoglobinopathy with its highest prevalence in Southeast Asia. The screening for this disorder is included in the national policies of the endemic area, but the screening is recommended for the pregnant. For the newborn group, the screening for Hb E disorder is carried out in some settings like USA focusing on the migrant.[26,27] The widely used technique is HPLC.

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