Umbilical Cord Blood Transplant – Will it Change the Medical Scenario in Malaysia?

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Umbilical Cord Blood Transplant (UCBT) is a type of allogenic haematopoetic stem cell transplant. Stem cell transplantation as a mode of treatment of diseases was first successfully done by the pioneering work of a Nobel Prize Winner in Physiology or Medicine, E. Donnall Thomas in 1957 [1]. Throughout the past 50 years, numerous other researchers have improved the techniques of this previously highly risky procedure. Among the notable landmark in haematopoetic stem cell transplant include: advancement in immunogenetics of HLA, better immunosuppressive preparative regimen, improved control of infections, appearance of donor registries throughout the world and successful transplantation stories using haematopoetic stem cells from peripheral blood and the cord blood. These developments lead to a change in terminology from marrow transplantation to haematopoetic stem cell transplantation [2].

The source of cells used in the transplant process can come from the patient himself (autologous transplant) or a donor (allogenic transplant). In UCBT, the donor cells are derived from a by-product of pregnancy namely the umbilical cord.

The first UCBT was reported in 1989 by Gluckman *et al* in a child with Fanconi anemia using cord blood from his HLA-matched twin sister [3]. The use of cord blood as the source of stem cells has increased since then involving both paediatric and adult patients. The advantages of UCBT over bone marrow transplant include ease of collection and availability, no risk to the donor (mothers or newborn), low risk of viral transmission to the recipients, easy delivery process compared to freshly harvested bone marrow and importantly increased tolerance to HLA-mismatch.

The main disadvantage of using umbilical cord transplant is low stem cell content and slow engraftment compared to bone marrow transplant which over the years would probably be overcome as technology and experience improves. Research is ongoing to increase the number of stem cell content include using multiple units of cord blood and culture techniques to expand the UCB stem cells[4, 5].

However, the ability of using minimally matched HLA has put the UCBT a favorable method of transplant over bone marrow transplant especially among the paediatric patients. Currently, throughout the world, there is an effort to set up either private or public cord blood banks which collect and store the cells over a period of time. Worldwide umbilical cord and bone marrow donor registry has reported that there are at least 61 stem cell donor registries from 44 countries, and 42 cord blood banks from 26 countries. On 28 May 2009, the registry website quoted 13,193,706 donor and cord blood units in its database[6]. There is a growing scientific and ethical concern in the literature on the emergence of private cord bank throughout the world including Malaysia on justification of collecting umbilical cord for personal long term storage. However, in United Kingdom, Richard Branson has started the first world public-private UCB bank known as Virgin Health Bank of which 80% of sample will be placed in public and 20% in the private storage [7].

The use of umbilical cord blood haematopoetic stem cell transplant has been established in conditions such as leukemia, lymphoma, aplastic anaemia or various blood or autoimmune disorders[4,8]. In fact, the greatest acceptance of this mode of treatment is in the field of haematology, especially in patients who would not benefit from prolonged chemotherapy or are resistant to it. Other indications include from inborn errors of metabolism to other diseases such as severe combined immunodeficiency, Fanconi anemia, sickle-cell disease, myelodysplastic syndrome, lymphoma, Hodgkin's disease and meduloblastoma. The use of this procedure in neurological conditions is largely experimental in most cases but proven effective in cases of lysosomal storage disorders such as Metachromatic Leukodystrophy and Krabbes disease. Haemopoietic stem cells transplantation was first used in lysosomal disorders, before serious disease symptoms become apparent. The rationale of this is that enzymes produced from the transplanted stem cells will stop further degenerative processes in affected children. In lysosomal diseases such as Krabbes diseases (Globoid cell leukodystrophy) and Metachromatic Leukodystrophy, long term survival have been recorded, while in cases such as infantile Neuronal Ceroid Lipofuscinosis, definitive recommendations cannot be made. Efforts are currently underway to assess the effectiveness of stem cell therapy in cases of chronic epilepsy[9].

It is a blessing that human is born together with a placenta with potential regenerative tissue. There is exciting recent development in regenerative medicine of potential usage of using cord stem cells instead of more controversial source of embryonic stem cells in repairing myocardial, hepatocytes, muscle and neural tissue. In future, with possibility of delaying the process of human aging and repairing tissue using placental and cord stem cells, one then realized that what was thought to be a by-product of pregnancy is actually the fountain of youth born together with human [10-12].

In Malaysia , the experience of umbilical transplant was first reported by Chan from Universiti Malaya who reported the

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first successful umbilical cord transplant in 1999 involving a 25 months old beta-thalassaemia major boy [13]. Last year, Gan *et al* has reported their adult haematopetic stem transplant experience [14,15]. In this issue, Chan and et al has timely reported their 10 year experience in unrelated cord blood transplant in paediatric population. Its use in non –haematological disorders is still not widespread in Malaysia but the scenario will most probably change over the next few years when better treatment regimes become available.

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