

Blood from the umbilical cord is a rich source of hematopoietic stem cells. These cells from the umbilical cord blood (UCB) can be used to treat certain malignancies, metabolic and immunological conditions. The process by which the umbilical cord and placental blood is salvaged at birth and stored by cryopreservation for future use is known as UCB banking. Umbilical vein is used for collecting the UCB.

Cord blood banks can be classified as private, public or hybrid banks. When the UCB is stored for future use for the child himself i.e. autologous or for one of a family member i.e. allogenic, they are known as private cord blood banks. The banks accepting UCB donations and making them available for anyone in need of transplant are the public banks. Newly emerging model is the hybrid model where a bank offers both private and public donation, after the family takes an informed decision.

Clinical benefits

1. UCB is useful for all those who need allogenic hematopoietic stem cell transplantation (HSCT)
2. Transplantation of UCB is possible across HLA barriers. There is a lower risk of graft versus host disease (GVHD) with UCB as compared to conventional HSCT from peripheral blood and bone marrow
3. UCB can be used for allogenic transplantation of an awaiting family member (biological parents or sibling only) who is confirmed to be suffering from an illness that can be cured by allogenic HSCT. Thalassaemia is an example where UCB from unaffected matched sibling donor can be used for thalassaemia transplants

Limitations of UCB use

1. When the disease exists in the donor's own cells (hemoglobinopathies, storage disorders, hemophagocytic

- lymphohistiocytosis, immunodeficiencies, *etc.*), use of one's own UCB stem cells is contraindicated
2. The risk of having a disease curable by autologous transplant is very low (0.04 to 0.0005%) in low risk families. Even when there is a remote chance of having a disease where autologous stem cells are curative, for example, certain high-risk solid tumors, stem cells can be readily taken from the marrow or peripheral blood of the patient, which provide results similar to that of using UCB
 3. The role of UCB in diseases like BPD, HIE where regenerative property of the stem cells is utilized, is still under research. The use of UCB for such purpose should be limited to clinical trials only at present
 4. There are certain hematological malignancies, where graft versus leukemia reaction is harnessed as a therapeutic benefit to kill the leukemia cells. UCB may have a limited role here and allogenic stem cells from peripheral blood or bone marrow are preferred over UCB
 5. UCB is costly and its cost comprises of testing, processing and storage cost
 6. There is also a concern that a single UCB unit may not contain enough stem cells to be useful in adults as the cell dose per kg body weight may be insufficient

Recommendations

The American Academy of Pediatrics, 2017, ACOG 2016, American Medical Association, 2007 American Society for Blood and Marrow Transplantation (ASBMT) 2008 and most recently, the Indian Academy of Pediatrics (IAP) consensus statement 2018 recommends the following:

1. The general public should be provided accurate information about the clinical limitations and benefits of UCB banking and transplantation (allogenic versus autologous) as per the current available evidence
2. The parents of the neonate should be informed clearly that, currently, there is no scientific data to prove that autologous cord blood is of any value for regenerative medical purposes (HIE, BPD)
3. To ensure that UCB is stored in sufficient numbers and is made

available for patients in need of HSCT, public banking of UCB is encouraged where possible

4. Because of limitations of autologous UCB, storage of cord blood for personal use is not recommended
5. UCB can be stored for personal use, in cases of sibling or biological parents suffering from a disease curable by allogeneic HSCT

At AIIMS, we do not encourage routine UCB banking and undertake it in only specific indications as mentioned.

References

1. Sachdeva S, Gunasekaran V et al. Pediatric Umbilical Cord Blood Banking: Consensus Statement of the Indian Academy of Pediatrics, Indian Pediatrics 2018; 35: 489-494.
2. Shearer WT, Lubin BH, Cairo MS, et al Cord Blood Banking for Potential Future Transplantation. *Pediatrics*. 2017;140(5):e20172695.

