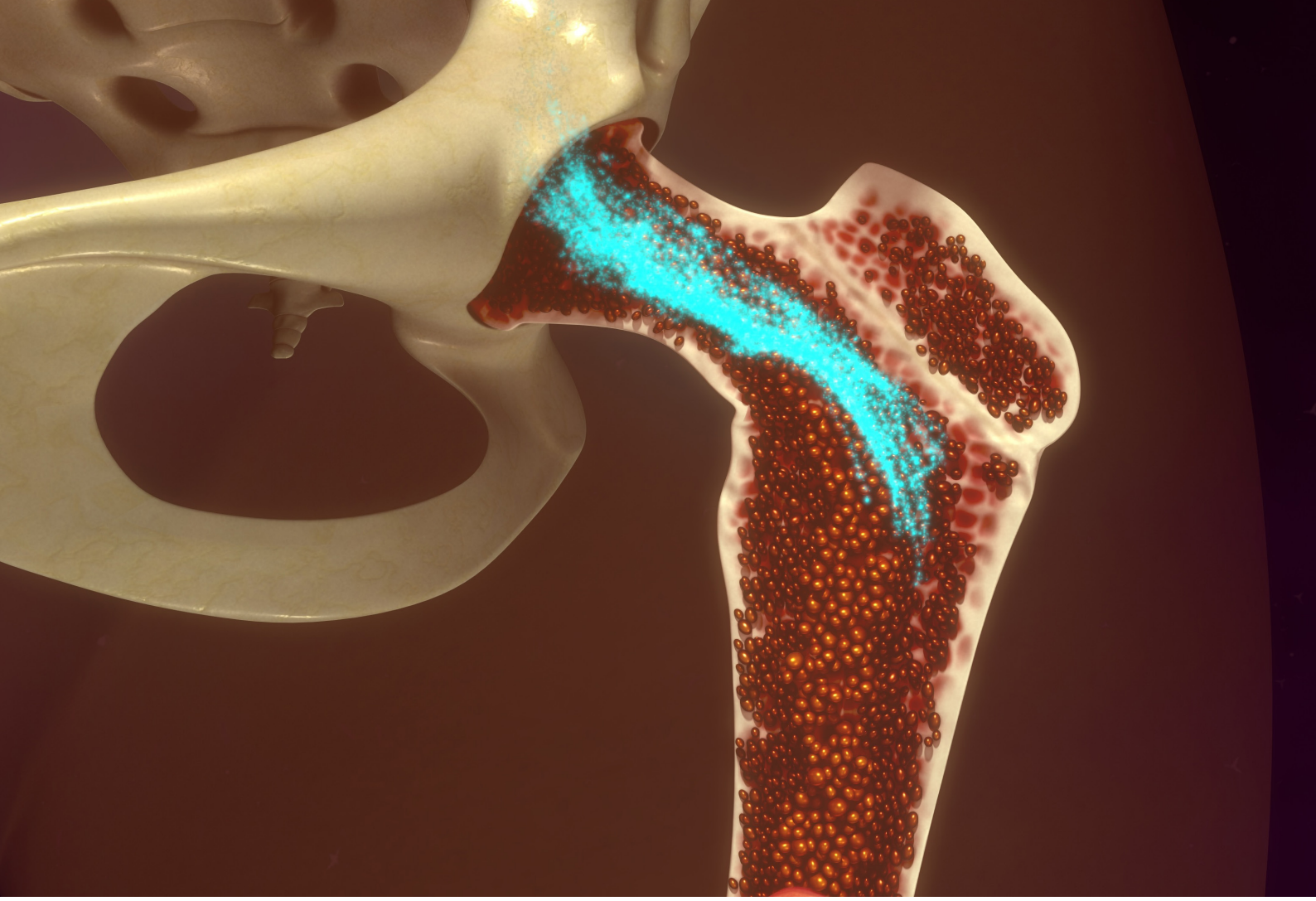


Miracle of Modern Science

Bone Marrow Transplantation – The Miracle Procedure

Bone marrow transplantation, or blood stem cell transplantation as it is now commonly known, is one of the most amazing medical treatments of the last century. It was first developed in the 1950s, but has since advanced into a transformative life-saving procedure which has been used more than 1.5 million times worldwide!

Bone marrow transplantation is used for the treatment of patients with blood cancers, such as leukaemia, lymphoma, myeloma and germ cell tumours. It is also utilised for the treatment of patients with non-cancer conditions, such as thalassemia, aplastic anaemia, and in some autoimmune conditions like multiple sclerosis.

TYPES OF STEM CELL TRANSPLANTS

There are two main types of stem cell transplants. They are autologous and allogeneic stem cell transplants.

Autologous Stem Cell Transplantation - The stem cells used for an autologous transplant are collected from the patient's own body. This is sometimes done because intensive chemotherapy or radiation therapy treatment can damage the stem cells and immune system. Therefore, doctors may remove and store stem cells prior to cancer treatment.

After chemotherapy, these stem cells are returned to the body to help rebuild, and restore the immune system and the body's ability to produce blood cells and fight infection.

Allogeneic Stem Cell Transplantation - The stem cells used in an allogenic stem cell transplant are taken from a donor. Allogeneic stem cell transplantation is commonly used for treating aggressive forms of acute leukaemia and myelodysplastic syndromes. It is also used for the treatment of aplastic anaemia, red cell disorders (such as thalassemia) as well as in some cases of lymphoma and myeloma.

COMMON QUESTIONS AND MYTHS ABOUT BONE MARROW TRANSPLANTATION

The man on the street often does not know much about Bone Marrow Transplantation or hold a number of misconceptions about the procedure. Some frequently asked questions and commonly perpetrated myths about Bone Marrow Transplantation include:

THERE IS AN AGE LIMIT FOR BONE MARROW TRANSPLANTATION

Age itself is not the only factor when it comes to deciding on a patient's fitness for transplantation. The patient's physical well-being as well as other medical issues he/she has are also important considerations. However, in terms of age, patients up to the age of 70+ can be considered for both autologous and allogeneic bone marrow transplantations.

IS BONE MARROW TRANSPLANTATION AN ACTUAL OPERATION?

No, it is not. In the past, some transplant doctors would actually inject bone marrow stem cells into the patient's bone. In most cases, the stem cells are infused into patients just like a blood transfusion. The stem cells have the ability to home in on the bone marrow environment, where they will take root and start growing.

WHAT HAPPENS WHEN A MALE PATIENT RECEIVES A TRANSPLANT FROM A FEMALE DONOR?

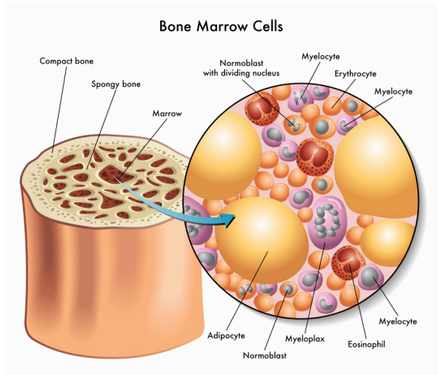
It is not uncommon for patients to worry that they will undergo a sex transformation after transplantation. In fact, only the bone marrow stem cells are replaced. Hence, after a successful transplantation, the patient will still be male. However, his blood stem cells will actually be female!

THE BLOOD GROUP OF DONOR AND PATIENT MUST BE THE SAME

While it is preferable for the donor and patient to have the same blood group, this is not essential. In a successful transplant, the patient's blood group will usually change to that of the donor's after 3-4 months.

HOW DO WE FIND A MATCHED DONOR FOR ALLOGENEIC BONE MARROW TRANSPLANTATION?

Donors and patients are matched based on their HLA (Human Leucocyte Antigen) typing. HLA molecules are present in our white blood cells, and are important in affecting the degree of rejection between donor and patient.



> Bone marrow transplantation is used for the treatment of patients with blood cancers, such as leukaemia, lymphoma, myeloma and germ cell tumours. It is also utilised for the treatment of patients with non-cancer conditions, such as thalassemia, aplastic anaemia, and in some autoimmune conditions like multiple sclerosis.

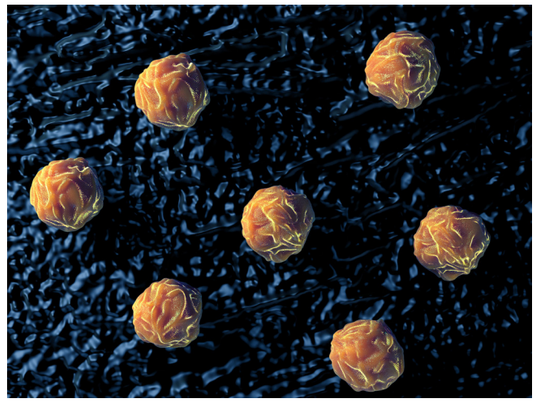
HLA typing is a simple test that is performed on donors and patients using a blood test, or using a cheek swab (rubbing a cotton swab on the inner side of the check). In most cases, an ideal donor and patient match is when the HLA typing is 10/10 matched (or 12/12 matched).

WHAT ARE THE BEST CHANCES OF FINDING A FULLY MATCHED DONOR?

The best chances of finding a fully matched donor are from testing the siblings (brothers and sisters) of the patient. There is a 25% chance that each sibling could be a fully HLA matched donor with the patient. If there are no suitable matched donors, then often a donor search is initiated in Singapore and international donor registries to find a donor. The chances of finding a donor are in part related to ethnicity. Caucasian patients have a 70-80% chance of finding a matched unrelated donor, but Malays may have only a 10% chance of finding a donor. This is due to the low number of Malay donors signed up on international registries.

WHAT IF I CANNOT FIND A MATCHED DONOR BUT NEED A TRANSPLANT URGENTLY?

In recent years, many centres around the world have started to use haplo-identical donors for transplantation. Haplo-identical donors are family members who are >50% matched with the patient. Most parents, children or siblings

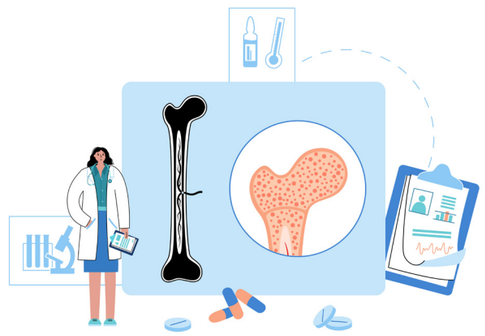


Stem cells of human bone marrow

of the patient would be a probable haplo-identical donor so this immediately increases the chances of a suitable donor significantly. Studies around the world have indicated that the outcomes of haplo-identical matched donor transplantation are similar to that of a fully matched unrelated donor.

WHAT IS THE ADMISSION PERIOD FOR A BONE MARROW TRANSPLANTATION?

Patients receiving an autologous or allogeneic bone marrow transplantation will require chemotherapy to empty the bone marrow before the stem cells are infused. As patients will have a suppressed immune system, they are usually kept in hospital for a period of 3-4 weeks after the transplant until their immune system starts to recover.



WHAT ARE THE CHALLENGES FACING PATIENTS RECOVERING FROM ALLOGENEIC BONE MARROW TRANSPLANTATION?

Patients recovering from bone marrow transplantation experience side-effects due to an altered and immature immune system. In the short term, patients will be at higher risk of infections, including bacterial and viral infections. Allogeneic transplantation patients are also at risk of developing graft versus host disease (GvHD). This is a condition where the donor's cells attack the patient's body, often causing damage to the skin, liver or gut. Also, for patients with blood cancer, there remains a risk of the disease recurring even with a bone marrow transplantation.

WHAT CAN FAMILY MEMBERS DO TO HELP SUPPORT LOVED ONES UNDERGOING BONE MARROW TRANSPLANTATION?

Bone marrow transplantation is a major treatment and often occurs after a few months of ongoing treatment. Patients need all the love and support they can get to keep them going during this difficult period and through their recovery phase. Family members can help with emotional support, and also help to support the nutrition of the patient. We often advise family members to work with the transplant support services of the respective transplant centres to devise the best supportive network for the patient, dependent on his/her individual needs.

IS IT SAFE FOR BONE MARROW TRANSPLANTATION PATIENTS TO RECEIVE THE COVID VACCINE?

As transplant patients are on drugs to suppress their immune system at the early recovery phases, and their immune systems are still immature, it is not recommended that they receive the COVID vaccination early post-transplant. At a later stage post-transplant, when they have weaned off their immunosuppression for more than 3 months and are physically well, they may be considered for vaccination. Patients are advised to discuss the specific details on vaccination with their transplant physicians. PRIME

Dr Lim Zi Yi

Medical Director and Senior Consultant Haematologist
Centre for Clinical Haematology
MBChB (Edinburgh), FRCP (UK), FRCPath (UK)

Dr Lim has a specialist interest in Haemato-oncology and Haematopoietic Stem Cell Transplantation. In addition, he has wide experience in the management of general haematological conditions (such as clotting disorders, anaemia and bleeding disorders). He received his medical degree from the University of Edinburgh, UK and subsequently underwent specialist training in haemato-oncology at Kings College Hospital, London where he helped to develop it into one of the largest allogeneic haematopoietic stem cell transplant centres in Europe. He subsequently returned to Singapore where he led the development of several haematological services in the public and private sector.

Centre for Clinical Haematology

Mount Elizabeth Novena Specialist Centre
38 Irrawaddy Road, #09-47/48/57, Singapore 329563
Tel: (65) 6256-8836

Gleneagles Hospital Annexe Block
6A Napier Road, #02-39/40, Singapore 258500
Tel: (65) 6261-3898

Email: contact@cfch.com.sg Website: cfch.com.sg