LEUKAEMIA IN CHILDREN: A SUCCESS STORY

Dr Catherine Cole, a paediatric haematologist and oncologist and the director of laboratory haematology at Princess Margaret Hospital for Children in Perth

Twenty years ago a diagnosis of leukaemia in a child was most often a death sentence, with cure rates no higher than 30 per cent. Today about 80 per cent are cured as a result of the sustained research that has led to better treatment.

Dr Catherine Cole, a paediatric haematologist and oncologist and the director of laboratory haematology at Princess Margaret Hospital for Children in Perth, says leukaemia accounts for about 25 per cent of childhood cancers. Of that 25 per cent, about 85 per cent are the high-risk and rapidly progressive acute lymphoblastic leukaemias (ALL). Her unit treats about 15 new ALL cases a year.

Leukaemia treatment is tailored to each patient and adjusted according to the response at each stage of therapy. The complete course of treatment typically extends over two years in girls and three years in boys.

The first month's treatment targets the cancer itself, and the response can be assessed in the first one or two weeks. Even in this early stage it is possible to identify markers that suggest a good prognosis, in which case some aspects of treatment can be scaled back, or more resistant disease that might benefit from more intensive therapy.

The next phase aims to prevent the spread of the leukaemia cells into the brain and spinal cord. Radiotherapy was once used, but chemotherapy administered into the fluid surrounding the spinal cord is now the treatment of choice, as it has significantly fewer adverse effects. A second phase of chemotherapy, termed reintensification, is aimed at further reducing the number of diseased cells.

These first stages require an extended time in hospital and lead to well-recognised side effects such as hair loss. But children can resume almost normal lives as they move into an extended period of maintenance therapy, requiring a single monthly intravenous chemotherapy treatment supplemented by oral medication.

"We are extremely conscious of the psychological effects of the disease and its treatment on our patients and their families," Dr Cole says. "Paediatric oncology is very good at providing multidisciplinary care that involves social workers, psychologists, teachers and other disciplines as well as medical services. The highest incidence of ALL is in preschoolers, and we know that many can't remember much about their illness or its treatment when they are older."

Refinement to chemotherapy protocols so they kill cancer cells more effectively is one element of the advances in leukaemia treatment. Other advances include treatments that are better tolerated, causing fewer side effects at the time and less likelihood of future problems such as infertility. Better supportive treatment, for example to control infection when patients' immune systems are suppressed, has also helped.

Although childhood leukaemia attracts considerable attention because of its particular poignancy, it fortunately remains relatively rare. This means that individual treatment centres would have difficulty recruiting sufficient patients for meaningful studies, so national and international co-operation is essential.

The Princess Margaret oncology unit was the first non-American institution to join the US-based Children's Oncology Group. Established more than 50 years ago, the group now enrols about 2,000 patients a year into its clinical trial programs.

As a paediatric and adolescent oncologist and haematologist, Dr Cole has a special interest in patients who can fall into a poorly defined area between paediatric and adult services. Her young patients tend to have a greater capacity to tolerate intensive cancer treatment than older adults, and there is a risk that older adolescents or young adults will miss out on optimal treatment.

"We now have evidence that young adults with leukaemia can do twice as well when they are treated with 'paediatric' rather than 'adult' protocols," she says.

BONE MARROW TRANSPLANTATION

Substantial advances have also been made in bone marrow transplantation, a key part of treating certain blood cancers. About 1,200 transplants are conducted each year in Australia, of which two-thirds use the patient's own cells and one-third use donor cells.

Autologous transplantation typically involves obtaining bone marrow cells from the patient prior to chemotherapy and/or radiotherapy. Temporarily "banking" the stem cells allows the patient to receive high-dose treatment that is more effective in killing cancer cells but destroys marrow cells. Stem cells are then returned to repopulate the marrow and restore normal blood cell formation.

In allogeneic transplants, stem cells from a donor, matched as closely as possible to the recipient, are transplanted after the patient's own marrow is subjected to chemotherapy or radiotherapy. This effectively provides the patient with a new immune system to attack abnormal cells, although there is some risk of the graft attacking normal tissue.

The advent of recombinant G-CSF (granulocyte colony stimulating factor) – largely a product of Australian research led by pathologist Professor Donald Metcalfe – has removed the need to surgically extract bone marrow from donors. Instead, four injections of G-CSF are used to stimulate the proliferation of stem cells in marrow and their liberation into circulating blood.

The circulating stem cells are then extracted in a procedure that is no more taxing than a normal blood donation, except that it takes three or four hours.

The Australian Bone Marrow Donor Registry (www.abmdr.org.au) lists people willing to be considered as stem cell donors. Potential donors must be aged between 18 and 40, meet the usual requirements for blood donation and be prepared to donate on behalf of patients anywhere in the world.

After registering with the Australian Red Cross Blood Service, donors provide a blood sample for tissue typing, and their details are entered onto an international database of more than 10 million people. About 1,000 Australians are asked to donate stem cells each year.

The Australasian Bone Marrow Transplant Recipient Registry records virtually all transplants conducted in Australia since 1992 and New Zealand since 1998 and contains data on about 11,000 procedures.

BLOOD CANCERS – A QUICK GUIDE

Source: Leukaemia Foundation, www.leukaemia.org.au

	NEW CASES IN AUSTRALIA PER YEAR	PEAK AGE OF INCIDENCE	MOST COMMON COURSE OF DISEASE
Leukaemia			
Acute lymphoblastic leukaemia (ALL)	300	Children 0-14 years (60% of all cases)	Progresses quickly
Chronic lymphocytic leukaemia (CLL)	700	> 60 years (80% of cases), rare <40 years	Progresses slowly, not all cases require treatment
Acute myeloid leukaemia (AML)	700	> 60 years	Progresses quickly
Chronic myeloid leukaemia (CML)	250	> 50 years	Develops gradually, but chronic phase can progress to accelerated and blast phases requiring intensive treatment
Lymphoma			
B-cell or T-cell (non-Hodgkin's) lymphoma	3,500	> 50 years	Highly variable: many different types
Hodgkin's lymphoma	400	15-30 years	Variable; most are curable
Myeloma	1,100	> 60 years (80% of cases)	Variable in early stages, but often progresses to serious disease