

Youngest bone marrow transplant patients at higher risk of cognitive decline

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Toddlers who undergo total body irradiation in preparation for bone marrow transplantation are at higher risk for a decline in IQ and may be candidates for stepped up interventions to preserve intellectual functioning, St. Jude Children's Research Hospital investigators reported. The findings appear in the current issue of the *Journal of Clinical Oncology*.

The results clarify the risk of intellectual decline faced by children, teenagers and young adults following [bone marrow transplantation](#). The procedure is used for treatment of cancer and other diseases. It involves replacing the patient's own blood-producing stem cells with those from a healthy donor.

Researchers tracked IQ scores of 170 St. Jude [patients](#) before and for five years after transplantation, making this the most comprehensive effort yet to determine how the procedure affects intelligence. The patients ranged in age from 4 months to 23 years when their transplants occurred. The procedure had little lasting impact on the IQ scores of most patients.

"For the great majority of patients, these findings provide reassurance that transplantation will not have a significant negative impact on cognitive development," said corresponding author Sean Phipps, Ph.D., chair of the St. Jude Department of Psychology. "We have also identified a high-risk group of younger patients who may benefit from more intensive interventions, including developmental stimulation and

other rehabilitative therapies designed to prevent a decline in intellectual functioning and aid in recovery."

The high-risk group includes patients whose transplants occurred when they were aged 3 years or younger and involved total body irradiation (TBI). TBI is used to prepare patients for transplantation by killing remaining cancer cells and protecting the transplanted cells from their immune systems. TBI is associated with a range of short-term and long-term side effects. At St. Jude, therapeutic advances have significantly reduced the use of TBI in bone marrow transplantations.

Previous studies of [bone marrow](#) transplantation survivors reported conflicting results about the long-term impact of age and TBI on cognitive abilities.

Before transplantation, the average IQ scores of all patients in this study were in the normal range. One year after transplantation, average IQ scores of patients aged 5 and younger had declined sharply. But scores of most patients rebounded in subsequent years. Five years after the procedure, IQ scores for most patients, even the youngest survivors, had largely recovered and fell within the range of normal intelligence.

Patients in the high-risk group were the lone exception. IQ scores of patients who were both aged 3 or younger when their transplants occurred and who received TBI failed to recover from the first-year decline. Five years after transplantation, these survivors had average IQ scores in the low-normal range of intelligence. Their scores were more than 16 points lower than the scores of patients who were just as young when their transplants occurred but did not receive TBI.

Of the 72 patients in this study whose transplants included TBI, researchers found there was a long-term impact on intellectual functioning only of patients who were aged 3 or younger at

transplantation.

"The significant first-year decline reflects the intensity of transplantation, which our results suggest leads to greater disruption in development in the youngest children than was previously recognized," said the study's first author Victoria Willard, Ph.D., a St. Jude psychology department research associate.

These findings are good news for most parents whose children must undergo transplantation and provide another reason for hope of good long-term outcomes. For those whose children are in the newly recognized high-risk group, increased attention and activities designed to stimulate cognitive development may help to prevent reduced IQ following transplantation, Phipps said.

Provided by St. Jude Children's Research Hospital

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