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Successful transplantation of tissue-engineered vein in a child offers hope

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The first biologically tissue-engineered vein grown from a patient's own stem cells has been successfully transplanted into a 10-year-old girl with portal vein obstruction, dramatically enhancing her quality of life. These pioneering results, published online first in the *Lancet*, could offer a potential new way for patients lacking healthy veins to undergo dialysis or heart bypass surgery without the problems of synthetic grafts (that are prone to clots and blockages) or the need for lifelong immunosuppressive drugs.

"The young girl in this report was spared the trauma of having veins harvested from the deep neck or leg with the associated risk of lower limb disorders, and avoided the need for a liver or multivisceral transplantation", explain Martin Birchall and George Hamilton from University College London, UK in a linked Comment.

The hepatic portal vein drains the blood from the intestines and spleen to the liver, and blockage can cause serious complications such as lethal variceal bleeding, enlarged spleen, developmental retardation, and even death. To date, attempts to restore portal blood flow using umbilical veins and artificial grafts to build a bridge around the blockage (meso Rex bypass) have had mixed success.

Here, a team from the University of Gothenburg took a 9cm segment of iliac (groin) vein from a deceased human donor and removed all living cells, leaving a tube consisting of just the protein scaffolding. This scaffolding was injected with stem cells obtained from the girl's own

bone marrow. Two weeks after seeding, the graft was reimplanted during a meso Rex bypass procedure.

The recipient had no complications from the operation and the procedure immediately restored normal blood flow. In the year following the operation she increased in height from 137cm to 143cm and her weight rose from 30kg to 35kg.

A year after the first graft procedure, decreased portal blood flow was noted. A narrowing of the graft required a second stem cell-based graft to be done. The patient has remained well since and is able to take increasing long distance walks of 2 to 3 km and is also taking part in light gymnastics. Importantly, she has not developed anti-donor antibodies despite not taking immunosuppressive drugs.

The authors conclude: "The new stem-cells derived graft resulted not only in good blood flow rates and normal laboratory test values but also, in strikingly improved quality of life for the patient. The work also establishes the feasibility and safety of a novel paradigm for treatment, in cases of venous insufficiency, obstructed veins or inadequate autologous veins. Furthermore our work opens interesting new areas of research, including trying to reproduce arteries for surgical use in patients with arteriovenous fistulas for dialysis [a type of vascular access for dialysis] or coronary bypass surgery."

"Olausson and colleagues' report suggests that tissue-engineered vascular grafts are promising, but one-off experiences such as the procedure they describe need to be converted into full clinical trials in key target populations, and delivered via straightforward, quality-controlled production processes if regenerative medicine solutions are to become widely used and accepted.", add the Comment authors.

More information: Study online: www.thelancet.com/journals/lan …

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