DIALYSIS

Autologous grafts offer vascular access hope

Although the guidelines of the National Kidney Foundation's Kidney Disease Outcomes Quality Initiative indicate that autogenous arteriovenous fistulae are the preferred type of hemodialysis vascular access, synthetic expanded polytetrafluoroethylene implants are the main option for patients without suitable veins. However, Todd McAllister, Nicolas L'Heureux and colleagues have now achieved encouraging results with the use of tissue-engineered vascular access grafts.

In the mid-1990s, the consensus was that engineered tissues of physiological mechanical strength could only result from a combination of a synthetic biomaterial and living cells. However, the body responds to the synthetic scaffolds by forming a scar around them. The cells within the synthetic implants are exposed to an inflammatory environment that impedes their function and causes them to be replaced by fibrotic tissue. During the last 16 years, L'Heureux and colleagues have pioneered the tissue engineering by self-assembly (TESA) technique (Figure 1), which allows the production of living human tissues that possess physiological strength in the absence of a synthetic scaffold.

In their latest study, McAllister *et al.* collected samples of skin and superficial veins from ten patients on hemodialysis who had a high probability of access failure and no suitable veins for a fistula. These samples were used to grow sheets of living fibroblasts that were allowed to fuse around a temporary stainless steel support for 10 weeks in cell culture. The mean burst pressure of the fully biological vessels thus obtained was 3,512 mmHg (range 2,348–4,617 mmHg), a value that compares favorably with that of native human blood vessels (2,500 mmHg).

During the 3-month safety phase in which the newly implanted autologous grafts were not used for hemodialysis, three grafts failed, one patient withdrew from the study as a result of severe gastrointestinal bleeding, and one patient died of non-access-related causes. In the remaining five patients, only one intervention was performed to maintain secondary patency, and a total of 68 patient-months of patency were recorded. Although the cohort was small, the short-term patency rates in these high-risk patients approach the Dialysis Outcomes Quality Initiative's objective of 76% at 3 months. The long-term intervention rate for vessels that

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Figure 1 | A fully biological, autologous blood vessel produced via the tissue engineering by self-assembly approach.

matured to hemodialysis use was better than the standard of care. These results are “the first demonstration that there is a realistic alternative to expanded polytetrafluoroethylene,” says McAllister, whose group plans to expand their work to a phase II/III multicenter study.

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Original article McAllister, T. N. *et al.* Effectiveness of haemodialysis access with an autologous tissue-engineered vascular graft: a multicentre cohort study. *Lancet* **373**, 1440–1446 (2009).