

## Management of type 1 diabetes

### Does transplantation offer a cure for type 1 diabetes?



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People with diabetes live each day managing what is at best an inconvenience. Often the condition is more than this – it is a significant barrier to living a normal, healthy life. Diabetes treatment continues to advance year-on-year, but mostly this provides solutions to managing the condition and associated problems. It is not easy to manage diabetes using the current tools.

A potential cure remains just out of sight. The great hope must be to try to achieve insulin independence. There are a number of promising strategies to achieve this. Islet or pancreas transplantation remains an exciting area of development, but is unlikely to be the answer for the majority of people. The possibility of providing insulin-producing, glucose-sensitive cells from stem cells also seems to be a long way off. The use of real-time glucose sensor and insulin pump therapy raises the hope of an artificial pancreas, but again there are problems with these systems and no obvious easy fixes.

Type 1 diabetes is clearly an immune-mediated condition, and a number of studies have tried to use immunomodulation to alter the course of the disease. Can we interrupt the auto-immune destruction of beta-cells?

A number of groups are developing blocking antibodies with some success.

An alternative approach is to try and reset the immune system using stem cell transplantation. Voltarelli et al (2007) published the results of a small study of 15 patients, with most subjects remaining insulin independent. The initial study was short and this paper from Couri et al (summarised alongside) tells us what happens in the longer term (mean 30 months follow-up) with a larger group of patients. The technique of autologous haemopoietic stem-cell transplantation involves three steps:

1. Mobilisation and harvesting of haemopoietic stem cells.
2. Elimination of self-reactive lymphocytes within the body.
3. Reinfusion of the stem cells produced in step 1.

As is often the case the results of this second paper are not quite as impressive as the first, but 12 out of 20 participants remained insulin independent at the end of the study. The long-term consequences of the treatment are unclear, but the therapy was well tolerated with few complications in the study period. The next step from this group must surely be a randomised controlled trial of their technique.

Voltarelli JC, Couri CE, Stracieri AB et al (2007) Autologous nonmyeloablative hematopoietic stem cell transplantation in newly diagnosed type 1 diabetes mellitus. *JAMA* **297**: 1568–76

### DIABETES TECHNOLOGY & THERAPEUTICS

#### Online management aids self-efficacy

Readability	✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓

**1** This pilot study was undertaken to examine whether a web-based diabetes case management programme can improve glycemic control and diabetes-specific self-efficacy in adults with type 1 diabetes.

**2** Individuals with type 1 diabetes of 21–49 years of age receiving multiple daily injections with insulin

glargine and rapid-acting analogues who had a recent HbA<sub>1c</sub> >7.0% (>53 mmol/mol) were eligible for inclusion in this 12-month clinic-based study (*n*=77).

**3** Participants were randomised to receive usual care or the web-based care management programme. The authors observed a non-significant decrease in HbA<sub>1c</sub> levels from baseline in the intervention group of 0.48% (5.2 mmol/mol).

**4** Self-efficacy, as measured by the Diabetes Empowerment Scale significantly improved in the intervention group (*P*=0.04).

McCarrier KP, Ralston JD, Hirsch IB et al (2009) Web-based collaborative care for type 1 diabetes: a pilot randomized trial. *Diabetes Technol Ther* **11**: 211–17

JAMA

### Insulin independence can be achieved through stem cell transplantation

Readability	✓✓✓✓✓
Applicability to practice	✓✓
WOW! factor	✓✓✓✓✓

**1** This study followed up the results of a 2007 paper investigating the effects of the autologous nonmyeloablative haemopoietic stem-cell transplantation (HSCT) in 15 individuals with type 1 diabetes.

**2** The original paper followed the participants for an average of 18.8 months, and most of them achieved insulin independence with normal HbA<sub>1c</sub> levels. The present study was undertaken to determine whether this was due to preservation of beta-cell mass.

**3** C-peptide levels were used to determine beta-cell mass in people newly diagnosed with type 1 diabetes during subsequent autologous nonmyeloablative HSCT.

**4** It was found that during a mean follow-up of 29.8 months, 20 individuals without previous ketoacidosis and not receiving corticosteroids during the preparative regimen became insulin free. Of these, only eight relapsed during the study period, but only needed low-dose insulin (0.1–0.3 units/kg).

**5** C-peptide levels increased significantly during follow-up (*P*=0.001), and this was maintained for the duration of the follow-up.

**6** The authors concluded that autologous nonmyeloablative HSCT was able to induce prolonged and significant increases of C-peptide levels, thus reducing or removing the need for daily insulin doses in a small group of people with diabetes.

Couri CE, Oliveira MC, Stracieri AB et al (2009) C-peptide levels and insulin independence following autologous nonmyeloablative hematopoietic stem cell transplantation in newly diagnosed type 1 diabetes mellitus. *JAMA* **301**: 1573–9

## DIABETES CARE

### Metabolic syndrome is a CV risk factor in type 1 diabetes

Readability	✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓

**1** This study aimed to assess the predictive value of metabolic syndrome definitions for cardiovascular (CV) events, CV- and diabetes-related mortality, and the progression of renal disease in people with type 1 diabetes.

**2** A prospective study design was used and includes complete lipid profiles and data from 3783 adults with type 1 diabetes in the FinnDiane

Study. Mean age of participants was 37±12 years, and mean diabetes duration was 23±12 years.

**3** Median follow-up was 5.5 years, and metabolic syndrome was defined according to WHO, National Cholesterol Education Program (NCEP), and IDF definitions.

**4** The WHO definition was associated with a 2.1-fold increased risk of CV events and a 2.5-fold increased risk of CV- and diabetes-related mortality. The NCEP definition did not predict outcomes, but added to the risk associated with elevated albuminuria ( $P<0.001$ ). The IDF definition did not predict outcomes.

Thorn LM, Forsblom C, Wadén J et al (2009) Metabolic syndrome as a risk factor for cardiovascular disease, mortality, and progression of diabetic nephropathy in type 1 diabetes. *Diabetes Care* **32**: 950–2

## DIABETES & METABOLISM

### No additional risk with scuba diving

Readability	✓✓✓
Applicability to practice	✓✓
WOW! factor	✓✓✓✓

**1** This study examined whether there is any additional risk for people with type 1 diabetes participating in underwater diving, over and above that associated with the sport itself.

**2** Twelve people with diabetes undertook two dives per day over two 5-day periods. Capillary blood

glucose levels were measured at 60, 30 and 10 minutes before diving; data were gathered from 90 dives.

**3** In 56 of the dives, supplementary carbohydrate or insulin was necessary, but only one dive was interrupted on account of hypoglycaemic symptoms. Continuous monitoring showed that blood glucose levels gradually decreased during the dives.

**4** It was concluded that scuba diving does not appear to confer additional risk to people with type 1 diabetes.

Bonomo M, Cairoli R, Verde G et al (2009) Safety of recreational scuba diving in type 1 diabetic patients: the Deep Monitoring programme. *Diabetes Metab* **35**: 101–7

## DIABETES CARE

### Screening for ICAs to improve detection

Readability	✓✓✓✓
Applicability to practice	✓✓
WOW! factor	✓✓

**1** The Diabetes Prevention Trial–Type 1 parenteral and oral insulin trials screened the relatives of people with type 1 diabetes with islet-cell autoantibodies (ICAs), diagnosing 246 individuals using this technique.

**2** Of the 246 people diagnosed with diabetes, 218 had data regarding the presence of symptoms, and 138

reported no symptoms to indicate the presence of the condition.

**3** On diagnosis, 90 people had an HbA<sub>1c</sub> level <6.2% (<44 mmol/mol). Oral glucose tolerance tests (OGTTs) indicated that 35.4% had a glucose level <100 mg/dL (5.5 mmol/L) at baseline.

**4** Screening for ICAs followed by OGTT may allow diagnosis of diabetes before severe metabolic decompensation occurs. Only using HbA<sub>1c</sub> may cause some people with the condition to be missed.

Triolo TM, Chase HP, Barker JM: DPT-1 Study Group (2009) Diabetic subjects diagnosed through the Diabetes Prevention Trial–Type 1 (DPT-1) are often asymptomatic with normal A1C at diabetes onset. *Diabetes Care* **32**: 769–73

## DIABETOLOGIA

### Adults with type 1 diabetes tend to eat a high-fat atherogenic diet

Readability	✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓

**1** This study aimed to examine how diet and adherence to guidelines differ between adults with and without type 1 diabetes. The authors also investigated whether there is any correlation with coronary heart disease (CHD) risk factors.

**2** The authors enrolled 571 people with type 1 diabetes, and 696 individuals without diabetes. All individuals were asymptomatic for CHD, and aged between 19 and 56 years.

**3** All participants completed a self-administered food-frequency questionnaire. They all underwent a cardiovascular screening examination and had their coronary artery calcium (CAC) measured using electron-beam computed tomography.

**4** The results of the diet questionnaire indicated that adults with type 1 diabetes had a diet higher in fat, saturated fat and protein, but lower in carbohydrate than people without diabetes, and fewer than half of adults with type 1 diabetes met national dietary guidelines for fat and carbohydrate intake.

**5** Higher fat intake was associated with increased CHD risk factors, poorer glycaemic control and increased levels of CAC, while higher carbohydrate intake was associated with reduced odds of CAC.

**6** It was concluded that adults with type 1 diabetes may find extra dietary counselling beneficial for adhering to dietary guidelines, which will, in turn, help them to reduce their long-term cardiovascular risk.

Snell-Bergeon JK, Chartier-Logan C, Maahs D et al (2009) Adults with type 1 diabetes eat a high-fat atherogenic diet that is associated with coronary artery calcium. *Diabetologia* **52**: 801–9

“Adults with type 1 diabetes may find extra dietary counselling beneficial for adhering to dietary guidelines, which will, in turn, help them to reduce their long-term cardiovascular risk.”