

# Transplantation in diabetology

These days, there are still more options and procedures in diabetes therapy:

## 1) patient education

- support the change of lifestyle, i.e. proper eating habits, physical activity, avoid smoking and alcohol,...
- inform about possible risks if the patient does not follow the doctor's instructions sufficiently (hypertension, atherosclerosis, coronary artery disease, stroke and more)
- motivation

## 2) pharmacological therapy

- best in combination with lifestyle changes, when non-pharmacological therapy fails
- according to DM type (DM1 - insulin dependent, DM2 - insulin non-dependent)

## 3) chirurgical intervention

- surgery of complications caused by diabetes
- bariatric procedures (obesity)
- cardiovascular and ophthalmological surgery (diabetic retinopathy)
- liver transplantation (renal failure), pancreas transplantation (DM1)

## Transplantation of pancreas

Transplantation of pancreas is surgical procedure, which replaces unfunctional patient's organ with severe form of diabetes with vital organ from suitable donor. He has an exceptional position among other organ transplants. It is performed mainly in patients with serious complications. The pancreas has two parts: endocrine and exocrine. The endocrine part contains the islets of Langerhans, which produce the hormone insulin, which is needed to regulate blood glucose levels. Many patients develop complications associated with vascular disease at a young age, such as diabetic retinopathy, nephropathy, ketoacidosis, diabetic coma, vascular diseases of the limbs (especially leg ulcers for a leg to necrosis, etc.), which can result in its loss.

### Recipient selection

Pancreatic transplantation is not an indication for all patients with diabetes. After transplantation, the patient must take with immunosuppressive therapy which reduces the recipient's defenses against the donor organ and significantly increases the risk of infections. It is necessary mainly for allotransplantations. It was assumed that it was appropriate to transplant the kidney first and only the pancreas later. Currently, the pancreas is transplanted at the same time as the kidney. They are obtained from the same deceased donor. The advantage of this procedure is that the recipient receives initial high-dose immunosuppressive therapy only once.

### Donor selection

- donors in 10 - 55 years of age
- without metabolism disorders
- minimal alcohol takings
- healthy lifestyle
- highest HLA match as possible

### Operation

We can transplant the whole pancreas or just just a part of it. Currently, it seems to be the most promising method of transplantation of the whole pancreas with the outlet of a part of the duodenum with a pancreatic outlet into the bladder. The digestive juice of the pancreas is drained into the bladder, and insulin enters the recipient's bloodstream by connecting the pelvic vessels of the recipient to the vessels of the donor organ. The pancreas is stored in the lower abdomen. The pancreas itself can be left. Although it does not produce insulin, it can secrete enzymes important for digestion. However, each operation has certain risks. The need for surgery and the benefit-risk balance of the operation for the patient must be considered.

### Advantages and disadvantages of transplantation

#### Advantages

- maintaining normal glucose levels without the need for insulin
- preventing or slowing the progression of complications associated with diabetes
- nerve damage does not worsen, sometimes even showing improvement

#### Disadvantages

- the host responds to the graft as foreign material, activates its immune system, and causes rejection of the

- replaced pancreas
- patients must take strong immunosuppressive therapy to prevent rejection
- immunosuppression has a number of complications

## Immunosuppressive therapy, complications

- azathioprine, mycophenolate mofetil, methotrexate, cyclosporine, cyclophosphamide
- therapy success rate 70-80%
- complications: rejection, metabolic disorders, more frequent urinary tract infections, abdominal infections and pancreatitis, bacterial and viral diseases, risk of tumor growth and others

## Langerhans islet transplantation

- islet extraction from the pancreas of many donors
- insertion of cells into the portal vein after rinsing in collagenase solution
- centrifugation
- local anesthesia
- does not require much intervention in the body
- still difficult to obtain viable cells

## Complication

- few donors
- immune system destroys cells - immunosuppressants!
- must be repeated
- insufficient number of cells

## Future

### BioHub

- a mini organ implanted between the layers of the omentum
- striving for natural insulin production
- contains true insulin-producing cells that are sensitive to blood sugar levels and releases the exact amount of insulin needed to control blood glucose
- limited to serious cases
- Obstacles: the need for a large number of cells for transplantation
- the need to take islets for a long time, without the need for immunosuppressants
- determining the optimal body location for transplantation

### Stem cells

- at the experimental level on mice
- patients would not have to be dependent on donors, the administration of immunosuppressants and the risk of
- progenitor cells would be introduced into the body and would produce mature insulin-secreting cells

## Links

<https://www.eurostemcell.org/diabetes-how-could-stem-cells-help>

<https://www.diabetesresearch.org/BioHub>

<http://www.diabetes.org>

<https://www.mayoclinic.org/tests-procedures/pancreas-transplant/about/pac-20384783>

[https://www.google.sk/search?](https://www.google.sk/search?q=biohub&espv=2&biw=1366&bih=662&source=Inms&tbm=isch&sa=X&ved=0ahUKEwjVx-rhoZDRAhUmAsAKHXjkCtwQ_AUIBigB#imgrc=5njX6BgYqTWBvM%3A)

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