CONSIDERATIONS ON ARTIFICIAL PANCREAS TRANSPLANTATION IN ROMANIA

Andreea Vancea1, Florica Mekeres2, Dalma Szatan1, Lavinia Tuscan1, Amalia Tarța1,
B. Tolaș1, Livia Todoruț1, Camelia Țăran1

1. University of Oradea
2. County Clinical Emergency Hospital of Oradea

CONSIDERATIONS ON ARTIFICIAL PANCREAS TRANSPLANTATION IN ROMANIA (Abstract): Introduction: Hybrid artificial pancreas is an insulin secreting tissue surrounded by a protective membrane against the post-transplantation immune reaction and it is used for the treatment of diabetes mellitus. Islet transplantation offers the advantages of a minimally invasive procedures compared with pancreas transplantation for people with diabetes type I. The purpose of transplantation is to implant enough cells needed for glucose control. The artificial pancreas act as a pump which continuously monitor the blood glucose level. Material and method: Artificial pancreas is inserted into the body between the skin and muscles around the pelvis to come into contact with the body. This device contains islets which are obtained by centrifugation with a pump from a cell extract from a pancreas of dead donor or from a living donor. Results and discussions: Artificial pancreas transplantation has recently become one of the most promising therapeutic way trying to improve glyco-metabolic control in patients with type I diabetes. The process for obtaining pancreatic cells is a complex one and involves counting the number of islands, the use of immunosuppressants and transplant nestereoidieni a considerable mass of 5,000 islands / kg body weight. Conclusion: Extracting pancreatic cells from a life donor present no risk for him, as is closer kinship chance of success is higher. Artificial pancreatic transplantation can restore endogenous insulin to the relatively long duration and also the level of glycemic control limits. Key words: ARTIFICIAL PANCREAS, DIABETES, GLYCEMIC CONTROL.

INTRODUCTION

The artificial hybrid pancreas is an insulin secreting tissue, surrounded by a semi-permeable membrane that protects it from post-transplant immune reactions. It is used in the treatment of diabetes mellitus. Islet cell transplants offer the advantages of a minim-invasive procedure in comparison with the transplant of the whole pancreas, for the persons with type 1 diabetes (1).

The main treatment for these patients is formed by numerous exogen insulin injections linked with a regular monitorization of blood glucose level. The therapy with exogen insulin can help in the prevention of long term diabetes complications and the introduction of insulin pumps in the clinical practice significantly increased the possibility of miming the endogen function of the pancreas. Despite of all the efforts, the wanted glucose levels can’t be reached at a reduced number of patients (2, 3). The first transplants of allo-grafic islets were made in 1990 and it proved a good evolution until 1999 (4).

There are 2 ways to perform a transplant: auto-transplant and allo-transplant. The auto-transplant is possible in the case of patients with pancreatitis and acute hypoglicemia. Allo-transplant can be used in the treatment of type 1 diabetes and in consists in the transplant of islet cells from a donor. Afterwards these cells are processed, purified and transferred to the patient (5).
The scope of this transplant is to implant enough cells for a good control of blood glycemic. The artificial pancreas function as a pump of insulin that permanently monitors blood sugar level.

**MATERIALS AND METHODS**

The artificial pancreas is introduced in our body between the skin and the muscle in the pelvis area to enter in contact with the organism. This device contain pancreatic cells (islets) which are the results of centrifugation with a pump, from an extract of pancreatic cells from a donor in brain death (6).

All this process consist in the qualitative evolution which assume contains of islets use of immunosupresors nonsteroidd and the transplant of 5000 islets/kg. For a person who has 70 kg is necessary a number of 350,000 islets to be transplanted from the donor. There is the possibility to multiply to obtain a lots of cells, more than initial (7).

The essential components are: a sensor of glucose, a measuring sensor for detecting the glucose lever in blood, the pump for determination the amount of insuline which must to be injected, an electronic microprocessor for the orders and control, electronic memory for program and data, insulin reservoir which is inside the device, batteries, screen and buttons for placing orders and the set of elements for the infusion (8).

In Romania, islet transplantation was successfully realized at the County Clinical Hospital Constanta, The Surgery and Transplant Clinic. The patient V.J., who was 34 years old in 2004, was originary from Constanta (9). He started developing symptoms approximately 3 months and a half before the surgery and he was admitted several times in the hospital’s ICU (Intensive Care Unit) where he had been diagnosed with pancreatitis. His general health was already deteriorating when the doctor added incipient diabetes to his diagnose. “Before the transplantation of the islets, the patient was passing glucose in his urine, he had lost weight and had severe abdominal pain. He presented with three times higher blood sugar levels than the normal : 290 mg% and now his organism was able to maintain it within the normal range : 98-102mg%” according to Professor Vasile Sarbu. Not this case in particular is special, but the fact that in Romania they were able to make cells with certain functions and insert them into a human organism where they can start working. This new technology could open a new era in treating patients with diabetes, but not just yet (9).

Another successful intervention regarding the transplantation of pancreatic cells was registered in Kyoto, Japan, 2005. In this case the pancreatic islets were collected from a living donor. A 56 year old women donated to her 27 years old daughter whom had been suffering from type 1 diabetes for 12 years, altogether with acute pancreatitis since the age of 4. The patientis treatment until the surgery consisted of 28 units of insulin per day. Under this aggressive treatment she suffered spontaneous hypoglycemic episodes which endangerd her life. During the procedure, the collected islets from the donor, were injected through a catheter into the venous system, from where they were transported to the liver through the portal vein. The transplanted islets migrate in the liver, grow and stars producing insulin and glucagon. As a result the patientis insulin treatment was gradually reduced and after 22 days she did not need exogen insulin at all (10).

**RESULTS AND DISCUSSIONS**

Islet transplantation has recently become one of the most promising therapeutic procedure trying improvement glyco-metabolic control of patients with type I diabetes.

The process of obtaining pancreatic cells is complex, involves counting the islands, using immunosuppressive nesteroidd and transplant of a considerable mass of 5,000 islands / kg.

An advantage of this process is the ability to multiply and obtaining pancreatic cells in a much greater number of cells than the initial one.

For diabetics in Romania it is important that already was tried and succeeded the transplant of pancreatic cells, this mean there is a hope for patients with Type I to a more effective treatment and the chance to opt out of daily injections of insulin.

Following the intervention of the transplant of pancreatic islets, some patients may become insulin dependent, some patients may acquire partial pancreatic function, while others do not respond to treatment because the pancreatic cells can be phagocytosed by the patient’s immune system (11, 12).
CONCLUSIONS

The procedure of cell islet transplant from the organs of the living donor is more beneficial than from a brain dead donor, according to Japanese researchers. Although this method is limited by deficiency of the matching organs. The risk factors of the donor’s health also have to be taken into account before performing the procedure.

The extract of islet cells from a donor doesn’t show any risk, the tighter the kinship between the donor and acceptor is, the greater the chance for a success is.

The transplant of pancreatic islet cells can reassure the endogenic production of insulin at a relatively long term and at the same time a glycemia level within the control limits.

Insulin independence can not be maintained for the rest of the life, but the transplanted cells that remain functional and the organism of the patients offers protection up against severe acute hypoglycemia events and at the same time much better levels of glycylsed hemoglobin.

REFERENCES


Corresponding author

Florica Mekeres
E-mail: mekeres_florina@yahoo.com