Insulin Pumps

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Diabetes is a disease in which the body does not produce or properly use insulin, resulting in high glucose levels in the blood. There are two types of diabetes, Type I, or juvenile -onset diabetes, and Type II, or adult – onset diabetes. Those with type 1 must take insulin through injections several times a day along with testing their blood glucose level. Those with type 2 can often control their blood glucose levels through a combination of diet, exercise and oral medication. Not monitoring blood glucose levels could result in blindness, heart disease, nerve damage, and poor circulation.

One method of controlling blood glucose levels is through the use of a insulin pump. An insulin pump is made up of a pump reservoir filled with insulin, a small battery operated pump and a computer chip that allows the user to control exactly how much insulin the pump delivers. It is all contained in a plastic case about the size of a beeper.

The pump reservoir delivers insulin to the body by a thin plastic tube called an "infusion set." Infusion sets come in 24 inch and 42 inch lengths and have a needle or soft cannula at the end, through which the insulin passes. The cannula is inserted just under the skin, usually on the abdomen.

The pump is intended to be used continuously and delivers insulin 24 hours a day according to a programmed plan unique to each pump wearer. The pump mimics the pancreas by giving a small amount of insulin continually (the "basal rate"). This insulin keeps blood glucose in the desired range between meals and over night. When food is eaten, the user programs the pump to deliver a "bolus dose" of insulin matched to the amount of food that will be consumed.

The Diabetes Control and Complications Trials, a study focused on blood glucose controls, formed two groups in order find the best method to control blood glucose levels. The first group controlled their blood sugar “conventionally”, with one to two injections daily. The second group controlled their blood glucose “intensively”, using insulin pumps to keep their sugar as close to normal as possible. The results of the study showed that those with better control of their blood glucose levels had tremendous decrease in their risk for the long-term complications of diabetes. An implantable pump is now available but still in clinical trials. Patients who have not responded well to intensive insulin therapy, including multiple daily insulin injections or an external pump, are primary candidates. This pump delivers insulin into the peritoneal cavity in short, frequent bursts or "pulses", similar to how pancreatic beta cells secrete insulin. In the future, researchers are working to develop an implantable “smart pump”, with glucose sensors that would precisely deliver insulin when levels get too high. While existing implantable pumps deliver a specific dosage at a specific interval, the goal is for the implants to more closely simulate the normal function of the pancreas by using glucose sensors and the predictive mathematical models. The sensors would assess the level of glucose in the blood and pass the information to the "algorithm." Based on the data, the algorithm would cause the appropriate action by the pump.