An Apple® a Day… Keeps the Endocrinologist Away?

A biomedical engineer was inspired to develop a "bionic pancreas" when he found out his son had Type I diabetes at only 11 months old. Maintaining control of blood glucose levels is extremely important for preventing morbidity and mortality associated with diabetes but is also extremely difficult for patients. A device that monitors glucose levels on a moment to moment basis and delivers insulin to patients without their assistance would be an astonishing transition in care for diabetic patients.

The bionic pancreas is a quarter size device implanted in the subcutaneous tissue that measures serum glucose levels every five minutes. This device has been described since the 1970s, but until recently people had to be monitored inside institutions while wearing the devices. Now with Apple®'s invention of the iPhone® researchers have been able to monitor patients in a recent study through Bluetooth® technology in their own environments. With this device patients will be able to have their blood glucose levels monitored automatically, without interrupting their day. The device is paired with an app on the iPhone that allows users to input types of meals (small, large, breakfast, lunch, etc.) and the device can deliver premeal boluses and basal injections of insulin, based off of automatic readings. If the device measures a low blood glucose it can also deliver glucagon.

A recent random order, crossover study published in the New England Journal of Medicine describes the results of 20 adults and 32 adolescents who used the bionic pancreas and compared it to their usual insulin pump. In the adult bionic pancreas study group over the 5 day study period, the mean plasma glucose was 138 mg/dl and the mean percentage of time with a low glucose level (<70 mg/dl) was 4.8%. With one day of automatic adaptation by the bionic pancreas the mean glucose level with continuous monitoring was lower during the bionic pancreas phase than during the control phase (133 ± 13 vs 159 ± 30 mg/dl, $p<0.001$). Low blood glucose levels were also not as prevalent in the bionic pancreas phase (4.1% vs 7.3% $p=0.01$). In the adolescent group the mean plasma glucose levels were also lower in the bionic pancreas phase (138 ± 18 vs. 157 ± 27 mg/dl, $p=0.004$). However, the percentage of time was similar in bionic pancreas and control group regarding time with low blood plasma glucose readings (6.1% vs. 7.6%, $p=.23$). Interventions for hypoglycemic events in the adolescent group were lower for the bionic group (1 per 1.6 days vs 1 per 0.8 days, $p<0.001$). The researchers concluded that the bionic pancreas improved mean glycemic levels with less frequent hypoglycemic episodes compared to their usual pumps in adult and adolescent patients with Type I diabetes.

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