



## Different Methods of Insulin Injection

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Insulin was one of the utmost medical discoveries of the last century. Patients with Type 1 Diabetes Mellitus and many patients having long suffering Type 1 Diabetes Mellitus require insulin therapy to obtain good glycemic control. Insulin is a hormone. It has peptide nature, and easily destroyed by gastric acid if taken orally. Intradermal absorption of insulin is not consistent, and it cannot mimic physiological insulin secretion. In addition, self-administration of insulin via different routes namely intradermal, intramuscular and intravenous therapy is not suitable for each day. So subcutaneous route is widely preferred way for administration of insulin because by this route it can be self-administered. Although it has limitations like pain at site of injection, lipodystrophy, noncompliance by the patient, etc. The newer strategies of hormone delivery aim to deliver hormone with lowest invasiveness in a correct and precise manner and to cut back patient burden. This information focuses on the development of the past and present methods to deliver insulin with a perspective on anticipated developments.

Insulin injections are usually taken at often regular times throughout the day. Syringes or insulin pens are injections and both serve the same purpose [1]. As per some individuals the pen to be a lot of convenient after they solely want one kind of insulin hormone. These provisions led to the development of insulin pens. Insulin injections in vial and syringe are restricted by inconvenience and inaccuracy in preparing the dose. The newer insulin pens are used again, more correctly and equipped with safety characteristics such as easy to hear with each dose to improve accuracy. They reduce the chances of human errors. This seems to be a pen with cartridge. Some of these devices use replaceable.

Recently designed pen needles are shorter and thinner, less painful and requires less thumb force at the time of injection and time to inject insulin guide the individual with insulin requiring diabetes about the insulin dosage, memory functions to remember the amount and time of insulin dosage and automatic transmission

of insulin dose to the mobile logbook through Bluetooth technologies resulting in improved patient satisfaction [2]. Insulin pumps are alternatives of insulin injections. It is a computerized device, about the size of a beeper or pager, often worn on a belt or in a pocket. By the pump one can delivers never-ending low dose of insulin hormone through a tube that attaches to the body through a little needle inserted into the skin. The benefits area unit bigger flexibility with meals, exercise, and daily schedule, improved physical and psychological well-being and management of blood sugar levels.

Another device, Jet injections are used for persons having diabetes and having fear to tolerate needles. The injector holds many insulin doses. To administer a dose, the patient merely holds the injector against the skin, pushes a button, and a jet of air forces insulin through the skin. But the injector may cause staining. They are restrictly used as other types of insulin delivery [3].

Insulin delivery to the lungs by aerosol is the alternative to subcutaneous injection of insulin. It has long been appreciated; this insulin delivery reduces blood glucose. Advantages of the pneumatic route include a huge and well perfused absorptive surface, absence of certain peptidases enzymes that are present in the gastrointestinal tract that breaks down insulin, and the ability to bypass the "first pass metabolism". Though, the exact mechanism of insulin absorption across the pulmonary epithelium remains ambiguous, but it is believed to involve transcytotic and paracellular mechanisms [4].

In year 2006, US FDA approved the first inhaled product, Exubera. It was a dry power formulation available as 1 mg and 3 mg doses. The powder is taken with the help of an Enhance inhaler device. It has pharmacokinetic and pharmacodynamics properties are similar to insulin apart with a quicker onset of action (10 - 15 minutes). In clinical trials of patients with uncontrolled Type 1 dia-

betes mellitus and Type 2 diabetes mellitus, this powder was found to reduce postprandial blood glucose and glycosylated haemoglobin significantly. This product did not do well commercially despite the non-invasive route possibly due to higher cost, the bulky delivery device, concerns related to declining in pulmonary function, and less preference by the patients and physicians. In 2007, this product was withdrawn from the market by Pfizer.

Trans-dermal delivery of Insulin removes the problems associated with needles and injections and large surface area of the skin makes it a convenient route for insulin delivery. However, the penetration of insulin is halted by the stratum corneum, the outer most layer of the skin. Additionally, microneedles with 1 µm diameter and of various lengths can deliver insulin in effective, accurate and precise manner. Microneedle technology also can be combined as a skin patch. The transdermal insulin delivery techniques are limited by skin injury, burn or blister formation and rarely significant pain and discomfort. These technologies are still included and their long-term utility, safety and usefulness are not known at present [1].

There is a protracted history of analysis that specialize in distinctive a route of administration for insulin that's minimally or non-invasive, effective, safe, convenient and efficient for patients. Every route and delivery methodology has its own potential benefits and drawbacks. However, if prosperous, various routes of administration may revolutionize the treatment of diabetes and facilitate improve patients' quality of life. Though to overcome the restrictions of current insulin therapy researcher are looking to deliver insulin by an artificial pancreas.

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