

1.4.3. Alternative routes for insulin administration

Since the introduction of insulin therapy 85 years ago, subcutaneous injections have been the only route of delivery of insulin therapy to diabetic patient. During this time, numerous researches have been made to explore alternative routes for systemic insulin administration, but little has changed about the way insulin is administered (Figure 1.2). The traditional and most predictable method for administration of insulin is by subcutaneous injections. To decrease the suffering, the use of supersonic injectors, infusion pump and pens has been adopted (Yaturu, 2013). Insulin pumps are medical devices designed to deliver measured amount of insulin into patient's body in a controlled manner. Advances in insulin-infusion pumps have extended from the earlier, relatively bulky, external continuous subcutaneous insulin-infusion devices, to the present smaller, lighter and more reliable variable-rate pumps, which have improved catheters and inbuilt alarms. Evidence indicates that patients with problems such as frequent, unpredictable hypoglycemia could benefit from this approach. Implantable insulin pumps have also been in development (Tyagi, 2002). Insulin pens more discreet compared with vials and syringes. Insulin pen is a small pen-shaped device with small needle that can deliver exact amount of insulin to patient's body. Insulin pens combine the insulin container and the syringe into a single modular unit and eliminate the inconvenience of carrying insulin vials and syringes are more accurate and less painful (Perfetti, 2010).

The quest for a noninvasive route for delivery of insulin was attempted as early as 1925. Various noninvasive routes have been investigated including transdermal, nasal, pulmonary, rectal, oral, buccal, and vaginal (Kumria & Goomber, 2011).