

AFREEZA (INHALED INSULIN): A PRICK LESS INSULIN EFFECTIVENESS

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ABSTRACT

Reporting a large number of side effects from the subcutaneous administration of the insulin, a new approach to administer insulin through inhalation was emerged in the era to reduce the phobia of needle prick. This review is done with a view to assess the efficiency of the Afreeza as compared to the other rapid acting insulin. Reviews were identified by using the search engine i.e. Pubmed, google scholar, research gate data base, papers that are published in English are included. After reviewing the article it is postulated that the non invasive method of delivering insulin through pulmonary route prove to be effective as compared to subcutaneous route. As the side effects are common but the rate of absorption is quite fast which has a positive effect in lowering the post prandial blood glucose level.

Keywords: Insulin, Afreeza, Non Invasive, Inhalation, Pulmonary.

INTRODUCTION

Diabetes is a condition which results from an improper metabolism of carbohydrates and glucose as a result of the beta cells of pancreas failure to react to or generate the hormone insulin. There is no discrimination from diabetes in terms of age, colour, or gender. Concern has spread around the world over the rising human and financial costs of diabetes. In addition to the worrisome rate of increase in the population affected, the principal forms of the disease start at young age groups. The effects of diabetes mellitus surpass the typical short-term metabolic and long-term vascular ramification. They also increase the risk of a wide range of other conditions, such as Dementia, hepatic failure, uncontrolled cell growth, bone fractures, depression, and impairment of hearing.

Inadequate collaboration between healthcare professionals and a lack of training for healthcare professionals regarding the advancement of diabetes treatment plans are two important contributing factors to the poor health care management of these patients, which is why there is a rise in the count of individuals with diabetes mellitus.

Insulin is considered as one of the most important & widely accepted pharmacological management for Diabetes Mellitus.

Discovery of insulin was dated back to 1922 and the first time it is administered to the human. In 1930 a protein called protamine was discovered by Hagedron of Denmark & stated that when it mixes with insulin the action of the medicine last for a long period of time. In 1946, insulin known as isophene was discovered and later it is known as NPH (Neutral Protamine Hagedron).

In 1951 Hallasmoller with his colleagues illustrated that long acting insulin can be obtained by crystallizing the insulin with zinc ion and the preparation termed as "Lente" which is slow-acting insulin.

Nicol & Smith also contributed to the work by developing Human insulin from the pancreas of the cadaveric human.

In 1978 David Goeddel used Escherichia coli for the preparation of the first recombinant DNA human insulin .

In 1983 Moses et al & in 1985 Saizmann et al proposed intranasal vaporized form of insulin which was failed. In 1996 the first insulin analog which is of short acting named "lispro" was prepared followed by aspart in 2000, & glusine in 2004.

In 2006 Sanofi-Aventis & Pfizer prepared an elective conveyance strategy ,for delivering insulin through inhalation & termed it as " exubera" but it is failed after 1 year as it does not contributed in the physiologic benefits for the patient. Since from the decades the most adopted route for administering the insulin is through subcutaneous route but as the technology advances new method for administering insulin was invented and the method was "inhalation " means no prick is required.

BACKGROUND

There are number of insulins available in the market ranging from its long acting action to the rapid acting action depending on the level of the blood sugar. The insulins are classified on the basis of time course, agent, onset, peak & duration.

In rapid acting the agents are Lispro, Aspart, Glulisine having its onset within 5-15 minutes, reaches its peak in 1 hour and had its action for a period of 2 – 4 hours.

In short acting the agents are Regular insulin (Humulin R, Novolin R) having its onset within 30-60 minutes, reaches its peak within 2-3 hours and act for a period of 4-6 hours.

In intermediate acting, the agent were NPH (Neutral, Protamine,Hagedron) having its onset within 2-4 hour, reaches its peak in 4-12 hours and remains for 16-20 hours.

In very long acting , the agents were Glargine, Detemir having its onset in 1 &6 hour, having continuous peak point and remains for 24 – 36 hours.

Afreeza (Technosphere Insulin powder), an vigorous acting sniff in insulin, received approval from the authority of US Food and Drug Administration on 27/06/2014, with the goal of enhancing postprandial glucose regulation in individuals with type 1 diabetes mellitus. Compared to three currently available fast acting insulin clones i.e. insulin aspart, insulin glulisine, and insulin lispro, this is the only vigorous -acting insulin available with faster pharmacokinetics and pharmacodynamics.

METHODOLOGY

Studies were recognized by using various search engine (pubmed, google scholar, research gate) data base, articels published in English were included.

The search term that are used were, technosphere inhaler , Afreeza, pulmonary insulin & inhaled insulin.

Lutz Heinemann & Christopher.G. Parkin (2018) conducted clinical study on “Rethinking the viability & utility of Inhaled Insulin In Clinical Practice” the study shows that subcutaneous administration of insulin cover the pre and post meal glucose level but it is not achieving the pinned level of post prandial glucose control. Whereas the administration of technosphere inhaler(Afreeza)pulmonary administration proved reduction with less hypoglycemia and prove to be secure method of treating diabetes mellitus.

Naseer Mikhail (2017) conducted a review article on “Place of technosphere inhaled insulin in treatment of diabetes” and shows that even though it has some curb, technosphere inhaler represents a useful adjunct in the management of diabetes. Ease of administration, non-invasiveness, is a major advantage for injection-averse patients. TI is proved to be best than the subcutaneous insulin clone Aspart but this is associated with decreased rate of causing after meal hypoglycemia and weight gain. Cough proved to be a hindering factor in TI and occurs primarily in initial treatment.

Tracy L Shethji et al (2016) conducted a drug evaluation on “Technosphere insulin :inhaled parandial insulin” Technosphere insulin are absorbed faster as compared with insulin therapy given through injection and have a transitory course of action. It does not appear to be inferior to insulin therapy given through injection as well as less clubbed with low glucose level.. Therefore, in patients who do not wish to receive multiple subcutaneous insulin injections daily or who develop late postprandial hypoglycemia due to subcutaneous insulin, for them inhaled insulin therapy is recommended which shows its efficacy and faster mode of action with less side effect.

G.P. Annastioss et.al(2015) governed a standardized review & meta analysis on “Efficacy, safety, and patient acceptability of Technosphere inhaled insulin for people with diabetes”. Inhaled Technosphere insulin has a lower glycemic effect than insulin injection, but aerosol insulin is associated with harmless extreme hypoglycemia and increase in weight. The constant results and assurance of inhaled insulin need additional investigation. Mean while safety results are accessible, Snif in insulin (Afreeza) is recommended for the individual who refuse to take insulin injection with no co morbidities and who delay initiation or escalation of insulin therapy without pulmonary disease.

David c, cloneff (2014) conducted a review on “Afreeza Inhaled Insulin: The Fastest-Acting FDA-Approved Insulin Has Favorable Properties shows that the ultra-fast-performing inhaled insulin technosphere inhaler (Afreeza) helps to boost after meal glycemic control in individual with diabetes, specially the simplest & extremely-fast-performing insulin available on the store with quick pharmacokinetics and pharmacodynamics than the other three speedy-performing insulin analogs presently available on the store, which are insulin aspart, insulin glulisine, and insulin lispro.

DISCUSSION

In the therapy of the Diabetes, the most acceptable & approved pharmacological therapy is insulin. Insulin available on the basis of its onset, duration of action, but the route of administrating it is through subcutaneous only. As the recent advancement was made a new approach of delivering insulin named “Afreeza” was launched with inhalation route proved effective as compared with categories other

Other insulin of its categories which are having subcutaneous route of administration. A similar study was done by Mannkind corporation in December 2019. A total of 375 adults with type 1 diabetes will be given inhaled insulin and concluded that the adults who are given Afreeza shows decrease in the blood glucose level as compared to the adults who are given insulin aspart. The study shows that due to the distinctive pharmacokinetic & pharmacodynamic properties of Afreeza, it is related with the highest rate of absorption within 30-60 minutes post prandial and beneficial in reducing the blood glucose levels within minutes of administration.

Though Afreeza “Technosphere Inhalation” is beneficial as its route is non invasive but it is also associated with the side effect like decline in pulmonary function, acute bronchospasm & trouble breathing are notify which delays or worsen the effect of the insulin and the use of the inhalation insulin is not shows any evidence of using in special population like pregnant lady, nursing mothers, pediatric and the individual with other co morbidities. A similar article review was done by Loretta Fala in his article Afreeza (Insulin Human) Inhalation powder for treatment of patient with type 1 or type 2 diabetes and found that bronchospasm was notified in the patient with respiratory problems when given inhaled insulin. So it is also advised in the article that before starting the therapy patient is advised for spirometry and is not advisable for the people with chronic lung disease. Other symptoms also developed in the patient who are taking inhaled insulin that after starting the treatment there is a reduction in the pulmonary function was notified specifically after a period of 6 months of administration. Fala also mentioned that the safe and effective use of the “technosphere inhaler” is not verified for the certain group of the patient like pregnant mothers, mothers who are breast feeding their children, special groups like geriatric and pediatric age group and also the patient with previous history of liver and kidney impaired function.

CONCLUSION

The treatment of diabetes remains the more challenging and depend on the comprehensive care approach. Apart from using insulin, modification in the diet, exercise and reduction in the stress also plays a key role in its management. Advancement in the technologies gave rise to the new route of insulin administration i.e. inhalation. It proved to be beneficial to the patient who do not want to prick themselves daily for taking insulin or it is prick less method for insulin delivery. Rate of

absorption is rapid from pulmonary to systemic circulation and effective in lowering the after meal blood sugar level as compared with insulin aspart.

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