Review Article

INSULIN MEDIATED LIPOHYPERTROPHY

ABSTRACT:

Insulin is used to treat diabetes type 1 and 2.Lipohypertrophy (LH) is a typical side effect of insulin therapy in subcutaneous tissue. Several injections at the same place result in this problem. A potential underlying mechanism of lipohypertrophy is the production of insulin antibodies. Recognizing and effectively managing these problems are crucial. In order to detect mild forms of lipohypertrophy, every patient should have their lips thoroughly evaluated for the condition during a diabetes clinic evaluation. The best current preventative and therapeutic approaches for lipohypertrophy are non-reuse of needles and rotation of injection sites with each injection.Education for both doctors and patients on recognising and treating ~~with~~ lipohypertrophy is advisable.

Comment [DK1]: Kindly clarify what this means or it's a typo - lips

KEYWORDS:

Diabetes, Insulin, Lipohypertrophy.

INTRODUCTION:

Cells can take up glucose, a sugar, from the blood thanks to the chemical messenger insulin. By promoting cellular glucose absorption and regulating carbohydrate, lipid, and protein metabolism, insulin, a peptide hormone released by the pancreatic islets of Langerhans cells, maintains appropriate blood glucose levels. It has 51 amino acids and is actually a dipeptide made up of A and B chains. When there is insufficient production or elevated insulin demands in the body, medical treatment with insulin is advised..[1]

Insulin is classified as rapid acting, short-acting, intermediate-acting, and long-acting depending on how long it takes to take effect.

- Lispro and Aspart are examples of rapid-acting insulins that begin working within 5 to 15 minutes.
- Regular insulin, which is short-acting, begins to work in 30 to 40 minutes.
- The activity of intermediate-acting insulins (NPH) begins within one to four hours.
- Long-acting insulins, such glargine and detemir, begin to work within an hour or two.[2]

The main condition that insulin is used to treat is diabetes mellitus. In Type 1 or juvenile diabetes mellitus, the body's immune system or trauma or injury to the pancreas destroy pancreatic beta cells, which results in diminished or nonexistent insulin production. In those with type 1 diabetes, insulin is always necessary.[3]Type 2 diabetes mellitus is the most common type of diabetes and usually occurs after the age of 45 years.The exact cause of this is unknown, but factors such as genetic, obesity, metabolic syndrome, or sedentary lifestyle play a role. As the pancreas secretes more insulin to try to get glucose into the cells, they eventually burn out, and glucose starts building up in the blood. Treatment with insulin is necessary for the later stages of type 2 diabetes.

Adverse effects of insulin classify according to those caused by the drug itself and those caused by the specific route of administration. Hypoglycemia is, by far, the most common adverse effect of insulin therapy.[4] Hyperglycemia symptoms include frequency urge to urinate, excessive thirst, unusual hunger, headaches, weight loss, dizziness, trouble speaking, confusin, pale skin sweating, seizure, loss of consciousness.[5,6] The other adverse effects of insulin therapy include weight gain and rarely electrolyte disturbances like hypokalemia, especially when used along with other drugs causing hypokalemia.The subcutaneous route of administration also has adverse effects. Pain at the injection site, lipodystrophy at the injection site are the most common adverse effects of daily subcutaneous injections.[7]

In diabetic patients, lipohypertrophy (LH) is a typical side effect of insulin therapy in subcutaneous tissue. On the skin's surface, it appears as soft, benign nodules [8]. Insulin's lipogenic effect at the injection site and repetitive stress from administering insulin at the same location are linked to the development of LH. The local inflammatory response, increased local

fibrosis, and decreased vascularity are likely to blame for the poor insulin absorption from the afflicted areas [9,10].

Several injections at the same place result in this problem. Patients frequently repeat injections in the same region since it is less painful than switching to a new unpleasant site. Type 1 diabetes, which requires longer-term insulin therapy, a large number of insulin injections, the reuse of needles (with a considerable increase if used more than five times), and the use of pen devices are other potential risk factors. A potential underlying mechanism is the production of insulin antibodies. [11,12]

Recognizing and effectively managing these problems are crucial. A medical professional should check injection sites at least once a year for any signs of lipohypertrophy or lipoatrophy. People should be told to refrain from injecting into lipohypertrophic areas until the aberrant tissue has returned to normal. The best current preventative and therapeutic approaches for lipohypertrophy are non-reuse of needles and rotation of injection sites with each injection. [13] It has been demonstrated that switching to humanised rapid-acting insulin will lessen this adverse effect since adipocytes are only briefly in contact with the insulin, minimising any local lipogenic effects.[14] If more cautious measures are unsuccessful, liposuction is a good fallback.Even though these lesions may spontaneously regress, it has been discovered to be advantageous to administer insulin injections coupled with tiny doses of dexamethasone. [15]

DISCUSSION:

Skin-related side effects from insulin therapy include lipoatrophy, lipohypertrophy, edoema, and allergies.[16] Patients who utilised porcine or bovine insulin experienced lipoatrophy, which is the loss of subcutaneous fat at the site of insulin injection. Due to the use of highly purified recombinant human insulin, this problem is now uncommon. The most frequent cutaneous complication, known as lipohypertrophy, is characterised by a tumor-like swelling of the adipose tissue near the sites of subcutaneous insulin injection. According to various studies, the prevalence of Type 1 diabetes ranges from 27 to 49%, and that of Type 2 diabetes is 4%. (17,18,19,20,21)

The type 1 diabetes in children and young adults administered the insulin at the same site which lead to lipohypertrophy and lipoatrophy which sometimes lead to decreased blood glucose levels and major complications like retinopathy and motor neuropathy. The Type 2 diabetes in an elder women administering insulin at the similar site caused bilateral lipohypertrophy.(22,23,24,25,26)

Due to the convenience of these locations for injection and the fact that the patient's hands naturally reach these areas, lipohypertrophy usually arises on both sides of the umbilicus or in the mid-thigh regions.(27) Sites are frequently asymmetrical because the dominant hand preferentially injects one side. The patient eventually experiences less discomfort while injecting the same location as the area becomes hyposensitive, which results in irregular insulin absorption

and poor glycemic management. (26,28,29,30) It is generally accepted that the pathophysiology of insulin-induced lipohypertrophy is caused by the lipogenic effects of insulin, which cause adipocytes to grow and hypertrophy as a result of the stimulation of preadipocyte proliferation and differentiation. (26)

The incidence and prevalence of diabetes are rising alarmingly, and as a result of the oral hypoglycemic drugs' failure to control blood sugar, the focus of treatment has shifted to using insulin, even though this has also led to novel complications. A total of 38% of patients in the United Kingdom Prospective Diabetes Study (UKPDS), whose participants were followed for more than ten years, needed insulin to bring their fasting plasma glucose levels down to 6 mmol/L. (31)

Patients who did not use larger injection sites, regularly rotate their insulin injection sites, administer conventional premixed insulins, and were underweight are more likely to experience lipohypertrophy. Further, needle reuse and frequent injections (basal-bolus regimen) did not increase the likelihood of lipohypertrophy. (32)

CONCLUSION:

Despite technological advancements, insulin-induced lipohypertrophy continues to be a prevalent but underappreciated cause of poor glycemic control today, in the past, and in the future. In order to detect mild forms of lipohypertrophy, every patient should have their lips thoroughly evaluated for the condition during a diabetes clinic evaluation. If local insulin injection is carefully avoided, lipohypertrophies are frequently reversible. They can also be avoided by adhering to proper injection technique with systematic site variation. The most important and modifiable factors for reducing insulin-related lipohypertrophy in patients with type 1 diabetes are rotation of injections across a vast area and usage of rapid plus long-acting insulin analogues. Education for both doctors and patients on recognising and treating with lipohypertrophy is advisable.

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