

The assemblage of skin findings in the type 1 DM with incorrect injection technique: A case report

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ABSTRACT

Correct insulin administration technique, insulin type, and dose play a pivotal role in attaining glycaemic control. An error in any of the steps may lead to poor glycaemic control, which affects the patient in the short and long term. We are presenting here unusual skin findings in children with the wrong injection technique. A 10-year-old male child already diagnosed with type 1 Diabetes Mellitus (DM), presented with poor glycaemic control. On examination, we found skin rashes encircling most of his abdominal area circularly. Rashes were round to oval, well-circumscribed, hyperpigmented to hypopigmented to depigmented macules to papules surrounded by a hyperpigmented halo, 0.5 to 1 cm in diameter, painless varying in color from white to pinkish-red to light brown to brownish-black. On observing the administration technique of insulin, we found it was administered incorrectly as intradermal instead of subcutaneous. Proper Diabetes education and insulin administration techniques remain the cornerstone in the management of type 1 DM. We should ensure appropriate insulin administration on every visit.

Keywords: Injection technique, insulin administration, type 1 DM

Background

Type 1 Diabetes Mellitus is a disorder of reduced production or absence of endogenous insulin and dependence on exogenous insulin to manage and prevent its complications. Type 1 diabetes accounts for about 5% to 10% of all patients with diabetes. It is the most diagnosed diabetes in youth (under 20 years of age) and contributes to $\geq 85\%$ of all diabetes cases in this age group worldwide.^[1] The incidence and prevalence of Type 1 DM are suspected to be high in India, but due to the absence of a nationwide registry, one cannot be sure of the exact numbers. The Diabetes Atlas 2017 estimates 128,500 children and adolescents with diabetes in India.^[2] The administration of insulin is the cornerstone in the management of type 1 DM. Correct insulin

technique and the right insulin type and dose play a pivotal role in attaining glycaemic control. An error in any of the steps may lead to glycaemic variability, leading to hyperglycemia or Diabetic ketoacidosis, or hypoglycemic episodes affecting the patient in the short and long term.^[3] Hence counseling on the part of physicians plays a significant role in managing diabetes mellitus type 1. We are presenting a case of type 1 DM who was being administered insulin intradermally instead of the subcutaneous route, leading to poor glycaemic control and unusual skin rashes at the injection site. After proper education with the correct injection technique, his glycaemic control improved with rashes disappearance. This case highlights the importance of patient education and counseling by primary care physicians for proper insulin administration.

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Case Report

A 10-year-old male patient already diagnosed with type 1 Diabetes Mellitus presented to our hospital with poor glycaemic control. The

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patient developed symptoms of polyuria with nocturia associated with polydipsia six months back. Initially, the mother thought polyuria might be secondary to polydipsia. Later, his mother got suspicious after noticing that ants were getting attracted to urine, and General Practitioner consulted the patient for the same. He was diagnosed with Diabetes Mellitus Type 1 and was started on premixed insulin (70/30) subcutaneously twice a day. At the presentation to our hospital, the mother's main concern was poor glycemic control. His initial complaints of polyuria and polydipsia were not a concern as it was relatively less, and there were no symptoms and signs suggestive of diabetic ketoacidosis. There was no family history of Diabetes Mellitus. He was vitally stable, and systemic examination revealed no abnormality. His blood sugar monitoring was done infrequently, mostly once every day or alternate day, due to fear of needle prick. His blood sugar readings were in the hyperglycemic range. On further examination, we found skin rashes encircling most of his abdominal area circularly. Rashes were round to oval, well-circumscribed, hyperpigmented to hypopigmented to depigmented macules to papules surrounded by a hyperpigmented halo, 0.5 to 1 cm in diameter, painless, varying in color from white to pinkish-red to light brown to brownish-black [Figure 1]. There were also a few erosions and crusted plaques. New lesions were pinkish-red, while older lesions were either brown or white.

On further probing, we got to know that the insulin given was correct in type as prescribed with the appropriate dosage, and the storage condition was also adequate, but the administration technique was faulty. On observing the administration technique, the insulin was being given parallel to the skin over the abdominal surface, raising a bleb of about 0.5 to 1 cm, making the procedure faulty. It was delivered intradermally instead of subcutaneously. The glycemic status range of the patient at presentation was as follows: fasting blood sugar (FBS)-185 to 200 mg/dl and postprandial blood sugar (PPBS) – 220 to 270 mg/dl with urine glucose 2+ on the dipstick without ketonuria. There was normal arterial blood gas (ABG) with an HbA1C value of 7.6%. The disease's pathophysiology and natural history were explained to the child and his parents, including the importance of regular glucose monitoring with proper record maintenance. The patient was started on a Basal bolus regime (injection glargine and injection as part via prefilled pen with 4mm long needle). The proper subcutaneous injection techniques over the abdomen and



Figure 1: Hyperpigmented to hypopigmented macules to papules surrounded by a hyperpigmented, following intradermal insulin injection

thighs, and upper arms in a rotatory pattern were demonstrated. Parents were made to administer insulin under supervision to gain confidence and do not repeat the faulty technique. Dietary counseling was done, and a diet chart was provided based on patient preference and accessibility of foods. They were explained the benefits of better glycemic control and were counseled regarding immediate management of hypoglycemia, and were provided with sick day guidelines. They were also equipped with a doctor's contact number in case of emergency. Over the follow-up visits over the next two to three months, his skin rashes started to disappear, and the patient attained better glycemic control. The patient and his parents attained confidence in managing the disease.

Discussion

The most common complication of insulin injection was Lipohypertrophy, as reported by a worldwide injection technique questionnaire study. Insulin injection over the lipohypertrophied site leads to poor insulin absorption leading to variability in glycemic control.^[4]

Health care personnel plays a crucial role in that there should not just be the verbal transfer of information; they must employ the principle of “Therapeutic Education,” which must be patient-centered and varies from patient to patient. Patients and parents must actively participate in management. It also takes into account the whole array of social, psychological, and biological factors. It focuses on motivational factors, bringing changes in the disease and management aspect better and, therefore, bringing changes in behavior, helping patients in the short and long term.^[5]

In our case report, the mother was actively participating in the management. Due to faulty insulin technique, the patient developed unusual skin rashes with poor glycemic control. Patients and parents were given proper diabetic education and were taught to administer insulin subcutaneously, and correctness of administration was ensured during the hospital stay and on every visit. This highlights the importance of proper education and repeated demonstration if required, as understanding may vary from person to person. One should ensure appropriate insulin types, doses, and techniques at every visit as it may jeopardize patient health. Formal diabetes education will also help parents and patients in gaining confidence and better management of the disease. There are other methods like double-checking procedures and computerized protocols that were also found to be effective strategies for reducing insulin errors.^[6]

There are very few related case reports. Sawatkar *et al.*^[7] reported hyperpigmented rashes encircling the abdomen attributed to blunt trauma due to repeated use of needles. Sahasrabudhe *et al.*^[8] reported lipohypertrophy with scars that were attributed to the intradermal injection of insulin.

In our case report, the patient presented with skin rashes, which were different from the above two case reports. It varied from hyperpigmented to hypopigmented macules to papules due to

intra-dermal insulin injection. A skin biopsy would have been helpful to find out the exact etiopathology of these skin rashes, which could not be done in our case.

Conclusion

Proper Diabetes education and counselling remain the cornerstone in the management of type 1 DM. Primary care physicians and paediatricians taking care must also ensure appropriate insulin administration on every visit. If required, they must demonstrate adequate insulin administration techniques. Such small steps may help the patient and family in long-term management.

Learning points

- This is the unusual skin manifestation of intradermally injected insulin.
- It highlights the importance of Diabetic education and demonstration of proper injection techniques.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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