

# Unexplained Persistent Hyperglycaemia in a Type I Diabetes Patient - Is Injection Site Lipohypertrophy the Cause?

RANJANA AJIT SAHASRABUDHE<sup>1</sup>, TEJAS YASHWANT LIMAYE<sup>2</sup>, VIDYA SANJAY GOKHALE<sup>3</sup>

## ABSTRACT

Type I diabetes patients depend on insulin injections. Proper injection technique is essential for good glycaemic control. Incorrect technique can also lead to local injection site adverse effects, commonest being lipohypertrophy. Hypoglycaemia, by far the most dreaded adverse effect of insulin, receives utmost focus in management of patients on insulin. Lipohypertrophy, on the other hand, is a relatively neglected adverse effect. It is necessary for health care providers to realize that it can also have serious clinical implications. We present a case of persistent unexplained hyperglycaemia in a Type I Diabetes Mellitus (T1DM) patient with severe injection site lipohypertrophy. After switching to normal unused sites, her blood sugar levels improved, along with reduction in insulin requirement. The case highlights the importance of continuous patient education and alert monitoring by health care providers.

**Keywords:** Insulin injection technique, Patient education, Site rotation

## CASE REPORT

A 17 year old female patient had been diagnosed to have T1DM at the age of 10 years. She was on twice daily insulin (10 units regular insulin + 12 units premixed insulin (30/70) before breakfast and before dinner). She used mainly thighs and sometimes abdomen for taking injections.

She gave history of persistently high blood sugar levels for more than a year, despite regular diet and insulin. Paradoxically, she also had episodes of hypoglycaemia about 6-8 times a month, with blood sugar dipping to 55-70mg%. Cost of strips did not permit adequate daily Self Monitoring of Blood Glucose (SMBG). Her fasting blood glucose ranged from 80 to 200mg% and postprandial was 200 to 300mg%. HbA1c tested nine months earlier was 8.6%. The glycaemic excursions were being attributed by her Health Care Providers (HCPs) to presumed noncompliance for dietary recommendations. As she was reprimanded for the same during follow-up visits to the clinic, she tended to avoid the follow-up appointments.

On examination, both thighs showed massive lipohypertrophy on the unusual antero-medial aspect of thighs [Table/Fig-1a]. Abdomen also showed evidence of repeated use of two restricted regions on either side of the umbilicus, but the changes were less marked.

Patient gave history of using the lateral aspects of thighs for initial two years, when her mother had been giving injections. Since this area became stiff and difficult to inject, the patient had started using the antero-medial aspect of thighs since five years and continued to do so in spite of the evident hypertrophy.



**[Table/Fig-1a,b]:** Injection sites showing lipohypertrophy on antero-medial aspect of thighs a: Massive lipohypertrophy at visit 1 b: Reduced lipohypertrophy six months after discontinuing the use of this site.

**Action taken:** Through in depth interview, we explored her perceptions and reasons for continued use of these obviously hypertrophied sites in spite of the embarrassing appearance. Major reason that emerged was less pain of injection at these sites, the so called 'HAPPY POINTS'. Discussion with fellow patients had also made her accept it as an inevitable consequence of years of use of insulin. She was unaware that it was an avoidable effect compromising insulin absorption and could be the cause of erratic blood sugars despite reasonable adherence to recommended routine. The interview also revealed that, though told at diagnosis to rotate the injection sites, follow-up visits mainly focused on blood sugar control, with no emphasis on this aspect of insulin administration.

	Visit 1	Six months after change of site
BSL mg%	F: 80-200; PP: 200-300	F: 80-100; PP: 90-110
HbA1c	8.6%	7.1%
Insulin – Total daily dose	44 U	30 U
Hypoglycaemia episodes	6-8/month	3-4/month

**[Table/Fig-2]:** Glycaemic parameters of the patient at visit 1 and six months later.

The patient was explained that injection in sites with lipohypertrophy compromises absorption of insulin [1], which in turn is responsible for the wide excursions in blood glucose with high postprandial levels as well as multiple episodes of hypoglycemia [2].

She was told to avoid the affected part completely and switch to the then unused normal areas. She was taught a systematic method of rotating the site of injection and a proper method of glucose monitoring to suit her budget; yet give useful information to help tailor her doses for optimal glycaemic control.

**Follow-up and Outcome:** Six months after switching to unaffected sites with methodical site rotation and appropriate SMBG, lipohypertrophy was reduced significantly [Table/Fig-1b], with no new manifestations. Her glycaemic control was improved, necessitating 31.8% reduction in insulin dose [Table/Fig-2]. Hypoglycaemia episodes, though reduced, still remained a concern and were being addressed by her and her HCPs by further fine tuning of insulin doses.

## DISCUSSION

Patient education is imperative for optimal management of diabetes [3], more so in patients with T1DM, as these patients depend on insulin injections. Various global and national forums have defined guidelines for correct injection technique [4,5]. They emphasize the need to rotate injection sites. Most clinics do include these guidelines as an essential component of patient education at the initiation of insulin treatment. However, as reported by our patient, subsequent follow-up visits mainly focus on glycaemic control, with very little emphasis on patients' injection practice in terms of technique and site rotation.

Incorrect injection technique has long been known to lead to localized lipohypertrophy [6], in turn compromising glycaemic control [7]. Repeated use of same location for insulin injection is the most common cause of lipohypertrophy [8]. A common reason for repeated use despite obvious changes is less pain on injection at these sites. Training of patients to methodically rotate injection sites and inspection of injection sites by the HCPs at follow up visits are two practices recommended for minimizing this adverse effect [2,9].

Incorrect site and improper site rotation had resulted in ungainly appearance of lipohypertrophy in our patient, which not only caused embarrassment, but also compromised her glycaemic control. Being held responsible for the resulting uncontrolled glycaemia made her want to avoid follow-up visits. A timely look at the injection sites would have saved this entire physical and mental trauma to the patient. This re-endorses the importance of inspection of injection sites by HCPs at the routine follow up visits, especially for patients showing inadequate glycaemic control [9].

Hypoglycaemia, the most dreaded adverse effect of insulin [10], receives utmost focus in management of patients on insulin, while lipohypertrophy is relatively neglected [11]. It is necessary for health care providers to realize that it can also have serious clinical implications.

## CONCLUSION

Injection site lipohypertrophy is a neglected adverse effect of insulin. Whereas, blood glucose records are diligently looked into at every follow-up visit, lipohypertrophy is rarely looked for. In the case reported, improper site rotation had resulted in embarrassing appearance of lipohypertrophy, with compromised glycaemic control and increased insulin dose. This could have been avoided by a vigilant approach during routine visits to the clinic. Thus, this case underlines the importance of patient education and regular inspection of injection sites by health care providers at the follow-up visits.

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### PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Pharmacology, BVDU Medical College, Pune, Maharashtra, India; Coordinator Medical Education Unit (Additional Charge) - Research Fellow, Diabetes Unit, KEM Hospitals, Pune, Maharashtra, India.
2. Senior Research Fellow, Diabetes Educator and Nutritionist, Diabetes Unit, KEM Hospitals, Pune, Maharashtra, India.
3. Diabetes Educator and Medical Social Worker, Diabetes Unit, KEM Hospitals, Pune, Maharashtra, India.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Ranjana Ajit Sahasrabudhe,  
Department of Pharmacology, BVDU Medical College, Pune -411043, Maharashtra, India.  
E-mail: ranjanas2003@yahoo.co.in

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