



ORIGINAL RESEARCH PAPER

Diabetology

CASE REORT ON TYPE 3C DIABETES MELLITUS

KEY WORDS: Type 3c diabetes mellitus, pancreotogenic, chronic pancreatitis

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ABSTRACT

Type 3c diabetes mellitus is also called as pancreatogenic or pancreatogenous diabetes mellitus. It is mainly caused due to chronic pancreatitis and cystic fibrosis. Chronic pancreatitis is a disease characterized by pancreatic inflammatory and fibrotic injury resulting in irreversible parenchymal damage which leads to destruction of alpha, beta and delta cells in the pancreas. This destruction leads to an unpredictable level of glucose in the blood. Treatment for type 3c diabetes differs from type 1 and type2 diabetes but Type 3c diabetes is often misdiagnosed as type 2 diabetes. It is difficult to diagnose and classify patient with type 3c diabetes mellitus because long standing type 1 and type 2 diabetes mellitus are associated with exocrine pancreatic failure and acute or chronic pancreatitis. There are no separate guidelines for type 3c diabetes mellitus. Patient with type 3c diabetes required pancreatic enzyme replacement therapy that aid in digestion and insulin to optimize glycemic control and they experience episodes of hyperglycemia and hypoglycemia, so their blood glucose levels should be closely monitored

INTRODUCTION:

Diabetes mellitus is a chronic, metabolic disease characterized by elevated level of blood glucose level in the blood. Type3c diabetes mellitus is mainly caused due to chronic pancreatitis and cystic fibrosis. The other causes are acute pancreatitis, pancreatic cancer, surgical pancreatic resection, alcoholic pancreatitis, traumatic pancreatitis and hereditary pancreatitis. Chronic pancreatitis is a disease characterized by pancreatic inflammatory and fibrotic injury resulting in irreversible parenchymal damage. Development of diabetes mellitus in chronic pancreatitis mainly occur due to the destruction of islet cells by pancreatic inflammation additionally nutrient maldigestion leads to an impaired incretin secretion and therefore leads to a diminished insulin release of the remaining beta cells. It is estimated that 1-9% of patient with diabetes have type3c diabetes mellitus. However, the number might be highly underestimated due to difficulty in diagnosing this kind of diabetes mellitus. Even now most of the type3c diabetes mellitus patient are diagnosed as type 2 diabetes mellitus due to poor diagnosis. Type 3c diabetes mellitus is a frequent comorbidity of chronic pancreatitis. Prevalence of Type 3c diabetes mellitus in patients with chronic pancreatitis is reported up to 70%. Prevalence of chronic pancreatitis is estimated at 5-10 per 100,000 adults. Increased disease duration is an important risk factor for diabetes secondary to chronic pancreatitis. In hereditary pancreatitis, the medium age of onset of diabetes mellitus is between 38-58 yrs. No systematic studies have been examined the potential genetic difference between type 3c diabetes mellitus secondary to chronic pancreatitis and type 2 diabetes mellitus. Patient with long standing duration of disease, prior partial pancreatectomy and early onset of calcific disease seem to be higher risk for developing type 3c diabetes mellitus.

Case Study:

A 21year old male came to hospital weighing 69kgs and height of 173cm with the chief compliance of one episodes of seizure. He had a history of giddiness on and off. His vitals reported Spo2 97%, Temperature 97.8°F, Pulse 72 beats/min, BP 120/80 mmHg, RR 20 breaths/minutes. He was diagnosed with chronic pancreatitis before 6 months and with Type 3c diabetes before 2 months. He was also diagnosed to have Dyslipidemia. CECT Abdomen showed Multifocal chunky calcification in the head body and tail of pancreas, Head and

body appears mildly atrophic with dilated main pancreatic duct (Diameter~3.7mm) which is sign of high risk of pancreatic cancer. An intraductal calculus measuring ~5.9mm noted in the region of head of pancreas. No evidence of any abnormal enhancement with pancreatic parenchyma. His Capillary blood glucose (CBG) level at the time of admission was 393mg/dl, His lipid profile shows increased serum cholesterol (257mg/dl), Low density lipoprotein (194mg/dl), Triglycerides (240mg/dl). Treatment started with Inj. Actrapid 3ml for every 3 hours and Inj. Acetyl cysteine. He was closely monitored to prevent the complications of abnormal glycemic attacks. His CBG level gradually decreased to 184mg/dl but he experienced a sudden elevated blood glucose level on the second day of admission so he was treated with long acting insulin Lantus 10 units and he was treated with antibiotic cefixime, oral antihyperlipidemic agents, antiepileptic drug, nutrient supplements, Eberconazole, pancreatin and activated dimethicone, The patient improved and he was clinically stable, discharged with Insulin Novarapid and lantus, antihyperlipidemic agents and pancreatin. His CBG level was 134mg/dl at the time of discharge. He was good and kept follow up. On regular medical checkup He kept improving and planed for Islet cell transplant

Lab Values:

S.no	PARAMETERS	VALUE
LIVER FUNCTION TEST		
1.	Bilirubin, serum	0.4mg/dl
2.	Bilirubin, Direct	0.17mg/dl [H]
3.	Total protein, serum	8.2g/dl
4.	Albumin, serum	4.8g/dl
5.	Globulin, serum	3.4g/dl
6.	A/G ratio	1.4
7.	ALP (Alkaline phosphatase)	122U/L
8.	ALT (Alanine transaminase)	10U/L
9.	AST (Aspartate transaminase)	12U/L
10.	GGT (Gamma glutamyl transferase)	19U/L

BLOOD PARAMETERS

1.	Hb	14.9g/dl
2.	PCV	43%
3.	Total WBC	10600 Clls/mm3
4.	MCV	79
5.	MCH	28pg
6.	MCHC	35g/dl
7.	RDW-CV	13.3%
8.	Platelet count	348000 Cells/mm3
9.	Neutrophiles	63.4%
10.	Monocytes	3.1%
11.	Lymphocytes	29.5%
12.	Eosinophils	3.3%
13.	Basophils	0.7%
14.	INR	0.93

URINE ANALYSIS:

1.	Color	Pale yellow
2.	Clarity	Clear
3.	pH	6.0
4.	Specific gravity	1.020
5.	Glucose	++++
6.	Protein	NIL
7.	Blood	NIL
8.	Ketone bodies	-ve
9.	Bile salt	-ve
10.	Bile pigment	-ve
11.	Pus cells	1-2/ hpf
12.	Epithelial cells	1-2/hpf
13.	RBCs	NIL

LIPID PROFILE TEST

1.	Cholesterol, serum	257mg/dl[H]
2.	HDL, serum	42mg/dl[H]
3.	LDL, serum	194mg/dl[H]
4.	Triglycerides	240mg/dl[H]

CBG (Capillary blood glucose) LEVELS

S.no	Days	CBG LEVEL	Treatment
1.	Day 1	394mg/dl	On insulin actrapid 8units/3 hours
2.	Day2	221mg/dl	On insulin actrapid 6 units
3.	Day 3	11:00 am	184 mg/dl Actrapid 8 units
		6:00 pm	284 mg/dl Actrapid 12 units
		11:00 pm	244 mg/ dl Lantus 10 units
4.	Day 4	6:30 am	139 mg/dl Actrapid 8 units

DISSCUSSION:

Type 3c diabetes is caused by damage to the pancreas, such as inflammation or injury. Unlike type 1 and type 2 diabetes which are more commonly known, type 3c is not related to insulin resistance or an autoimmune response. Instead, it occurs when the pancreas is unable to produce enough insulin due to its damaged state. Type 3c diabetes is a condition that is often referred to as *brittle diabetes*. It is characterized by the destruction of beta cells, alpha cells, and delta cells in the pancreas. This destruction leads to an unpredictable blood glucose level in affected individuals. The destruction of beta cells in the pancreas leads to a decrease in insulin production. Alpha cells are responsible for producing glucagon which raises blood sugar levels while delta cells produce somatostatin which helps regulate insulin and glucagon secretion. When these cells are damaged or destroyed in type 3c diabetes, it can lead to fluctuations in blood glucose levels that are difficult to predict and manage. In conclusion, type 3c diabetes or brittle diabetes refers to a form of diabetes where the destruction of beta cells alpha cells and delta cells in the pancreas leads to an unpredictable blood glucose level. By accurately identifying cases of type 3c diabetes early on, appropriate treatment strategies can be implemented. This may involve enzyme replacement therapy to aid digestion or insulin therapy to manage blood sugar levels effectively. Proper management through close monitoring and personalized treatment plans is

essential for individuals with this condition.

Diagnosis:

- The **major** criteria for diagnosing type 3c diabetes mellitus are
- Presence of exocrine pancreatic insufficiency.
- Pathological pancreatic imaging.
- Absence of type 1 diabetes mellitus associated with autoimmune markers.
- The **minor** criteria for diagnosing type 3c diabetes mellitus are
- Impaired beta-celled function.
- No excessive insulin resistance.
- Impaired incretin or pancreatic polypeptide secretion.
- Low serum levels of lipid soluble vitamins such as A, D, E and K.
- It is not that much easy to diagnose and classify a patient with type 3c diabetes mellitus. Long standing type 1 and type 2 diabetes mellitus are associated with exocrine pancreatic failure and patient with diabetes mellitus are at high risk of developing acute or chronic pancreatitis. In order to classify patients with type 3c diabetes mellitus correctly commonly accepted diagnosis criteria should be established.

Management:

Till now there is no separate guidelines for type 3c diabetes mellitus Patient with type 3c DM required pancreatic enzyme replacement therapy to optimize glycemic control and typically relay on insulin instead of oral anti-hypoglycemic agents. Type 3c DM patient often experiences *brittle* diabetes characterized by impaired production of both insulin and glucagon in the pancreas leading to frequent episodes of both hypoglycemia and hyperglycemia. So, it is difficult to treat the patients and they as to be closely monitored. Metformin therapy can be considered, especially in patients with types 2 and 3c diabetes; this drug may protect against development of pancreatic ductal adenocarcinoma.

Glycemic control

There is no separate glycemic target for type3c diabetes mellitus. the only thing is to maintain the HbA1c level <7% to improve the quality of life.

The ADA does not classify specific targets for glycemic control for patients with type 3c diabetes, nor does it define a safe value for HbA1C. The ADA defines stages of hypoglycemia that may be especially important to identify in a patient with type 3c diabetes:

- Level 1 is defined as glucose between 54 and 69 mg/dL
- Level 2 is defined as glucose less than 54 mg/dL
- Level 3 (severe hypoglycemia) is defined as glucose less than 54 mg/dL requiring assistance.

Pancreatic exocrine insufficiency:

Treatment of Type 3c diabetes includes treatment of pancreatic exocrine insufficiency with pancreatic enzyme replacement for the better absorption of fat and vitamins and it also increase the production of incretin which ultimately leads to better glycemic control

CONCLUSION:

Type 3c diabetes mellitus is a serious complication in patients with chronic pancreatitis and it is often misdiagnosed as type 2 diabetes which may leads to improper treatment and further worsen the patient condition. The patient often experiences a cyclic episode of hyperglycemia and hypoglycemia because of the destruction of alpha, beta, and delta cells in the pancreas. Their CBG levels has to be monitored frequently. So it is very important to diagnosis the condition of the patient correctly and to provide them with right treatment.

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