

Pancreatogenic Diabetes

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Objectives



- Compare and characteristics of pancreatogenic diabetes, type 1 diabetes, and type 2 diabetes
- Describe treatment regimens for hyperglycemia associated with pancreatogenic diabetes
- Recognize physiologic and clinical factors that increase the complexity of treating hyperglycemia associated with pancreatogenic diabetes

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Type 2 Diabetes
Non-insulin + insulin
therapy

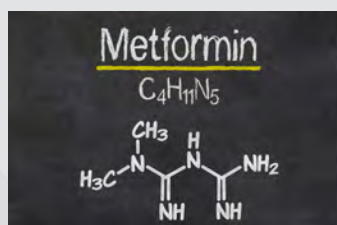


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Type 1 Diabetes
Insulin therapy



Type 2 Diabetes
Non-insulin + insulin
therapy



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Type 1 Diabetes
Insulin therapy

Type 2 Diabetes
Non-insulin + insulin
therapy

	Type 1 (5-10%)	Type 2 (90-95%)
Clinical	Onset < 20 years* Not obese Absolute insulin deficiency Antibody + DKA +	Onset > 30 years* Obese Normal or increased insulin Antibody - DKA -
Genetics	30-60% concordance in twins HLA-D linked	90-100% concordance in twins No HLA association
Pathogenesis	Autoimmune disease	Insulin resistance and relative insulin deficiency
Islet cells	Insulinitis early (precedes clinical disease) Marked atrophy and fibrosis β -cell depletion	Focal atrophy and amyloid deposits Mild β -cell depletion

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Type 1 Diabetes
Insulin therapy

Cystic-Fibrosis Related Diabetes
Insulin therapy

Type 2 Diabetes
Non-insulin + insulin
therapy

Pancreatitis
Insulin therapy*

Ketosis prone diabetes
Insulin therapy*


Pancreatic cancer
Insulin therapy*

Mature Onset Diabetes of the Young (MODY)
Therapy varies

Partial pancreatectomy
Insulin therapy*

Total pancreatectomy
Insulin therapy


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PANCREATOGENIC DIABETES

- Cystic-Fibrosis Related Diabetes
- Pancreatitis
- Pancreatic cancer**
- Partial pancreatectomy
- Total pancreatectomy
- Infiltrative diseases
- Trauma
- Fibrocalculous pancreatopathy
- Others

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PANCREATOGENIC DIABETES

- Cystic-Fibrosis Related Diabetes
- Pancreatitis
- Pancreatic cancer**
- Partial pancreatectomy
- Total pancreatectomy
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- Trauma
- Fibrocalculous pancreatopathy
- Others


ADA Classification of Diabetes

- I. Type 1 Diabetes
- II. Type 2 Diabetes
- III. Other specific types
 - A. Genetic defects of beta cell function (e.g. MODY)
 - B. Genetic defects in insulin action
 - C. Diseases of the exocrine pancreas**
 - D. Endocrinopathies
 - E. Drug or chemical induced
 - F. Infections
 - G. Uncommon forms of immune-mediated diabetes
 - H. Other genetic syndromes sometimes assoc. with DM
- IV. Gestational diabetes

American Diabetes Association; Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care* 1 January 2014; 37 (Supplement_1): S81-S90

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PANCREATOGENIC DIABETES



Diagnosis


Background

Management

Pancreatitis
Pancreatic cancer
Partial pancreatectomy
Total pancreatectomy

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PANCREATOGENIC DIABETES



Diagnosis

- Diagnosis of DM
- Evidence of exocrine pancreas disease
- DM likely due to exocrine pancreas disease

Pancreatitis
Pancreatic cancer
Partial pancreatectomy
Total pancreatectomy

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PANCREATOGENIC DIABETES



Diagnosis

- Diagnosis of DM
- Evidence of exocrine pancreas disease
- DM likely due to exocrine pancreas disease

- Rule out type 1 diabetes (islet Abs)
 - Pancreatic polypeptide?
 - Measure insulin resistance?

Pancreatitis
Pancreatic cancer
Partial pancreatectomy
Total pancreatectomy

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PANCREATOGENIC DIABETES



Pancreatitis

42 yo male presents to ER with N/V, abdominal pain x 48 hours.

PMHx - recurrent acute pancreatitis related to alcohol. No known history of diabetes.

Labs - BAL + in ER. Blood glucose 350, anion gap metabolic acidosis, + urine ketones. HbA1c 8.8%. CT scan →

FHx – Father with DM2, HLD, CAD

PE – BP 118/78, P 108, R 24, temp 98.6 F, BMI 31 kg/m²

What is the etiology of his diabetes?

How should his diabetes be treated acutely and chronically?



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What is the etiology of his diabetes?

Insulin deficiency (chronic pancreatitis)?
Peripheral insulin resistance (BMI, FHx)?
Autoimmune diabetes (LADA)??

How should his diabetes be treated acutely and chronically?

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Peripheral insulin resistance (BMI, FHx)?
Autoimmune diabetes (LADA)??

How should his diabetes be treated acutely and chronically?

Acute - Insulin (evidence of DKA)

Chronic – Insulin (DKA history, insulin deficiency)

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PANCREATOGENIC DIABETES



Pancreatitis

Background

Chronic pancreatitis
Recurrent acute pancreatitis
Necrotizing pancreatitis

Insulin deficiency (beta cell loss)
Hepatic insulin resistance
Peripheral insulin resistance?

Pancreatic enzyme deficiency
CP: Up to 80% risk of diabetes
Little data on DM complications

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PANCREATOGENIC DIABETES



Pancreatitis

Management

Insulin deficiency = Insulin therapy

Metformin?

SGLT2i?

DPP-4i ~~no~~ GLP-1a?

Sulfonamide ~~no~~ urea?

Thiazolidinedione ~~no~~?

Other considerations

Pancreatic enzymes

Nutrition

DKA prevention

Hypoglycemia prevention

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PANCREATOGENIC DIABETES



Diagnosis

Background

Management

Pancreatitis
Pancreatic cancer
Partial pancreatectomy
Total pancreatectomy

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PANCREATOGENIC DIABETES



Pancreatic cancer

66 yo female presents to PCP with c/o 25 lb weight loss, weakness, polyuria, abdominal pain

PMHx – HTN, HLD, COPD

Labs - Fasting glucose 180 mg/dl, HbA1c 8.5% (*new diagnosis of DM)

CT scan for abdominal pain showed a pancreatic head mass

Biopsy – pancreatic adenocarcinoma

What is the etiology of her diabetes?

What do you need to consider when treating her diabetes?

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Biopsy – pancreatic adenocarcinoma

What is the etiology of her diabetes?

Type 2 diabetes?

Pancreatic cancer?

Other?

What do you need to consider when treating her diabetes?

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What is the etiology of her diabetes?

Type 2 diabetes?

Pancreatic cancer?

Other?

What do you need to consider when treating her diabetes?

Treatment for pancreatic cancer

Hypoglycemia risk

Prognosis and goals of care

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PANCREATOGENIC DIABETES



Pancreatic cancer

Background

DM increases risk of pancreatic CA
New onset DM = higher risk
DM very common in Panc CA

DM not related to pancreas damage
Panc CA may cause hyperglycemia

Insulin resistance
Reduced beta cell function

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PANCREATOGENIC DIABETES



Pancreatic cancer

Management

Insulin therapy?

Metformin?

SGLT2i?

DPP-4i  LP-1a?

Sulfonurea? 

Thiazolidinedione? 

Other considerations

Surgery/chemo may improve BG

Pancreatic enzyme therapy

Steroids with chemo

Appetite and intake

Hypoglycemia prevention

Prognosis and goals

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PANCREATOGENIC DIABETES



Diagnosis

Background

Management

Pancreatitis
Pancreatic cancer
Partial pancreatectomy
Total pancreatectomy

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PANCREATOGENIC DIABETES



Partial pancreatectomy
Total pancreatectomy

Background

Whipple
 Distal pancreatectomy
 Total pancreatectomy

Prevalence of DM:
 Whipple – 15 to 43%+
 Distal panc – 14 to 45%+

Pancreatic enzyme deficiency
 Total panc - "Brittle" diabetes
 Little data on DM complications

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PANCREATOGENIC DIABETES



Partial pancreatectomy Total pancreatectomy

58 yo female underwent distal pancreatectomy 3 months ago for IPMN. BG normal post-op but now fasting BG 145 mg/dl and HbA1c 6.8%.

She has no known history of DM

PE: BMI 32 kg/m², BP 145/85

Other labs: TG 300

What is the etiology of her diabetes?

What do you need to consider when treating her diabetes?

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Partial pancreatectomy Total pancreatectomy

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She has no known history of DM

PE: BMI 32 kg/m², BP 145/85

Other labs: TG 300

What is the etiology of her diabetes?

Insulin deficiency (distal panc)?

Type 2 diabetes?

Other?

What do you need to consider when treating her diabetes?

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PANCREATOGENIC DIABETES



Partial pancreatectomy Total pancreatectomy

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She has no known history of DM

PE: BMI 32 kg/m², BP 145/85

Other labs: TG 300

What is the etiology of her diabetes?

Insulin deficiency (distal panc)?

Type 2 diabetes?

Other?

What do you need to consider when treating her diabetes?

Insulin and/or other DM medications

Nutrition, pancreatic enzymes

Hypoglycemia risk

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PANCREATOGENIC DIABETES



Partial pancreatectomy Total pancreatectomy

Management

Insulin therapy?

Metformin?

SGLT2i?

DPP-4i ~~in~~ LP-1a?

Sulfonurea ~~?~~

Thiazolidione ~~?~~

Other considerations

Post-op vs. Long-term hyperglycemia

Pancreatic enzyme therapy

Screening for DM post-op

Nutrition

Hypoglycemia prevention

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Conclusions



- Pancreatogenic (Type 3c) diabetes:
 - Should be suspected in patients with DM + exocrine pancreatic disease
 - Frequently requires insulin therapy
 - Has a higher risk of glucose variability and hypoglycemia
 - Infrequently associated with DKA
 - Presents a challenging co-morbid condition in those with pancreatic cancer; goals of therapy are important

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