

## Insulinoma

Insulinomas are pancreatic neuroendocrine tumors that produce and release insulin. These tumors are typically benign and may be associated with multiple endocrine neoplasia type 1 (MEN-1). Patients may present with the classic Whipple triad, which consists of symptoms of hypoglycemia, documented hypoglycemia during a symptomatic episode, and relief of symptoms with administration of glucose. Diagnostically, patients will demonstrate elevated insulin levels but also elevated C-peptide because the insulin is being produced endogenously. Management includes surgical resection, octreotide, and/or diazoxide.



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## Characteristics

## Pancreatic Neuroendocrine Tumor

## Pancreas with Neuron-indy-car and Tumor-guy

An insulinoma is classified as a pancreatic neuroendocrine tumor (PanNET). On histology, it is an insulin-producing neuroendocrine neoplasia of the B cells of the islets of Langerhans in the pancreas.

## Benign

Benign-bunny

Insulinomas are benign in 90% of cases. These are the most common endocrine-disrupting tumors of the pancreas. Adenocarcinoma is present in around 10% of cases.

### Associated with MEN-1

### Man with (1) Wand

In 90% of cases, insulinoma is a solitary tumor. In the remaining 10%, it is associated with multiple tumors, possibly in the context of multiple endocrine neoplasia type 1 (MEN-1).

## Clinical Features

## Whipple Triad

### Whipped-cream Triangle

Whipple's triad represents the three most definitive criteria for diagnosing insulinoma. It includes symptoms of hypoglycemia, documented low blood glucose, and rapid subsidence of symptoms after carbohydrate intake.

## Symptoms of Hypoglycemia

Hippo-glue-bottle

The high amount of insulin this tumor produces causes blood sugar to drop. Initially, sympathetic output may be increased resulting in diaphoresis, tremors, headache, etc after which neuroglycopenic symptoms such as altered mental status and vision changes may occur. This is the first criterion in Whipple's triad.

### Hypoglycemia During Episode

Hippo-glue-bottle on TV-episode

If the blood glucose is low (e.g. < 50 mg/dL) during an episode of hypoglycemic signs and symptoms, this fulfills criterion #2 in Whipple's triad.

## Relief with Glucose

### Relieved-face with Glue

The final criterion is relief of symptoms with glucose administration.

## Diagnosis

### Increased C-peptide

Up-arrow (C) Cat Pimp-tie

In addition to lab values showing increased insulin levels from the tumor, an increased C-peptide level will also be seen. This is because insulin is being produced endogenously in this disease, which helps differentiate it from exogenous etiologies of hyperinsulinemia and/or hypoglycemia.

## Management

### Surgery

Surgeon

The therapy of choice for insulinoma is surgical resection. Normally these tumors are small, and thus can be operated on without complications.<br>

### Octreotide

Octo-tree-ride

In the case of a poor surgical candidate, therapy with diazoxide or octreotide - which inhibit insulin secretion - can be attempted.

### Diazoxide

Dice-socks

In the case of a poor surgical candidate, therapy with diazoxide or octreotide - which inhibit insulin secretion - can be attempted.