Somatostatinoma

Henry William Taylor, MD
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Table of Contents

Pathophysiology
Presentation
Diagnosis
Treatment

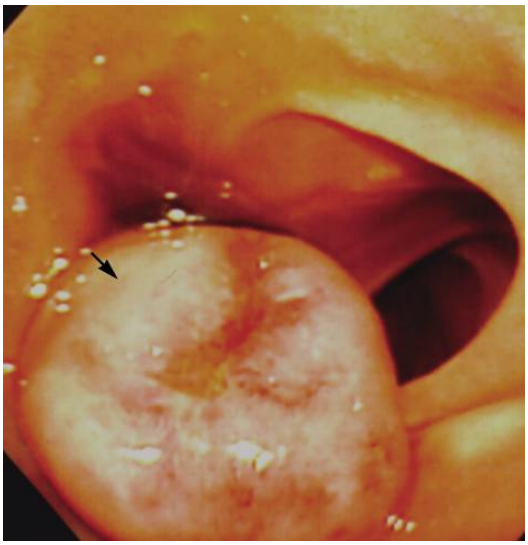
References

Pathophysiology

Also Known as "Somatostatin-Secreting Tumors", "Somatostatin-Secreting Pancreatic Neoplasm", or "SS-omas"

Definition [1]

- Somatostatin Secreting Neuroendocrine Tumor
- Due to an Abnormal Growth of D-Cells
- *See Pancreatic Neuroendocrine Tumor (PNET)



Duodenal Somatostatinoma on Endoscopy (Arrow Point to Ampulla of Vater) [15]

Location [2-6]

- Pancreas (40-55%) – Most Common
- Duodenum (45-50%)
- Other Rare Locations:
  - Jejunum
  - Stomach
  - Colon
  - Rectum
  - Lung
  - Kidney
  - Liver

Pancreatic Distribution and Size

- Most Common in the Head (56%) [3]
- Most Often Solitary Masses [3,7]

- Usualluy Large at Time of Diagnosis
- Average Diameter: [3]
    - 5-6 cm in Pancreas
    - 2-5 cm in Duodenum

Malignancy

- Most are Malignant (75-78%) [7-9]
- Majority Have Metastases at Diagnosis (70-92%) [7-9]
- Associated Syndromes:
    - 35-45% of Pancreatic Somatostatinomas are Associated with Multiple Endocrine Neoplasia Type 1 (MEN-1) [10]
        - Overall One of the Least Common PNETS in MEN-1 (< 1%) [7,10,11]
    - 50% of Duodenal Somatostatinomas are Associated with Neurofibromatosis Type 1 (NF-1/von Recklinghausen Disease) [7,9,12]
        - Less Likely to Metastasize than Spontaneous Duodenal Somatostatinomas [7]
    - Has Also Been Associated with von-Hippel Lindau Syndrome [13,14]

Epidemiology

- Median Age: 54 Years [3]
- Equal Gender Distribution [7]

Presentation

Somatostatinoma Syndrome

- Syndrome of Symptoms Associated with the Overproduction of Somatostatin
- Triad: [16]
    - Diabetes/Glucose Intolerance
    - Cholelithiasis
    - Diarrhea/Steatorrhea
- Less Commonly Seen (19% if in Pancreas or 2% if in Duodenum) [2,17]

Additional Symptoms [10,16,18,19]

- Abdominal Pain (50%) – Most Common Symptom
- Weight Loss (20-30%)
- Hypochlorhydria
- Local Complications:
    - Abdominal Pain
    - Obstructive Jaundice
    - GI Bleeding/Anemia

Diagnosis

Diagnosis

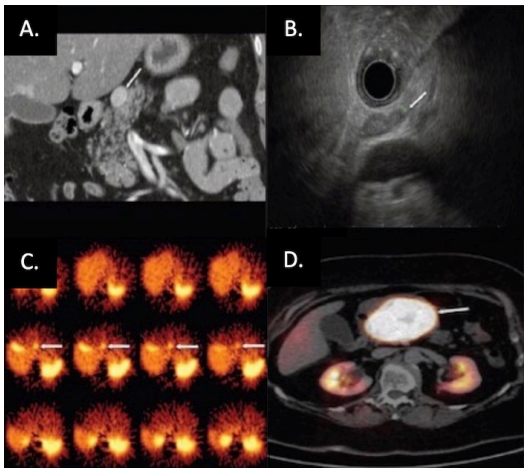
- If Somatostatinoma Syndrome Present:
  - High Fasting Plasma Somatostatin (At Least Thee Times the Upper Limit of Normal) [18]
  - Biopsy Not Required but Can Be Used for Grading [20]
- If Somatostatinoma Syndrome is Not Present (Most Common):
  - Most Commonly Detected in the Workup of a Pancreatic or Duodenal Mass
  - Biopsy Histopathology Demonstrates Well-Differentiated Islet Cells that Stain Positive for Somatostatin [21]

TNM Staging

- Same System Used for all Pancreatic Neuroendocrine Tumors [22]
- *See Pancreatic Neuroendocrine Tumor (PNET)

Localization

- Initial Imaging: Noninvasive (CT or MRI) [23,24]
- Somatostatin Receptor Imaging [23-26]
  - Consider if Initial Imaging Fails to Localize
  - Options:
    - *Somatostatin (Octreotide) Receptor Scintigraphy (SRS)* – Classic Test Used
    - *Functional PET Scan (Ga-68 DOTATATE)* – Becoming More Prevalent with Higher Sensitivity
- If Noninvasive Imaging Fails: Invasive Imaging
  - *Endoscopic Ultrasound (EUS)* – Generally Preferred Next Step [27]
  - *Selective Visceral Angiography* [28,29]



PNET on Imaging: (A) CT, (B) EUS, (C) SRS, (D) Functional PET [30]

Treatment

Surgical Resection (Treatment of Choice)

- Definitive Treatment: **Surgical Resection** [31,32]
  - Head/Neck: Pancreaticoduodenectomy
  - Body/Tail: Distal Pancreatectomy (Concurrent Splenectomy if Malignancy is Suspected)
  - Entire Pancreas: Total Pancreatectomy

- May Consider Enucleation for Small Tumors (< 2-3 cm) – Controversial Due to High Malignancy Rates
    - Additional Requirements: Single Lesion, ≥ 2-3 mm From the Main Pancreatic Duct, Well-Encapsulated, and No Local Invasion
- Due to High Rates of Metastases, Surgical Resection is Most Often Not Feasible [7-9]

Liver-Directed Therapy

- Resection of Metastases if Able [33,34]
- Radiofrequency Ablation (RFA) or Cryoablation [33-35]
- Hepatic Artery Embolization [36,37]

Additional Options in Surgically Unresectable Disease

- Somatostatin Analogs (Octreotide/Lanreotide) [38,39]
    - Can Also Be Use Preoperatively to Control Symptoms
- Other Molecular-Targeted Agents:
    - Everolimus [40]
    - Sunitinib [41]
- Peptide Receptor Radionuclide Therapy (PRRT) [42]
- Chemotherapy [24,43-45]
- Radiation Therapy [46,47]
    - Pancreatic Neuroendocrine Carcinomas Were Previously Considered to be Resistant to Radiation

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