CASE PRESENTATION
CARCINOID TUMOR OF THE AMPULLA OF VATER

M&M CONFERENCE
SUNY DOWNSTATE MEDICAL CENTER
JUNE 19, 2009
WASSIM ABI JAOUDE, MD, PGY IV
CASE PRESENTATION

- 66 y.o. female referred from another facility for a five months H/O:
  - abdominal pain
  - diarrhea
  - questionable history of hot flashes

- CT scan (11/20/2008)
  Dilated intra and extrahepatic bile ducts

- EGD (12/1/2008)
  Major ampulla prominent, enlarged and tissue very hard suspicious for ampullary cancer
CASE PRESENTATION - EGD
CASE PRESENTATION

- **EUS (12/1/2008)**
  - ISOECHOIC NOT INVADING THE MUSCULARIS PROPRIA
  - PANCREAS NOT INVOLVED
  - NO LYMPHADENOPATHY

- **PATHOLOGY**
  - MAJOR AMPULLA: FOCAL CARCINOID TUMOR IN A BACKGROUND OF EROSIIVE DUODENITIS
  - CELLS POSITIVE FOR CHROMOGRANIN, SYNAPTOPHYSIN, PANCYTOKERATIN.
CASE PRESENTATION - EUS
CASE PRESENTATION

- **METASTATIC W/U**
  - OCTREOTIDE TOTAL BODY SCAN
  - SEROLOGIC MARKERS
  
  ALL NEGATIVE BY REPORT

- ADMITTED ON THE SAME DAY OF SURGERY FOR ELECTIVE PANCREATICODUODENECTOMY
- PE ON ADMISSION WAS UNREMARKABLE
CASE PRESENTATION

OPERATIVE PROCEDURE

INTRAOPERATIVE EGD REIDENTIFIED THE TUMOR IN THE AMPULLARY REGION

XYPHOUMBILICAL MIDLINE INCISION

NO EVIDENCE OF METASTATIC DISEASE

DUODENUM KOCHERIZED

CHOLECYSTECTOMY

DILATED CBD, TRANSECTED AT DUODENUM

MOBILIZATION OF THE STOMACH AND ANTRRECTOMY

DISSECTION OF RETROPanCREATIC PV

DIVISION OF PANCREAS
CASE PRESENTATION

OPERATIVE PROCEDURE

TRANSECTION OF JEJUNUM AT TREITZ
ROTATION OF DUODENUM UNDER MESENTERY ROOT
SPECIMEN WAS TAKEN OUT
ANASTOMOSES- PANCREATIC CO Jejunostomy,
CHOLEDOCHO Jejunostomy AND GASTRO Jejunostomy
JP NEAR PANCREATIC ANASTOMOSIS
JP NEAR BILIARY ANASTOMOSIS
CLOSURE IN LAYERS
PATHOLOGY

- AMPULLARY CARCINOID TUMOR, 3.5 CM IN DIAMETER
- TUMOR INVADING INTO THE DUODENUM AND FOCALLY COMPRESSING THE CBD
- HEAD OF PANCREAS AND STOMACH FREE OF TUMOR
- METASTATIC CARCINOID IN 1 OF 5 PERIPANCREATIC LN
- 3 PERIGASTRIC LN FREE OF TUMOR
- TUMOR POSITIVE FOR CHROMOGRAININ, SYNAPTOPHYSIN AND NSE
CASE PRESENTATION

IN HOSPITAL COURSE

- Patient persistently acidotic postop, remained intubated and transferred to the ICU
- Developed respiratory failure, with pneumonia and sepsis; a CT scan on POD#6 showed multiple pockets of fluid w/o evidence of abscess
- Failed extubation twice before being able to be extubated on POD#11
- After transfer to the floor on POD#14, remained febrile with an increasing drainage from both JP drains that became bilious and murky
- POD#19 a PTC showed a bile leak near the choledochoenteric anastomosis and an 8 F external/internal drain was placed percutaneously bridging the anastomosis
CASE PRESENTATION

IN HOSPITAL COURSE

- Persistently high drainage amounts from the 3 drains as well as failure of the patient to improve prompted another CT scan that showed a collection below the drains; a pigtail drain was placed on POD#23.
- POD#26 patient taken to the OR for failure to improve.
- EXPLORATORY LAPAROTOMY W/ LOA was done:
  - the ext/int tube tip was found outside the bowel in the abscess cavity
  - multiple enterotomies were made during the LOA and a segment of small bowel was resected
  - a hole was also found in the hepatic flexure and a RIGHT HEMICOLECTOMY was done.
IN HOSPITAL COURSE

- the afferent loop was also resected and the pancreas oversewed
- the coledochojejunal anastomosis was reconstructed
- drains were placed
  - 5 adys after the procedure the patient was extubated
  - Prolonged SICU course with K. pneumonia sepsis
  - Persistent fever with subsequent CT scans showing intraabdominal collection
  - POD#24 after the second procedure IR drainage
  - POD#35 after second procedure, tube study showed resolution of the collection
  - Discharged on 5/7/09
CARCINOIDS TUMORS OF THE AMPULLA OF VATER: DIAGNOSIS AND MANAGEMENT

WASSIM ABI JAOUDE, MD, PGY IV
ANATOMY OF THE AMPULLA OF VATER

www.downstatesurgery.org
GENERAL OVERVIEW OF CARCINOID TUMORS

Rare, slow growing tumors
Originate from neuroendocrine system
Foregut, midgut, hindgut carcinoids
Appendix > rectum > ileum > lungs > bronchi > stomach
Incidence 1-2/100000 in US
67.2 percent survival at 5 years regardless of site

R.G. Robertson, W.J. Geiger, N.B. Davis: Carcinoid Tumors, Am Fam Physician 2006; 74:429-34
GENERAL OVERVIEW OF CARCINOID TUMORS

SYMPTOMS

Asymptomatic mainly

Obstruction/intussusception

Mesenteric fibrosis- disabling abdominal pain, malnutrition, kinking of bowel, ischemia and perforation

Valvular heart disease- right sided, related to high serotonin levels

R.G. Robertson, W.J. Geiger, N.B. Davis: Carcinoid Tumors, Am Fam Physician 2006; 74:429-34
GENERAL OVERVIEW OF CARCINOID TUMORS

SYMPTOMS

CARCINOID SYNDROME - diarrhea (serotonin), flushing (tachykinins), wheezing/bronchospasm (histamine/serotonin)

CARCINOID CRISIS - severe flushes and diarrhea with dehydration and arrhythmias; caused by anesthetics; prevent with IV octreotide infusion and hydration

GENERAL OVERVIEW OF CARCINOID TUMORS

SYMPTOMS

SKIN METS- subcutaneous skin nodules; severe pain; difficult to manage with analgesics; may require resection

BONE METS- 10%; best test bone scan; pain is main symptom; radiotherapy provides satisfactory long term palliation

### Table 1
Characteristics of Carcinoid Tumors by Location

<table>
<thead>
<tr>
<th>Location</th>
<th>Percent</th>
<th>Approximate age at presentation</th>
<th>Symptoms</th>
<th>Metastasis at diagnosis</th>
<th>Carcinoid syndrome (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectum</td>
<td>26</td>
<td>60</td>
<td>Rectal bleeding, pain, constipation</td>
<td>Tumor size &lt; 1 cm:&lt;br&gt;5 percent&lt;br&gt;Tumor size &gt; 2 cm: majority</td>
<td>&lt;5</td>
</tr>
<tr>
<td>Small intestine</td>
<td>25</td>
<td>60 to 70</td>
<td>Abdominal pain, small bowel obstruction</td>
<td>Majority present with metastasis, usually to lymph nodes or liver</td>
<td>5 to 7</td>
</tr>
<tr>
<td>Lungs, bronchi, and trachea</td>
<td>23</td>
<td>50</td>
<td>Recurrent pneumonia, cough, hemoptysis, chest pain</td>
<td>&lt;15 percent</td>
<td>&lt;5</td>
</tr>
<tr>
<td>Appendix</td>
<td>12</td>
<td>40 to 50</td>
<td>Appendicitis caused by tumor presence; incidental discovery during other pelvic procedures</td>
<td>&lt;5 percent</td>
<td>&lt;5</td>
</tr>
<tr>
<td>Stomach</td>
<td>7</td>
<td>60 to 70</td>
<td>Anemia, abdominal pain</td>
<td>&lt;10 percent</td>
<td>5 to 10; also Zollinger-Ellison syndrome</td>
</tr>
<tr>
<td>Colon</td>
<td>7</td>
<td>70</td>
<td>Pain, anorexia, weight loss</td>
<td>&gt;66 percent</td>
<td>&lt;5</td>
</tr>
</tbody>
</table>

Information from references 2, 4, and 5.
### GENERAL OVERVIEW OF CARCINOID TUMORS-DIAGNOSTIC STUDIES


<table>
<thead>
<tr>
<th>Test</th>
<th>Details</th>
</tr>
</thead>
</table>
| **5 HIAA**                                | 100% specific, 35% sensitive  
Urinary levels influenced by foods             |
| **PLATELET SEROTONIN LEVEL**              | More sensitive marker for detection of small amounts of serotonin    |
| **CHROMOGRANIN A**                        | For functioning and non functioning tumors; more sensitive than 5HIAA(68%)
but less specific (86%); highly accurate in detecting relapses; correlates with tumor burden; decreased survival with high levels |
| **In-PENTETREOTIDE SCINTIGRAPHY**         | 80-90% sensitive  
A positive finding is predictive of response to octreotide therapy |
| **I-MIBG SCAN**                           | Sensitivity less than In-Pentetreotide scan (70%)  
Combination increases sensitivity               |
| **POSITRON EMISSION TOMOGRAPHY**          | FDG uptake limited in carcinoids due to low proliferation rate.  
6-F-DOPA and C-labeled 5HTP PET- sensitivity up to 65% for small tumors and LN metastases  |
| **RADIOLOGIC STUDIES**                    | **CT scan**- liver mets, extrahepatic tumor localization in abdomen and mediastinum; **Barium Follow Through**- for primary tumors of the small bowel |
| **CAPSULE ENDOSCOPY**                     | Experience with carcinoid tumors is limited  
Promising technique                        |
### General Treatment Options for Malignant Carcinoid Tumors

**Carcinoid Tumor**

Surgical resection if possible:
- **Hepatic metastases dominant:** long-acting somatostatin analogues; hepatic artery embolization or ligation with or without interferon, with or without chemotherapy
- **Systemic spread:** chemotherapy or interferon or long-acting somatostatin analogues

**Carcinoid Syndrome**

Systematic progression through treatment options:
- **Heart disease:** diuretics, long-acting somatostatin analogues, occasional valvular replacement
- **Flushing:** avoid precipitating food and alcohol; 5-HT3-receptor antagonist; long-acting somatostatin analogues; interferon; hepatic artery embolization or ligation with or without interferon, with or without chemotherapy
- **Diarrhea:** antidiarrheal agents; 5-HT3-receptor antagonist; long-acting somatostatin analogues; interferon; hepatic artery embolization or ligation with or without interferon, with or without chemotherapy
- **Wheezing:** selective bronchodilators; long-acting somatostatin analogues; interferon; hepatic artery embolization or ligation with or without interferon, with or without chemotherapy

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5-HT3 = serotonin receptor subtype 5-hydroxytryptamine-3.

Information from references 1 and 23.
AMPULLARY CARCINOIDS - OVERVIEW

- Rare tumor
- 105 cases reported in the literature
- 0.3-1% of gastrointestinal carcinoid tumors in western countries
- Mean age 51 years
- M/F 2/1

Hatzitheoklitos et al. Carcinoid of the Ampulla of Vater: Clinical Characteristics and Morphologic features; Cancer March 15, 1994, Vol73, No.6
Senda et al. Minute Ampullary Carcinoid Tumor with Lymph Node Metastases: a Case Report and Review of Literature; World Journal of Surgical Oncology 2009, 7:9
AMPULLARY CARCINOID- OVERVIEW

- Ampullary carcinoids are associated with Von Recklinghausen Neurofibromatosis in almost 25% of cases.
- Ampullary carcinoids mainly secrete somatostatin (58-67%) and do not cause the carcinoid syndrome. 13% do not secrete.

PRESENTING SYMPTOMS

- Jaundice most common (62%)
- Non specific abdominal pain second most common
- Weight loss (10%)
- Acute pancreatitis and upper GI bleeding

Hatzitheoklitost et al. Carcinoid of the Ampulla of Vater: Clinical Characteristics and Morphologic features; Cancer March 15, 1994, Vol73, No.6
**DUODENAL VS AMPULLARY CARCINOIDS**

- **Duodenal carcinoids** have relatively a low metastatic potential which is closely related to the size of the tumor
  - tumors < 10 mm in diameter almost never metastasize (Burke et al.)
  - tumors 20-50 mm metastasize in 47% of cases (Soga et al.)

- **Ampullary carcinoids** are more aggressive and metastasize regardless of size (Hatzitheoklithos et al. Carcinoid of the Ampulla of Vater: Clinical Characteristics and morphologic features; Cancer March 1994, Vol.73, No. 6)
  - 46% for tumors > 2 cm
  - 47% for tumors < 2cm
APULLARY CARCINOIDS - PREOP DIAGNOSIS

- **PREOPERATIVE DIAGNOSIS** CORRECT IN ABOUT 14% OF PATIENTS
  - submucosal lesions with ulceration in only 6%
  - biopsies have a very low yield

- Along with diagnostic modalities outlined above, other useful techniques include:
  - **EGD AND ERCP**
  - **EUS** - NECESSARY TO DETERMINE THE DEPTH OF INVASION IN CASE ENDOSCOPIC RESECTION IS CONSIDERED
  - **MRI/MRCP** - isointense on T1, hyperintense on T2; enhancing submucosal mass w/o necrosis or hemorrhage w/ outflow obstruction

Hatzitheoklitos et al. Carcinoid of the Ampulla of Vater: Clinical Characteristics and Morphologic features; Cancer March 15, 1994, Vol73, No.6
TREATMENT OPTIONS FOR AMPULLARY CARCINOIDS

CARCINOIDs OF THE AMPULLA OF VATER METASTASIZE IN HALF OF THE CASES REGARDLESS OF SIZE


However, SHOULD EVERY PATIENT WITH THIS TUMOR UNDERGO A PANCREATICODUODENECTOMY?
TREATMENT OPTIONS FOR AMPULLARY CARCINOID TUMORS

In their review of 73 cases of ampullary carcinoid tumors, Hatzitheoclitos et al. recommended:

- **LOCAL EXCISION** for tumors 2 cm and less

- **PANCREATICODUODENECTOMY** for tumors more than 2 cm in diameter and in the presence of regional lymph node involvement

Hatzitheoklithos et al. Carcinoid of the Ampulla of Vater: Clinical Characteristics and morphologic features; Cancer March 1994, Vol.73, No. 6
TREATMENT OPTIONS FOR AMPULLARY CARCINOID TUMORS

ENDOSCOPIC RESECTION

- Controversial
- Can be considered if:
  - Tumor size less than 2 cm
  - Limited to the submucosa without invasion of the muscularis propria
  - No evidence of metastases
  - Strict follow-up required

Fukatsu et al. Periampullary Carcinoid Tumor; Endoscopy 2007; 39; E49-50
TREATMENT OPTIONS FOR AMPULLARY CARCINOID TUMORS

ENDOSCOPIC RESECTION WITH STRIP BIOPSY

- Needle injection in submucosal space
- Lifting of the tumor by rapid SM injection of HS-E solution
- Tumor pulled up with wide mouth forceps
- Snare tightened around tumor
- Resection with electrosurgical current

Fukatsu et al. Periampullary Carcinoid Tumor; Endoscopy 2007; 39; E49-50
TREATMENT OPTIONS FOR AMPULLARY CARCINOID TUMORS

LOCAL RESECTION

Three types of procedures that can be alternatives to pancreaticoduodenectomy:

- Transduodenal Ampullectomy
- Retroduodenal Resection of the Ampulla
- Pancreas Preserving Duodenectomy

Huang et al. Retroduodenal Resection of Ampullary Carcinoid Tumor in a Patient with Cavernous Transformation of the Portal Vein; J Gastrointest Surg (2007)11; 1322-27
TREATMENT OPTIONS FOR AMPULLARY CARCINOIDs

TRANSDUODENAL AMPULLECTOMY

The least aggressive

Can be used with duodenal and ampullary tumors

Requires in situ reconstruction of the CBD and pancreatic duct

Huang et al. Retroduodenal Resection of Ampullary Carcinoid Tumor in a Patient with Cavernous Transformation of the Portal Vein; J Gastrointest Surg (2007)11; 1322-27
TREATMENT OPTIONS FOR AMPULLARY CARCINOIDs

TRANSDUODENAL AMPULLECTOMY

a) after longitudinal duodenotomy is made, the ampulla is cannulated; circumferential stay sutures are placed in the duodenal mucosa

b) the tumor is removed with electrocautery; the CBD (at 11 o’clock) and the pancreatic duct (at 3 o’clock) are entered and separately cannulated

c) the duodenal mucosa is sutured to the CBD and pancreatic duct; the CBD and the pancreatic ducts are also carefully connected with 4/0 polydioxanone
TREATMENT OPTIONS FOR AMPULLARY CARCINOIDSCARCINOIDS—Transduodenal Ampullectomy
TREATMENT OPTIONS FOR AMPULLARY CARCINOID TUMORS

RETRODUODENAL RESECTION OF THE AMPULLA

Intermediately aggressive procedure
Excision of the duodenal wall as a wedge
Primary repair
Reimplantation of the CBD and pancreatic duct into the duodenum or into a jejunal Roux limb, simultaneously or separately

Huang et al. Retrodudodenal Resection of Ampullary Carcinoid Tumor in a Patient with Cavernous Transformation of the Portal Vein; J Gastrointest Surg (2007)11; 1322-27
TREATMENT OPTIONS FOR AMPULLARY CARCINOID TUMORS—Retroduodenal Resection

Huang et al. Retroduodenal Resection of Ampullary Carcinoid Tumor in a Patient with Cavernous Transformation of the Portal Vein; J Gastrointest Surg (2007)11; 1322-27
TREATMENT OPTIONS FOR AMPULLARY CARCINOID TUMORS

PANCREAS PRESERVING DUODENAL RESECTION

A jejunal Roux limb is used for anastomosis to the stomach and for reconstruction of the distal CBD and pancreatic duct openings.

Advantages over pancreaticoduodenectomy:
- More secure anastomosis at the head of the pancreas because the tissues in the periductal area are more fibrous.
- Better endocrine and exocrine function with preservation of the pancreatic parenchyma.

Huang et al. Retroduodenal Resection of Ampullary Carcinoid Tumor in a Patient with Cavernous Transformation of the Portal Vein; J Gastrointest Surg (2007)11; 1322-27
Fig. 1. New pancreas-preserving total duodenectomy (PPTD) method. During surgery the head of the pancreas is preserved, and the duodenum is totally resected. When necessary, part of the stomach is also resected. The structures around the major ampulla are not cut at the line between the duodenum and the head of the pancreas, and only the mucosa over the ampulla is removed. Hence the submucosal structure of the major papilla is saved, as shown in Figure 2a. Thus, the whole tract of the main pancreatic duct (MPD) is preserved.


**PANCREAS PRESERVING TOTAL DUODENECTOMY**

Fig. 3. Anatomists of the major papilla to the intestine after sphinctero-papillotomy. A stent catheter was inserted into the MPD to maintain its patency during the anastomotic procedure.

Fig. 4. Alimentary tract is reconstructed by the Billroth I method or the Billroth II method. With the Billroth I method, the stomach is anastomosed to the jejunum about 10 cm oral from the papillojejunostomy (a). With the Billroth II method, the stomach is anastomosed to the retrocolically shifted jejunum about 30 cm anal from the papillojejunostomy (b).
TREATMENT OPTIONS FOR AMPULLARY CARCINOIDSCARCINOIDSCARCINOIDSCARCINOIDS

PANCREATICODUODENECTOMY (WHIPPLE PROCEDURE)

The 30 day in-hospital mortality rate is less than 2% when performed by an experienced surgeon.

Six key steps:

1. Exposure of the infrapancreatic SMV
2. Extended Kocher maneuver
3. Portal dissection
4. Antrectomy
5. Jejunal transection, Treitz dissection and duodenal rotation underneath mesenteric vessels
6. Transection of pancreas and retroperitoneal dissection and specimen removal

Evans, DB, Periampullary Cancer in Cameron: Current Surgical Therapy
Assess resectability

- Liver
- Celiac axis
- Peritoneum

**Kocher maneuver**
mobilize duodenum and head of pancreas and evaluate SMA and SMV
Mobilize GB and cystic duct to the CBD to expose the portal vein - divide the CBD early.

Pylorus preserving - divide 2-3 cm distal to pylorus

**Classic** - 30-40% distal gastrectomy
Dissect GD artery and divide it after test-clamping.
PANCREATICODUODENECTOMY

SMV identified anterior to D3- Dissect along anterior surface of SMV under neck of pancreas- **Attention to Splenic Vein that meets SMV behind the neck**

Divide pancreatic neck w/ electrocautery- Stay sutures superiorly and inferiorly on pancreatic remnant to minimize bleeding
Dissect uncinate process to SMA while ligating small branches to SMV and PV

- Divide jejunum at 10-20 cm from ligament of Treitz
- Once the proximal jejunum is mobilized and D4 freed from the retroperitoneum, the DJ junction can be delivered dorsal to the SMV from left to right
PANCREATICoduodenectomy

Head and neck of pancreas
Uncinate process
Gallbladder and distal biliary tree
Duodenum
Proximal jejunum

SPECIMEN OUT

www.downstatesurgery.org
Pancreaticojejunostomy - end-to-side vs end-to-end in 2 layers: inner absorbable running duct & capsule to full thickness jejunum; outer sero-capsular nonabsorbable
Gastrojejunostomy done at 10-15 cm from hepaticojejunostomy, in 2 layers: inner continuous absorbable and outer nonabsorbable interrupted.
AMPULLARY CARCINOID TUMORS-
PROGNOSIS AND OUTCOMES

- FIVE YEAR SURVIVAL RATE 90%
- 6% OF PATIENTS DIE FROM METASTATIC AND PROGRESSION OF TUMOR
- SIZE OF THE TUMOR HAS NO PROGNOSTIC IMPLICATION
- THE GRADE OF THE TUMOR (HIGH VS LOW) CORRELATES BETTER WITH RECURRENCE AND SURVIVAL

Hatzitheoklitos et al. Carcinoid of the Ampulla of Vater: Clinical Characteristics and Morphologic features; Cancer March 15, 1994, Vol73, No.6
Carter et al. Neuroendocrine Tumors of the Ampulla of Vater Biological Behavior and Surgical Management; Arch Surg June 2009, Vol.144, No6, 527-531
CONCLUSIONS

- Rare tumors
- More aggressive behavior than duodenal carcinoids
- Metastatic potential unrelated to size of the tumor
- The grade of the tumor correlates better with outcomes
- Treatment controversial
  - most authors recommend Pancreateicoduodenectomy
  - Whipple procedure also recommended if LN disease is suspected preoperatively
  - less radical resections can be considered in poor surgical candidates and in small tumors
REFERENCES

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