

PANCREAS DUCTAL ADENOCARCINOMA – PDAC

CONTENTS

- I. What is the pancreas?
- II. What is pancreas cancer?
- III. What is the epidemiology of Pancreatic Ductal Adenocarcinoma (PDAC)?
- IV. What are the risk factors for the development of PDAC?
- V. What symptoms are associated with PDAC?
- VI. Can PDAC be inherited?
- VII. How is pancreas cancer diagnosed?
- VIII. What is a Whipple resection?
- IX. What is a distal pancreatectomy?
- X. What about chemotherapy and radiation therapy?
- XI. What questions should the patient ask the surgeon prior to surgery?

I. WHAT IS THE PANCREAS?

The pancreas is an organ that lies in the back of the upper abdomen. It measures 15-25 cm in length extending from right to left. It measures 1.4 to 4.0 cm from anterior to posterior and 3 to 9 cm in height. It is made up of the head, neck, body and tail of the pancreas. 60% to 90% of the pancreatic tissue lies in the head of the pancreas.

84% of the total volume of the pancreas is made up of exocrine acinar cells. These cells produce enzymes that participate in the digestion of food. The enzymes are secreted by the cells into small branch pancreatic ducts. The enzymes pass through these ducts into the main pancreatic duct, which carries them to be emptied into the duodenum. The duodenum is the first part of the small intestine where digestion of food by the enzymes first takes place. The cells making up the small branch pancreatic ducts and main pancreatic ducts account for only 2% to 4% of the volume of the pancreas.

The endocrine portion of the pancreas consists of cells that secrete hormones directly into the blood stream. These cells make up about 2% of the volume of the pancreas. The hormones secreted include insulin, glucagon, somatostatin, pancreatic polypeptide and vasoactive intestinal polypeptide.

II. WHAT IS PANCREAS CANCER?

Pancreas cancer most commonly refers to pancreatic ductal adenocarcinoma (PDAC). This is the most common type of malignant tumor of the pancreas. 65% of these arise in the head of the pancreas, and 35% arise from the body and tail.

These usually solid tumors grow locally to invade adjacent structures such as the duodenum, superior mesenteric vein, portal vein, superior mesenteric artery, stomach, colon and spleen. It can also invade lymphatic vessels and often grows along small nerves.

PDAC can metastasize to almost any organ. The most frequent sites of distant spread include the liver, lungs, spleen, peritoneum (lining of inner abdominal wall) and adrenal glands.

Malignant mucinous cystic neoplasms arise from benign mucinous neoplasms. These are less common than PDACs, and generally have a better prognosis.

Acinar cell carcinomas are rare, accounting for less than 2% of pancreas malignancies.

Pancreatic neuroendocrine neoplasms (PNEN) are also uncommon, representing 2% to 4% of pancreas tumors.

III. WHAT IS THE EPIDEMIOLOGY OF PANCREATIC DUCTAL ADENOCARCINOMA?

Pancreas cancer ranks fourth in death from cancer in the United States. It ranks ninth in the incidence of all cancers.

The risk of developing PDAC increases continuously throughout life. About 80% of pancreas cancers occur in people 60-80 years of age. The risk of pancreas cancer developing in people under 40 years of age is very low.

PDAC occurs more frequently in men than women with a male to female ratio of about 1.3.

The incidence of PDAC is highest in the African-American population. The incidence is less in Caucasians. The incidence is lower in Hispanics and Asians than in Caucasians.

IV. WHAT ARE THE RISK FACTORS FOR THE DEVELOPMENT OF PANCREATIC DUCTAL ADENOCARCINOMA?

Cigarette smoking is likely the most significant environmental risk factor for the development of PDAC. This has been calculated to cause 20-25% of all cases of PDAC. There is a two-fold increased risk in current smokers versus never smokers. Former smokers are at an increased risk. This risk decreases to the level of never smokers 20 years after quitting.

Diabetes Mellitus is another significant risk factor for PDAC. Diabetes Mellitus is associated with a 1.96 fold increase in PDAC. The shorter the duration of Diabetes Mellitus, the greater the risk is of developing PDAC.

Obesity is also linked to an increased risk of PDAC. The BMI measurement measures the degree obesity. The greater the BMI correlates with greater obesity.

Alcohol, consumed in large quantities, does increase the risk of PDAC.

Finally, hereditary factors do increase the risk of PDAC. This is dealt with in another section.

V. WHAT SYMPTOMS ARE ASSOCIATED WITH PANCREATIC DUCTAL ADENOCARCINOMA?

The following symptoms can be associated with PDAC:

1. Abdominal pain
2. Weight loss
3. Weakness
4. Fatigue
5. Jaundice
6. Back pain
7. Nausea
8. Vomiting
9. Early satiety (feeling “full” early after eating)
10. Loss of appetite
11. Diarrhea
12. New onset diabetes mellitus
13. Pruritus (itching)
14. Blood clots

VI. CAN PANCREATIC DUCTAL CARCINOMA BE INHERITED?

10% of pancreatic ductal adenocarcinomas (PDAC) are inherited. These are referred to as Hereditary Pancreatic Carcinoma (HPC). These include hereditary tumor predisposition syndromes, hereditary pancreatitis (HP), cystic fibrosis (CF), and familial pancreatic cancer (FPC).

Hereditary tumor predisposition syndromes account for 25% of HPC. These independent diseases are associated with an increased risk of various cancers, including PDAC. These syndromes include:

1. Peutz-Jeghers Syndrome (PJS)
2. Familial Atypical Multiple Mole and Melanoma Syndrome (FAMMM)
3. Hereditary Breast and Ovarian Cancer Syndrome (HBOC)
4. Hereditary Nonpolyposis Colorectal Cancer Syndrome (HNPCC) (Lynch Syndrome)
5. Familial Adenomatous Polyposis Syndrome (FAP)
6. Ataxia Telangiectasia Syndrome (AT)

Hereditary pancreatitis is an inherited condition that leads to the early onset of chronic inflammation in the pancreas known as chronic pancreatitis (CP). Cystic Fibrosis (CF) is also an inherited disease associated with an increased risk of the development of PDAC.

FPC is defined as PDAC in a patient with 2 or more first degree relatives with PDAC and without a hereditary tumor predisposition syndrome, HP, or CF. The risk of developing PDAC increases with the number of first degree relatives with PDAC. There is a 4.6, 6.4, and 32 times the normal risk of developing PDAC in patients with 1, 2, and 3 first degree relatives with PDAC, respectfully.

Patients are candidates for pancreas cancer screening if their risk for the development of PDAC is greater than a 10-fold risk. Screening tests would include CT scanning, MRI, endoscopic ultrasound and ERCP.

VII. HOW IS PANCREAS CANCER DIAGNOSED?

First the physician has to perform a complete interview of the patient regarding the patient's history. Next, a complete physical exam should be performed. This generally takes about 60 minutes.

Laboratory evaluation would include a CBC, CMP, CEA and CA-19 levels.

Radiographic imaging would include a CT of the chest, and CT of the abdomen and pelvis with triple phase IV contrast with pancreas protocol. A MRI might also be performed.

An endoscopic ultrasound (EUS) should be performed with biopsy of the tumor.

A nuclear medicine PET/CT scan might also be performed.

This work up is reviewed, and a diagnosis and plan is established.

VIII. WHAT IS A WHIPPLE RESECTION?

The Whipple pancreaticoduodenectomy is the surgery that is performed for pancreatic ductal adenocarcinoma located in the head of the pancreas.

It is an operation that is performed in the operating room under a general anesthetic with the patient asleep. Upon arrival to the operating room (OR), the patient is placed awake, in a sitting position on the OR table. The anesthesiologist next places an epidural catheter under local anesthesia. This is very effective in controlling discomfort post operatively. It is the same catheter that women receive before labor.

The patient is next placed laying down on the OR table. The patient is put to sleep under general anesthesia. The anesthesiologist places an endotracheal tube into the airway which is attached to the ventilator (breathing machine).

Next, a central venous line is placed into the internal jugular vein in the neck. An arterial line is placed into the radial artery in the wrist. A nasogastric tube is passed through the nose and into the stomach. A Foley catheter is passed into the bladder. The patient is prepped and draped, and the operation begins.

Initially, a diagnostic laparoscopy might be performed. This allows for the assessment of any possible tumor involvement of the peritoneum (inner lining of the abdominal cavity), stomach, liver, spleen and intestinal tract.

The following Whipple resection involves either a bilateral subcostal incision that extends across the upper abdomen just beneath the ribs, or a vertical incision in the abdominal wall midline. The Whipple resection involves possible removal of the antrum of the stomach, removal of the duodenum, removal of about 10 cm of small intestine, removal of the gall bladder, removal of the common bile duct, removal of a portion of the common hepatic duct, and finally, removal of the head of the pancreas with the tumor. If the tumor involves a segment of the portal vein and/or the common hepatic artery, then the segments can be removed and reconstructed. A feeding jejunostomy tube is placed into the small intestine and exits the abdomen through the left abdominal wall.

The procedure lasts approximately 5 to 7 hours. The patient may need to receive blood products during the surgery. The patient is usually extubated and off the ventilator, breathing on his own at the conclusion of the surgery. The patient will wake up with the nasogastric tube in place, central venous line in neck, arterial line in wrist, three drains coming out of the right side of the abdomen, Foley catheter in the bladder, and with the epidural catheter in place.

The patient is transferred to the intensive care unit after the surgery. Later, the patient is moved to a medical-surgical floor. Patients are generally in the hospital from 5 to 10 days. The hospital stay will be longer if there are complications.

The goal upon discharge is to have had all the lines and drains removed already. The patient goes home with the feeding tube in place. This will be removed 21 days following surgery in the office without difficulty.

Possible complications seen with the surgery include gastroparesis (feeling full after eating), infection, bleeding, leakages at connections, fistulas, abscesses, pneumonia and blood clots. Almost all of the complications can be managed successfully without another surgery. The goal is to have the patient totally recovered in 4 to 6 weeks. The risk of postoperative death with this operation is in the range of 2-6% in the first 6 weeks following surgery.

IX. WHAT IS A DISTAL PANCREATECTOMY?

This is an operation performed for PDAC involving the body and tail of the pancreas. The body and tail of the pancreas is removed generally along with the spleen. This is an operation with less complications than the Whipple resection.

X. WHAT ABOUT CHEMOTHERAPY AND RADIATION THERAPY?

Depending upon the type of tumor and its stage, the patient may be a candidate for post-operative chemotherapy and radiation therapy. Also, depending upon preoperative staging, the patient may be offered neoadjuvant therapy. This is chemotherapy and possibly radiation therapy given to the patient before the surgical procedure.

XI. WHAT QUESTIONS SHOULD THE PATIENT ASK THE SURGEON PRIOR TO SURGERY?

1. How long has he/she been practicing pancreatic surgery?
2. How old is he/she?
3. How many hospitals does he/she practice at?
4. Does he/she have residents who operate with him?
5. Does he/she have physician assistants who operate with him/her?
6. Does the surgeon do the entire operation himself/herself?
7. Does the surgeon see his/her patients every day?
8. Is the surgeon a high volume pancreas surgeon?
9. What is the surgeon's complication rate?
10. What is the surgeon's post-operative death rate in the first 6 weeks after surgery?
11. Is the hospital a high volume pancreas surgery hospital?
12. Is he/she a member of the American College of Surgeons?
13. Is he/she certified with the American Board of Surgery?
14. Since endocrine neoplasms do occur in the pancreas, is he/she a member of the American Association of Endocrine Surgeons?