

# Neoplasm at the Head of the Pancreas: A Case Study

KRISTINA MARIE GRIFFIN

**ABBREVIATIONS:** DVT = deep vein thrombosis; ERCP = endoscopic retrograde cholangiopancreatography; INR = international normalized ratio; PTCA = percutaneous transhepatic cholangiogram.

**INDEX TERMS:** Courvoisier gallbladder; hemostasis; obstructive jaundice; pancreatic neoplasm.

**Clin Lab Sci 2004;17(2):70**

*Kristina Marie Griffin CLS(NCA) is a recent graduate from Florida Gulf Coast University, Ft Myers FL. This case study was originally developed when she was a clinical laboratory science student.*

**Address for correspondence:** Kristina Marie Griffin, 5115 Cobble Creek Court #103, Naples FL 34110, (239) 598-5022, KMGHerbalScience@aol.com.

## CASE PRESENTATION

A 68-year-old male was seen by his anticoagulation clinic doctor for a scheduled warfarin check up. He had been diagnosed with deep vein thrombosis (DVT) about two years ago. The patient's international normalized ratio (INR) was 6.31; his target range is 2.0 to 3.0. The patient was referred to the evaluation clinic, where he was administered 2.5 mg of vitamin K. Consideration was given to his initial complaints of stomach ailments at the start of fluctuating INRs in the following weeks (Table 1).

In addition to unintentional weight loss, physician examination revealed that the patient claimed episodes of hematuria. He also complained of recent lower back and stomach pain, and for the past four weeks, blood-tinged sputum in the mornings. The patient has a history of smoking.

*The peer-reviewed Clinical Practice section seeks to publish case studies, reports, and articles that are immediately useful, are of practical nature, or demonstrate improvement in the quality of laboratory care. Direct all inquiries to Bernadette Rodak MS CLS(NCA), CLS Clinical Practice Editor, Clinical Laboratory Science Program, Indiana University, Fesler 409, 1120 South Avenue, Indianapolis IN 46202-5113. brodak@iupui.edu*

A urinalysis was performed and was negative for blood. Upon palpitation, his abdomen was non-tender and without masses. A 48-hour follow-up appointment was made with the anticoagulation clinic.

On the second day, the patient's prothrombin time (PT) was redrawn, and demonstrated an INR of 4.29. He maintained his directed warfarin dosage and was scheduled to return in 12 days.

At 14 days he displayed a critical INR of 6.58 and was administered another 2.5 mg of vitamin K. However, at this appointment, the patient confessed missing a warfarin dose within the last ten days. Plans were documented to decrease his warfarin dosage when the patient's INR fell to within his target range. His next appointment was scheduled for two days later. At this next appointment (16 days), the patient had an acceptable INR of 2.82. His warfarin dosage was decreased and he was asked to return in ten days for a follow-up.

On the 26th day, the patient's INR had increased to 4.68. He also stated that his urine was "dark, then light" when voiding. As well as decreasing his warfarin dosage once more, the attending doctor referred him to the evaluation clinic for the second time.

The patient reported to the evaluation clinic the following day. The attending physician acknowledged that the

**Table 1.** Summary of INR trends over the four-week period

INR (Target range: 2.0 – 3.0)	Day measured
6.31	0*
4.29	2
6.58	14*†
2.82	16
4.68	26

\* Vitamin K given

† Missed dose of warfarin

patient endured weight loss, yellow eyes, dark urines, light colored stools, and periumbilical tenderness. A new urinalysis revealed a large amount of bilirubin and urobilinogen (Table 2). Hepatomegaly was not apparent. A metabolic panel (Table 2) was also ordered; there was an obvious increase in alkaline phosphatase (ALP), aspartate aminotransferase (AST), and alanine aminotransferase (ALT). The attending physician assessed the patient as suffering from jaundice,

and to rule out malignancy, advised him to have an abdomen and pelvic contrast-enhanced computed tomography (CT) scan.

### DISCUSSION

Pancreatic cancer is the third leading neoplasm of the gastrointestinal system and has a dismal prognosis.<sup>1</sup> Most pancreatic tumors arise as adenocarcinomas of the ductal epithelial.<sup>2</sup> Only about 20% of pancreatic cancers seem contained entirely within the pancreas

at the time of diagnosis, and any secondary metastases would insinuate the presence of a malignancy versus a cyst or inflammation.<sup>3</sup>

Some 95% of pancreatic cancers begin in the exocrine pancreas, where digestive juices are produced.<sup>3</sup> Primary neoplasms discovered at the head of the pancreas tend to cause many complications; the main complaint being pain. Symptoms include jaundice, weight loss, abdominal pain, indigestion, back pain, clay-colored stools, blood clots, gallbladder enlargement, and nausea.<sup>2,3</sup>

Pancreatic cancer is slightly more common in men than women, and the risk increases with age.<sup>4</sup> The exact cause is unknown, but the incidence is greater in smokers; almost one-third of pancreatic carcinoma cases can be linked to cigarette smoking.<sup>4</sup> A minority of cases are known to be related to hereditary syndromes.<sup>4</sup>

### CLINICAL PRESENTATION AND PATHOPHYSIOLOGY

Cancer of the head of the pancreas usually is detected earlier because of its proximity to the bile duct with onset of pain.<sup>2</sup> Partial obstructive jaundice can be experienced in these cases from impaired flow of bile into the intestines due to the pushing of the pancreatic mass. Conjugated bilirubin accumulates in the liver and, therefore, can be expressed in the blood and urine. Since the bilirubin does not travel to the intestines to be broken down into urobilin, the feces is mostly deficient of pigmentation and becomes clay-colored.

Bile travels through ducts from the liver to the gallbladder for storage, and then to the small intestine.<sup>4</sup> It is not uncommon for patients with carcinoma at the head of the pancreas to experience

**Table 2.** Laboratory results of latest evaluation clinic visit

TEST	RESULT	UNITS	REFERENCE RANGE
<b>Urine</b>			
Color	Brown		Yellow
Appearance	Clear		Clear
Specific gravity	1.014		1.002 – 1.035
pH	5.5		5.0 – 9.0
Protein	Trace		Negative
Glucose	Negative		Negative
Ketones	Negative		Negative
Bilirubin	Large		Negative
Blood	Negative		Negative
Nitrate	Negative		Negative
Urobilinogen	2.0	EU/dL	0.1-1.0
<b>Metabolic panel</b>			
Glucose	7.7 H	mmol/L	3.9 – 6.1
BUN	6.8	mmol/L	2.9 – 8.2
Creatine	114 H	mmol/L	8 – 31
Sodium	142	mmol/L	136 – 142
Potassium	4.1	mmol/L	3.5 – 5.0
Chloride	111 H	mmol/L	96 – 106
Carbon dioxide	21 L	mmol/L	22 – 28
Anion gap	11	mmol/L	8 – 16
Calcium	2.42	mmol/L	2.05 – 2.55
Total protein	80	g/L	60 – 80
Albumin	40	g/L	35 – 50
ALP	472 H	U/L	50 – 120
AST	106 H	U/L	5 – 60
ALT	202 H	U/L	20 – 48
Total bilirubin	123 H	mmol/L	5 – 21

Courvoisier's law, where the gallbladder is enlarged and palpable, again from tumor pressure.<sup>5</sup>

The liver plays a crucial role in hemostasis. All clotting factors (except VIII) are synthesized in the liver.<sup>2</sup> The PT is used to monitor the extrinsic pathway, which consists of factors II, VII, IX, and X. This group is considered vitamin K dependent. For a patient on warfarin, the PT is a very important test because hemorrhage is the most serious side effect.

Besides requiring vitamin K, these extrinsic factors need carbon dioxide and oxygen for carboxylation. Carboxylated extrinsic factors have two double-negative ends that permit formation of coagulation complexes in the clotting cascade. Vitamin K can later be recycled (reduced) to carboxylate extrinsic factors repeatedly. To control clotting, which is necessary in patients with DVT, warfarin is used to block the decarboxylation step and inhibits recycling of vitamin K to a reduced form.<sup>6</sup> Administration of vitamin K will reverse the effects of warfarin by producing increased quantities of reduced vitamin K and thus circumvents the blockade.

## LABORATORY FINDINGS AND DIAGNOSIS

A sole finding of PT prolongation is not diagnostic of vitamin K deficiency, but is indicative of a factor VII deficiency or presence of an inhibitor.<sup>6</sup> Vitamin K dependent factors, particularly factor VII, are sensitive to liver dysfunction.<sup>6</sup> Hence, metastases on the liver can lead to impaired hepatic function and prolonged PT.

The resulting picture for partially obstructive jaundice is increased serum bilirubin, increased urine bilirubin, decreased fecal urobilinogen, and normal, decreased, or increased urine urobilinogen.<sup>7</sup> In diagnosing hepatobiliary disorders, there are several liver enzymes that classically increase to indicate a problem. Some include AST and ALP, which escape into the plasma from damaged liver cells; ALP, which is induced or released when the canalicular membrane is damaged and biliary obstruction occurs; and gamma-glutamyl-transferase, which is increased in both hepatocellular and obstructive disorders.<sup>2</sup>

Visualization of pancreatic and metastasized masses is also beneficial in diagnosis. Tools of this type used are abdominal ultrasound, CT scan, endoscopic retrograde cholangiopancreatography (ERCP), and percutaneous transhepatic cholangiogram (PTCA).<sup>4</sup> CT is probably the best diagnostic tool with a sensitivity and specificity of more than 80%, but ERCP is the only single imaging technique with a specificity greater than 90% in detecting pancreatic cancer.<sup>8</sup>

The most definitive procedure is through pancreatic biopsy to evaluate the tissue of interest. This is a surgical procedure, and patients under anticoagulant therapy must cease taking medication in order to not promote unnecessary bleeding.

## TREATMENT AND PROGNOSIS

For patients with biliary obstruction with incomplete surgical tumor removal, or the cancer has metastasized beyond the pancreas, the prognosis is poor with a median survival rate of less than one year.<sup>4</sup> Optimal management of patients with irresectable pancreatic carcinoma encompasses palliation of three major symptoms: obstructive jaundice, duodenal obstruction, and pain.<sup>9</sup> When the tumor is confined to the pancreas and cannot be removed, a combination of radiation therapy and chemotherapy may be recommended.<sup>4</sup> When the tumor has spread to other organs, such as the liver, chemotherapy alone is usually used.<sup>4</sup>

Jaundice due to an irresectable pancreatic neoplasm pressure can be relieved with the placement of a metallic biliary stent.<sup>10</sup> This is to keep the obstructed biliary duct open to allow for adequate bile drainage into the intestine.

Management of pain and other symptoms is an important part of the treatment of advanced pancreatic cancer.<sup>4</sup> Narcotics are the strongest pain relievers available and should be closely monitored by a physician. Hospice can be very helpful to patients for pain, symptom management, and psychological support for the patient and the family during the course of the illness.<sup>4</sup>

## CASE RESOLUTION

The CT report showed a 3.8 cm mass in the head of the pancreas with biliary obstruction, Courvoisier gallbladder, and multiple liver lesions most consistent with metastatic disease. The findings were a primary pancreatic neoplasm. The patient's family was consulted, and a diagnostic examination with an ERCP and a cytological analysis was completed which confirmed the diagnosis of a pancreatic neoplasm. His warfarin treatment was terminated in anticipation of a biliary stent. The patient's condition was untreatable and he sought hospice support.

## ACKNOWLEDGEMENT

Jo Ann Wilson PhD CLDir(NCA) BCLD (ABB) of the College of Arts and Sciences at Florida Gulf Coast University in Fort Myers, FL has given exceptional editorial support and advice in order to make this case study publishable.

## REFERENCES

1. Wagner M, Dikopoulos CK, Friess H, Büchler MW. Standard surgical treatment in pancreatic carcinoma. *Ann Oncol* 1999;10(suppl 4):S247-51.
2. Bishop BL, Duben-Engelkirk JL, Fody EP. *Clinical chemistry: principles, procedures, correlations*. 4th ed. Philadelphia PA: Lippincott Williams & Wilkins; 2000. p 356-7, 464-5, 527-8.
3. Medifocus. Pancreatic cancer prognosis and treatment options. 2002. Available at: [http://www.medifocus1.com/guide\\_detail.asp?gid=OC013&a=a&assoc=Google&keyword=pancreaticcancer](http://www.medifocus1.com/guide_detail.asp?gid=OC013&a=a&assoc=Google&keyword=pancreaticcancer). Accessed February 28, 2003.
4. MEDLINEplus Medical Encyclopedia. Pancreatic carcinoma. January 2003. Available at: <http://www.nlm.nih.gov/medlineplus/ency/article/000236.htm>. Accessed February 28, 2003.
5. CancerWEB. Courvoisier's law. 2003. Available at: <http://cancerweb.ncl.ac.uk/cgi-bin/omd?Courvoisier's+law>. Accessed February 28, 2003.
6. Beutler E, Lichtman MA, Coller BS, and others. *Williams hematology*. 6th ed. New York: McGraw-Hill Inc; 2001. p 1409,1474,1673.
7. Graff L. *A handbook of routine urinalysis*. Philadelphia PA: JB Lippincott Co; 1983. p 56-8.
8. Birk D, Schoenberg MH, Gansauge F, and others. Carcinoma of the head of the pancreas arising from the uncinate process. *Br J Surg* 1998;85:498-501.
9. van Wagenveld BA, Coene PPLO, van Gulik TM, and others. Outcome of palliative biliary and gastric bypass surgery for pancreatic head carcinoma in 126 patients. *Br J Surg* 1997;84:1402-6.
10. Maema A, Kubota K, Bandai Y, Makuuchi M. Proximal bile duct stricture caused by a pancreatic pseudocyst: intra-operative placement of a metallic stent. *Hepato Gastroenterol* 1999;46:2020-3.

## 2003 Reviewer Honor Roll

Special recognition is due the following Review Board members who have contributed their time and expertise to *Clinical Laboratory Science* by reviewing one or more manuscripts during 2003. Their timely and judicious reviews, comments, and suggestions have helped the editors select the best manuscripts for publication and helped the authors improve their articles before publication. On behalf of *Clinical Laboratory Science* editors, authors, and readers, I want to publicly thank each of the persons listed below for their contributions to *Clinical Laboratory Science* during 2003. Without their generous gifts of time and expertise, the quality of the articles published this past year in *Clinical Laboratory Science* would be unequivocally lower.

If you would like to become a member of the Review Board and review manuscripts submitted for possible publication in *Clinical Laboratory Science*, please send a letter or e-mail specifying the content areas that you feel comfortable reviewing, e.g., hematology, management, microbiology, etc., and a copy of a current curriculum vitae to: Marian Schwabbauer, CLS Executive Office, P.O. Box 5399, Coralville IA or [cls@ia.net](mailto:cls@ia.net).

### Marian Schwabbauer, Clinical Laboratory Science Executive Editor

Richard Bamberg/Key West FL  
 Kathleen Blevins/Oklahoma City OK  
 Diane Cearlock/Dekalb IL  
 Peter Colaninno/Farmingdale NY  
 Jo Ann Fenn/Salt Lake City UT  
 George Fritsma/Birmingham AL  
 Ellis Frohman/St Louis MO  
 Mildred Fuller/Norfolk VA  
 Abraham Furman/Portland OR  
 Richard Gregory/Indianapolis IN  
 Denise Harmening/Baltimore MD  
 Linda Hogan/Wichita KS  
 Cherry Horn/Washington DC  
 Virginia Hughes/Montgomery AL  
 Elizabeth Kenimer/Augusta GA  
 Nancy Konopka/Gettysburg PA

Linda Laatsch/Milwaukee WI  
 Hal Larsen/Lubbock TX  
 LouAnn Lawrence/New Orleans LA  
 Donna Leach/Winston-Salem NC  
 Lauralynn Lebeck/La Jolla CA  
 Craig Lehmann/Stony Brook NY  
 Lynn Little/Dallas TX  
 David McGlasson/Lackland AFB TX  
 Sharon Miller/St Charles IL  
 Harriette Nadler/Collegeville PA  
 Alison Pohl/Alameda CA  
 Joan Prince/Wauwatosa WI  
 Margaret Reinhart/Philadelphia PA  
 John Seabolt/Lexington KY  
 Stephen Sodeke/Tuskegee AL