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Case Report

A Case of Carcinoma Head of Pancreas and Duodenum with Review of Literature of Whipple Procedure

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ABSTRACT

Pancreatic ductal adenocarcinoma is the fourth most common root for cancer related deaths worldwide, with a 5-year overall survival of less than 8.0%. This tumor shows poor outcome and behaves catastrophically. Here we report a case of 59 year elderly male diagnosed as a case of carcinoma head of pancreas and duodenum after detailed history, examination and relevant investigations. The Whipple procedure was performed and patient responded well to surgery and was discharged after 6 days of hospital stay; though it is a painful surgery but a life-changing and life-saving operation. We have also discussed about the complications and variation in Whipple procedure with review of literature.

Keywords: Carcinoma; Duodenum; Histopathology pancreas; Whipple

INTRODUCTION

Pancreatic Ductal Adenocarcinoma (PDAC) is more prevalent disease in developed countries than developing nations. PDAC is the fourth most common root for cancer related deaths worldwide, with a 5-year overall survival of less than 8.0% [1]. This tumor shows poor outcome and behaves catastrophically. The occurrence of PDAC is expected to achieve a peak further in the future, because of tremendous rise of metabolic conditions like obesity and type 2 diabetes in population, which further makes PDAC etiology to establish easily. The extrapolation indicate a more than two-fold growth in the number of cases within the next ten years, which includes both, of new diagnoses and PDAC-associated deaths in the U.S. and European countries [2,3].

It is more frequent in races of African-Americans, more common in men than women and mostly a disease of older individual. Obstructive jaundice, duodenal obstruction, weight loss, and pain are the major symptoms, which occurs due to involvement of adjacent organs [4,5].

The Whipple procedure, also known as pancreatico-duodenectomy is the one of the treatment modality used for pancreatic tumour. It was first performed by Dr. Allen Whipple who pioneered this technique. It is a complex method for surgical treatment of pancreatic head malignancies and rarely, for an inflammatory condition like chronic pancreatitis. It includes removal of the head of the pancreas, part of the duodenum, the distal portion of common bile duct, the gall bladder and the gastric antrum. After their removal, remaining parts of the organs are reconnected [6]. Several differences are made from the standard procedure which depends upon the tumor location and size.

CASE PRESENTATION

A 59 years old male presented in the Surgery OPD with severe pain in the epigastrium, nausea, vomiting, and features of jaundice with weight loss for the last 6 months. Physical examination showed no significant finding, except for moderate tenderness in the epigastric region.

Abdominal sonography showed marked dilatation of the pancreatic duct with multiple hepatic masses. Computed tomography of the abdomen revealed a 3 cm × 4 cm mass over the head of pancreas which could not be differentiated from the adjoining duodenal wall (Figure 1). Multiple liver metastases were also recorded. The upper gastrointestinal endoscopy revealed solid growth in the head of pancreas (Figure 2). MRI showed typically hypointense areas on fat-suppressed and dynamically enhanced on pancreatic parenchymal phase T1-weighted imaging, with a variable appearance on T2-weighted images. Rest of the hematology and basic investigations like Liver Function Tests (LFT) and Kidney Function Tests (KFT) were corresponding to the long term effects of pancreatic adenocarcinoma.

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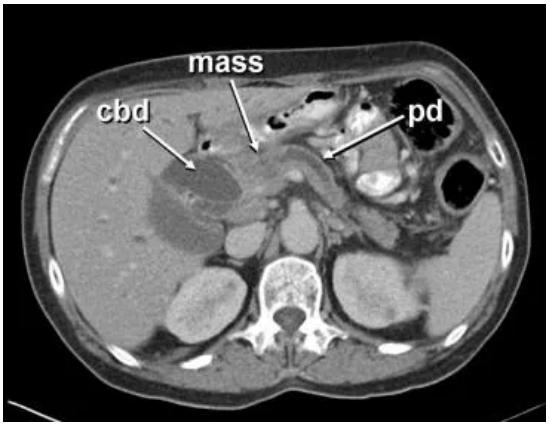

Figure 1: Computed tomography of the abdomen revealed a 3 cm × 4 cm mass over the head of pancreas which could not be differentiated from the adjoining duodenal wall.

Figure 2: Upper gastrointestinal endoscopy revealed solid growth in the head of pancreas.

Our patient underwent pre anesthetic checkup, planned for whipple operation after consent and explanation of all the after effects and complications of the procedure. Grossly the specimen showed a solid hard mass in the head of pancreas with grey cut surface with specks of haemorrhage and necrosis with thickened wall of the duodenum. Microscopic examination of the tissue section from the pancreatic mass showed irregular shaped glands infiltrating the stroma lined by atypical cells (Figure 3). Section from the duodenum showed atypical glands in the muscle layer with marked cytologic atypia (Figure 4). The final diagnosis rendered was pancreatic ductal adenocarcinoma with involvement of the duodenum.

He was administered adjuvant chemotherapy of oral fluoropyrimidine drug capecitabine, twice a day for 2 weeks, followed by a 1 week break before repeating the next dosage cycle along with 50 Gy of Co-60 teletherapy. Our patient is fine after 3 months of follow up period.

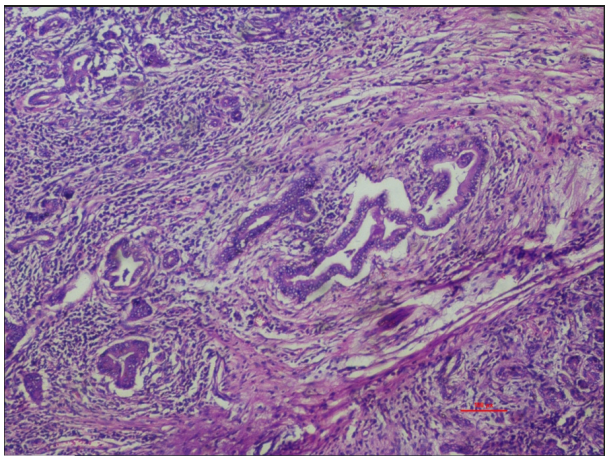

Figure 3: Microscopic examination of the tissue section from the pancreatic mass showed irregular shaped glands infiltrating the stroma lined by atypical cells. Haematoxylin and Eosin stain (×10).

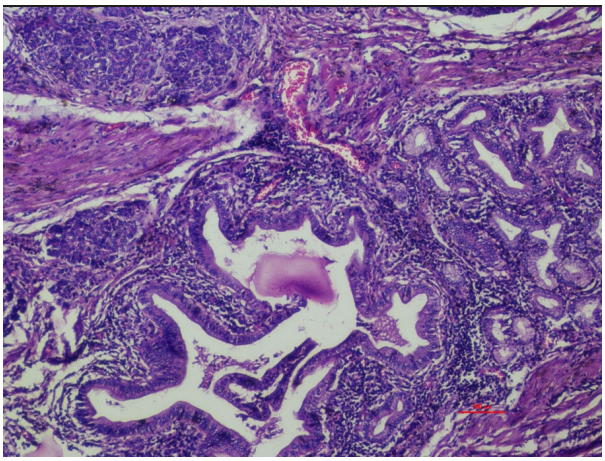

Figure 4: Section from the duodenum showed atypical glands in the muscle layer with marked cytologic atypical, using Haematoxylin and Eosin stain (×40).

RESULTS AND DISCUSSION

This article represents a case of carcinoma head of the pancreas with involvement of the duodenum, which is a highly fatal and hostile malignancy. The whipple procedure is the recommended method of treatment. The most frequent symptom of pancreatic head malignancy is jaundice, which is due to compression of common bile duct. Secondly, pancreatic exocrine insufficiency can result in broad variety of clinical features like steatorrhea, malabsorption, weight loss, abdominal discomfort and bloating. The dull aching, non-specific abdominal pain is due to invasion of celiac or superior mesenteric arterial plexus by the tumor. Few patients may have manifestations such as nausea, anorexia, weight loss and new-onset diabetes mellitus. Another study shows four major categories of prodrome-obstructive jaundice, duodenal obstruction, weight loss and cancer pain [4,5]. The massive gastrointestinal hemorrhage is rarely seen in PDAC [7]. The upper gastrointestinal bleeding has been infrequently reported in comparison to maelena and hematochezia [8]. Similarly, our patient presented with severe pain in the epigastrium, nausea, vomiting and symptoms of jaundice with weight loss but no gastrointestinal bleeding and specific finding of diabetes mellitus.

Preoperative nutritional status assessment helps in early identification of patients who require special care and nutritional needs for recovery. It is considered as an important perspective for postoperative morbidity and mortality [9,10]. First indicator is preoperative serum albumin. The albumin levels <21 g/l is associated with 29.0% postoperative mortality and 30-day mortality of 65.0% [11]. Second marker is jaundice, which indicate the extent of the damage [9]. Another factor is cancer cachexia, which is diagnosed if the weight loss is M 10.0% in six months [9,11]. The combination of anorexia and weight loss ≥ 10.0% is regarded as a poor prognostic signal [11]. Alcohol abuse and cigarette smoking should be completely discontinued, as they lead to post-operative mortality [12,13]. In our case, patient had full blown jaundice with low albumin level and weight loss >10.0% and past history of cigarette smoking, which was discontinued from last 2 years.

Diabetes is one of the important complications after pancreatic resection in whipple procedure. It has been observed that blood glucose levels are raised in immediate post-operative period, due to stress or certain medications [6,9]. Almost 80.0% of individuals with pancreatic cancer have developed diabetes mellitus following the diagnosis [6,9]. The long-term damage of the pancreatic endocrine tissue by the tumor is perhaps the most valid reason for the development of diabetes mellitus in such patients [9]. In our case, we have not found any specific manifestation of diabetes mellitus till date. The regular blood glucose monitoring is recommended in these patients to manage the effects of both counter regulatory hormones-insulin and glucagon [12,13]. Patients should be instructed and made aware of sign and symptoms of diabetes mellitus and advised regular checkup of blood glucose levels.

The degree of the pancreatic tissue destruction could lead to malabsorption, because of loss of exocrine functional part of pancreas in pancreatic adenocarcinoma or pancreatic resection [9]. Exocrine Pancreatic Insufficiency (EPI) is significantly found in 68%-92.0% of pancreatic cancer patients [9,14]. The other factor which further enhances malabsorption is decreased secretion of bicarbonate by the unhealthy pancreatic tissue. The consequence of it aids in an acidic environment, which denatures the remaining digestive enzymes. The outcomes of EPI include diarrhoea, steatorrhoea, micronutrient deficiencies and weight loss [9,10]. This problem can be overcome by intake of low-fat diet which is identified by patient tolerance, small periodic meals along with oral nutrition supplements to check optimal absorption from gut and pancreatic enzymes substitute. In our case we have not noticed significant malabsorption till date.

The duodenum and proximal jejunum are major sites for the absorption of macro and micronutrients. Surgical removal of these small intestinal parts could result in decreased absorption of iron, calcium, zinc, copper, selenium and fat-soluble vitamins [14]. Deficiency of vitamin B12 and folate is common, due to decrease bacterial growth in small intestine because of acidic environment and pancreatic insufficiency [6,10]. We did not investigate our patient for macro and micronutrients levels before surgery, so it is difficult to comment on this aspect.

The nutrition requirement has to be fulfilled appropriately to enhance the recovery postoperatively and to minimize the effects of cancer cachexia. Oral intake with oral nutritional supplements should be considered as a first choice, which was also adapted in our case. The enteral tube feeding (nasojenunal) should be started if the combined therapy does not meet the required demand. Still, an individualised approach should be taken into the account, so that any specific complications that may occur after surgery can be figured out easily. The routine use of Parenteral Nutrition (PN) as a single source of nutrition is not suggested and this alternative method should only be used when the oral and enteral routes have been unsuccessful [12]. A recent study illustrated that the combination of early enteral nutrition with parenteral nutrition is markedly superior to parenteral nutrition alone, due to decreased infectious complications, a shorter hospital stay, improved nutritional status and improved glucose control in the group receiving the combination therapy [15]. As we have assessed the patient condition postoperatively, we have started the oral intake after 3 days of combined enteral and parenteral nutrition, with good response.

Another notable complication of whipple procedure is pancreatic fistulas. The diagnosis of a fistula, as defined by the International Study Group for Pancreatic Fistulas (ISGFP) is made in the presence of an output via a drain of any fluid on or after postoperative day 3, and when the amylase content of the fluid is greater than three times the upper normal serum value [9,14]. It develops in 12%-38.0% of patients after whipple procedure [9,14]. Luckily, our patient is fine with no such complication of surgery.

Various diagnostic techniques can be used to evaluate the pancreatic tumor size, involvement of nearby structures and spread to distant organs. The best method for imaging of pancreatic ailment is hydro-CT, which involves distension of the stomach and duodenum by administration of 1-1.5 L of water as a negative contrast medium under medically induced hypotension by administration of buscopan [16]. Magnetic resonance cholangiography and Endoscopic Ultrasound (EUS) are other imaging modality which can be used to diagnose the tumor.

In the National Comprehensive Cancer Network (NCCN) guidelines for pancreatic adenocarcinoma, it is strongly recommended that all patients with unresectable pancreatic tumor have cancer confirmation prior to non-surgical treatment [17]. EUS-guided fine needle aspiration (EUS-FNA) is considered to be the prime choice of modality for achieving a tissue diagnosis in loco regional disease, especially prior to neo-adjuvant cancer therapy [18].

Cancer-associated Antigen 19-9 (CA 19-9) is the best tumor marker for pancreatic pathologies, due to its secretion in about 75%–80.0% of pancreatic cancer patients. The value of CA19-9 in pre and post-surgical condition is a remarkable signal for the prediction of malignancy, resectability and prognosis of pancreatic cancer patients [17]. Serum amylase and lipase levels are occasionally elevated. In our case the level of CA 19-9 was >100 U/mL.

The treatment modality for pancreatic tumor was first described by Walther Kausch in Germany in 1909, which was later modified by Allen Whipple in the United States [19]. In 1944, surgeon Watson further created changes in the classic whipple procedure by pylorus-preserving PD. This technique was popularized later and used for carcinoma of the papilla of Vater, chronic pancreatitis and duodenal cancer [20,21]. Pylorus-preserving PD has achieved more popularity over the classic Whipple procedure, because of preservation of stomach without constraining lymph node clearance [22] (Table 1). Surgical resection followed by adjuvant therapy is associated with disease relapse rates of >70.0% [23]. Only 30%–40.0% of pancreatectomies achieve R0 resections, even in experienced hands, because the tumors spread early into and along

neural sheaths [24]. A meta-analysis study showed no difference in mortality, overall survival, and few parameters of morbidity mainly pancreatic fistula, post pancreatectomy hemorrhage and biliary leakage [25].

Table 1: Pylorus-preserving versus pylorus-resecting PD.

Pylorus-preserving PD	Classic Whipple procedure
Pylorus ring is preserved	Whole stomach is removed
An increased incidence of DGE (19-22) range between 5% and 57% [23].	Post gastrectomy dumping syndrome, but less DGE (Delayed Gastric Emptying)
Intraoperative blood loss, operation time, and red blood cell transfusions were significantly reduced.	Intraoperative blood loss, operation time, and red blood cell transfusions were more due to upper extent of resection
Appetite and weight were better preserved in the pylorus-preserving group	Quality of life and nutritional status were reduced

Pylorus-preserving versus pylorus-resecting PD

Hiyoshi et al. evaluated gastric emptying and nutritional status after both procedures during a 12-month period, and authors concluded that pylorus-preserving PD better preserves physiological gastrointestinal function and long-term nutritional status [26]. Another study group of meta-analysis of the three existing RCTs showed no significant statistical difference between the two procedures and other relevant outcome parameters including postoperative pancreatic fistula, post pancreatectomy hemorrhage, intra-abdominal fluid collection/abscess, bile leakage, wound infection, pulmonary complications, mortality, reoperations, perioperative blood loss, duration of operation and length of hospital stay [27-30].

CONCLUSION

Pancreatic and duodenal carcinoma is a highly malignant tumor with dreadful prognosis and exponential growth. Although minimal-invasive distal pancreatectomy has gained wide popularity; open surgery is still the standard approach in pancreatic malignancy because of extensive involvement of visceral organs, lymph nodes, nerve sheath, mesentery and blood vessels. An individualized approach should be used in managing the complications and in opting the most appropriate route of nutritional support.

REFERENCES

1. ZSiegel RL, Miller KD, Jemal A. Cancer statistics, 2018. CA Cancer J Clin. 2018;68(1):7-30.
2. Quante AS, Ming C, Rottmann M, Engel J, Boeck S, Heinemann V, et al. Projections of cancer incidence and cancer-related deaths in Germany by 2020 and 2030. Cancer Med. 2016;5(9):2649-2656.
3. Rahib L, Smith BD, Aizenberg R, Rosenzweig AB, Fleshman JM, Matrisian LM. Projecting cancer incidence and deaths to 2030: The unexpected burden of thyroid, liver, and pancreas cancers in the United States. Cancer Res. 2014;74(11):2913-2921.
4. Mu DQ, Peng SY, Wang GF. Risk factors influencing recurrence following resection of pancreatic head cancer. World J Gastroenterol. 2004;10(6):906-909.
5. Bakkevold KE, Kambestad B. Palliation of pancreatic cancer. A prospective multicentre study. Eur J Surg Oncol. 1995;21(2):176-182.
6. Marcason W. What is the Whipple procedure and what is the appropriate nutrition therapy for it? J Acad Nutr Diet. 2015;115(1):168.
7. Lillemoe KD. Palliative therapy for pancreatic cancer. Surg Clin North Am. 1998;7(1):199-216.
8. Lee P, Sutherland D, Feller ER. Massive gastrointestinal bleeding as the initial manifestation of pancreatic carcinoma. Int J Pancreatol. 1994;15(3):223-227.
9. Pappas S, Krzywda E, McDowell N. Nutrition and pancreaticoduodenectomy. Nutr Clin Pract. 2010;25(3):234-243.
10. Sanford DE, Sanford AM, Fields RC, Hawkins WG, Strasberg SM, Linehan DC. Severe nutritional risk predicts decreased long-term survival in geriatric patients undergoing pancreaticoduodenectomy for benign disease. J Am Coll Surg. 2014;219(6):1149-1156.
11. Gibbs J, Cull W, Henderson W, Daley J, Hur K, Khuri SF. Preoperative serum albumin level as a predictor of operative mortality and morbidity: Results from the national VA surgical risk study. Arch Surg. 1999;134(1):36-42.
12. Karagianni VT, Papalois AE, Triantafillidis JK. Nutritional status and nutritional support before and after pancreatectomy for pancreatic cancer and chronic pancreatitis. Indian J Surg Oncol. 2012;3(4):348-359.
13. Lassen K, Coolsen MM, Slim K, Carli F, de Aguilar-Nascimento JE, Schäfer M, et al. Guidelines for perioperative care for pancreaticoduodenectomy: Enhanced Recovery After Surgery (ERAS®) Society recommendations. Clin Nutr. 2012;31(6):817-830.
14. Berry AJ. Pancreatic surgery: Indications, complications, and implications for nutrition intervention. Nutr Clin Pract. 2013;28(3):330-357.
15. Zhu XH, Wu YF, Qiu YD, Jiang CP, Ding YT. Effect of early enteral combined with parenteral nutrition in patients undergoing pancreaticoduodenectomy. World J Gastroenterol. 2013;19(35):5889-5896.
16. Hartwig W, Büchler MW. Pancreatic cancer: Current options for diagnosis, staging and therapeutic management. Gastrointest Tumors. 2013;1(1):41-52.
17. Wood DE. National Comprehensive Cancer Network (NCCN) clinical practice guidelines for lung cancer screening. Thorac Surg Clin. 2015;25(2):185-197.
18. Tempero MA, Arnoletti JP, Behrman SW, Ben-Josef E, Benson AB, Casper ES, et al. Pancreatic Adenocarcinoma, version 2.2012: featured updates to the NCCN Guidelines. J Natl Compr Canc Netw. 2012;10(6):703-713.
19. Whipple AO, Parsons WB, Mullins CR. Treatment of carcinoma of the ampulla of vater. Annals of surgery. 1935;102(4):763-779.
20. Watson K. Carcinoma of ampulla of vater successful radical resection. Br J Surg. 1944;31(124):368-73.
21. Traverso LW, Longmire WP. Preservation of the pylorus in pancreaticoduodenectomy. Surg Gynecol Obstet. 1978;146(6):959-962.
22. Diener MK, Hüttner FJ, Kieser M, Knebel P, Dörr-Harim C, Distler M, et al. Partial pancreatoduodenectomy versus duodenum-preserving pancreatic head resection in chronic pancreatitis: The multicentre, randomised, controlled, double-blind ChroPac trial. Lancet. 2017;390(10099):1027-1037.
23. Nimura Y, Nagino M, Takao S, Takada T, Miyazaki K, Kawarada Y, et al. Standard versus extended lymphadenectomy in radical pancreatoduodenectomy for ductal adenocarcinoma of the head of the pancreas: Long-term results of a Japanese multicenter randomized controlled trial. J Hepatobiliary Pancreat Sci. 2012;19(3):230-241.
24. Büchler MW, Kleeff J, Friess H. Surgical treatment of pancreatic cancer. J Am Coll Surg. 2007;205(4):S81-S86.

25. Hüttner FJ, Fitzmaurice C, Schwarzer G, Seiler CM, Antes G, Büchler MW, Diener MK. Pylorus-preserving pancreaticoduodenectomy (pp Whipple) versus pancreaticoduodenectomy (classic Whipple) for surgical treatment of periampullary and pancreatic carcinoma. Cochrane Database Syst Rev. 2016;2(2):CD006053.

26. Hiyoshi M, Chijiiwa K, Ohuchida J, Imamura N, Nagano M. Comparative study of gastric emptying and nutritional status after pylorus-preserving vs. subtotal stomach-preserving pancreaticoduodenectomy. Hepatogastroenterology. 2012;59(116):1018-1022.

27. Matsumoto I, Shinzeki M, Asari S, Goto T, Shirakawa S, Ajiki T, et al. A prospective randomized comparison between pylorus-and subtotal stomach-preserving pancreatoduodenectomy on postoperative delayed gastric emptying occurrence and long-term nutritional status. J Surg Oncol. 2014;109(7):690-696.

28. Hackert T, Probst P, Knebel P, Doerr-Harim C, Bruckner T, Klaiber U, et al. Pylorus resection does not reduce delayed gastric emptying after partial pancreatoduodenectomy: a blinded randomized controlled trial (PROPP Study, DRKS00004191). Ann Surg. 2018;267(6):1021-1027.

29. Kawai M, Tani M, Hirono S, Miyazawa M, Shimizu A, Uchiyama K, et al. Pylorus ring resection reduces delayed gastric emptying in patients undergoing pancreatoduodenectomy: A prospective, randomized, controlled trial of pylorus-resecting versus pylorus-preserving pancreatoduodenectomy. Ann Surg. 2011;253(3):495-501.

30. Klaiber U, Probst P, Strobel O, Michalski CW, Dörr-Harim C, Diener MK, et al. Meta-analysis of delayed gastric emptying after pylorus-preserving versus pylorus-resecting pancreatoduodenectomy. Br J Surg. 2018;105(4):339-349.