

STENT PANCREATIC DE PLASTIC – O CAUZĂ RARĂ DE FISTULĂ TARDIVĂ PANCREATICO-JEJUNALĂ

PLASTIC PANCREATIC STENT – A RARE CAUSE OF LATE POSTOPERATIVE PANCREATIC FISTULA AFTER A WHIPPLE PROCEDURE

Asist. univ. dr. SEBASTIAN VÂLCEA* , Asist. univ. dr. BOGDAN DUMITRIU,
Dr. VALENTIN NIȚESCU, Prof. dr. MIRCEA BEURAN, Asist. univ. dr. MIHAI ȘTEFAN

Disciplina Chirurgie Generală, Departament 10, UMF Carol Davila București
Secția III Chirurgie Generală, Spitalul Clinic de Urgență București

Postoperative pancreatic fistula is the leading cause of morbidity and mortality in patients undergoing pancreatic resection. The pancreatic duct stenting technique during pancreatic anastomosis does not reduce the incidence of postoperative pancreatic fistula after cephalic pancreatoduodenectomy. The drainage method includes the use of an external or internal stent. The current literature suggests that the use of an internal pancreatic duct stent does not help to reduce the leakage rate of pancreatic anastomosis after pancreatic resection, and it may increase the risk of pancreatic fistulas in soft pancreases [1].

We report here the case of a 74-year-old patient, who 15 years ago underwent a Whipple-type cephalic duodenopancreatectomy, the operative indication being a Vaterian ampulla, for which the anastomosis prosthesis was performed with a plastic stent placed intraoperatively at the level of the Wirsung canal later, in 2022, he developed a late pancreatic fistula through the migration of the transperietal stent to the skin level.

Pancreatic postoperative fistula represents a major cause of morbidity and mortality in pancreatic surgery. Therefore, many surgical techniques have been undertaken and tested to prevent the occurrence of pancreatic fistula and its related complications, also useful for decreasing mortality rates among these patients.

Fistula pancreatică postoperatorie este principala cauză de morbiditate și mortalitate la pacienții supuși rezecției pancreatice. Tehnica de stentare a canalului pancreatic în timpul anastomozii pancreatice nu reduce semnificativ incidența fistulei pancreatice postoperatorie după duodeno-pancreatectomie cefalică. Metoda de drenaj include utilizarea unui stent extern sau intern. Meta-analizele din literatura de specialitate sugerează că utilizarea unui stent de canal pancreatic intern nu ajută la reducerea ratei de fistulă a anastomozii pancreatice după rezecția pancreatică și chiar poate crește acest risc la pacienții cu pancreas moale [1].

Raportăm aici cazul unei paciente de 74 de ani, la care în urmă cu 15 ani s-a practicat o duodenopancreatectomie cefalică tip Whipple, indicația operatorie fiind un ampulom Vaterian, pentru care s-a realizat protezarea anastomozii cu un stent de plastic plasat intraoperator la nivelul canalului Wirsung ce a dezvoltat ulterior, în anul 2022, o fistulă pancreatică tardivă prin migrarea stentului transperietal până la nivel cutanat.

Fistula pancreatică postoperatorie (POPF) reprezintă o cauză majoră de morbiditate și mortalitate în chirurgia pancreatică. Prin urmare, multe tehnici chirurgicale au fost dezvoltate și testate pentru a preveni apariția fistulei pancreatice și a complicațiilor aferente acestora, cât și pentru scăderea ratei mortalității în rândul acestor pacienți.

Keywords: stent, fistula, pancreas, morbidity

1. Introduction

Plastic stents provide rapid palliation of biliary and pancreatic obstruction, and shorten hospital stay when compared to surgical bypass. In many cases, stent placement obviates major surgical intervention. The cost of a plastic stent is less than \$100 and is far less than an expandable metal stent, the cost of which may exceed \$1800 contingent upon manufacturer and presence or absence of a covering. Metal stents have a significantly longer life than plastic stents, although if the patient does not survive long enough, this cost-benefit will not be realized. Therefore, in patients with distal malignancy who have an anticipated life expectancy

less than three to four months, plastic stents are more cost-effective [2].

2. Plastic stents

Plastic stents are made of polyethylene or Teflon and are available in varying shapes, length and size for biliary and pancreatic pathologies. A pusher tube is used to place plastic stents over a guidewire with or without a guiding catheter. Delivery systems are available for plastic stents that combine the pushing and guiding catheters. The standard stent delivery system for 10 Fr comprise a 0.035 inch guidewire (480 cm) and a 6 Fr radio-opaque Teflon (260 cm in length) guiding catheter with a tapered tip to facilitate cannulation and a pusher tube. Some

* Autor corespondent/Corresponding author,
E-mail: sebastian.valcea@gmail.com

guiding catheters have two metal rings (placed 7 cm apart) at the distal end that helps in identification and measurement of the stricture length. The pusher tube is made of Teflon (8, 10, and 11.5 Fr) and used for positioning the stent during deployment [2].

Most plastic stents are made of radiopaque polyethylene and are available in sizes varying from 3 to 11.5 Fr. They also vary in length and configuration. There is no inner catheter for the 3–7 Fr stent delivery systems. Straight “Amsterdam” type stents are predominantly used for biliary drainage. Based on Poiseuille’s law there is a clear relationship between stent diameter and duration of stent patency. A straight configuration also appears to improve stent patency. Attempts to improve stent patency by eliminating side holes, changing stent material or coating the inner surface with a hydrophilic substance have generally not been successful. Double pigtail configurations help anchor the stent to prevent upward or downward migration. These stents are frequently used to maintain drainage in patients with difficult bile duct stones and in some patients with hilar structures [2].

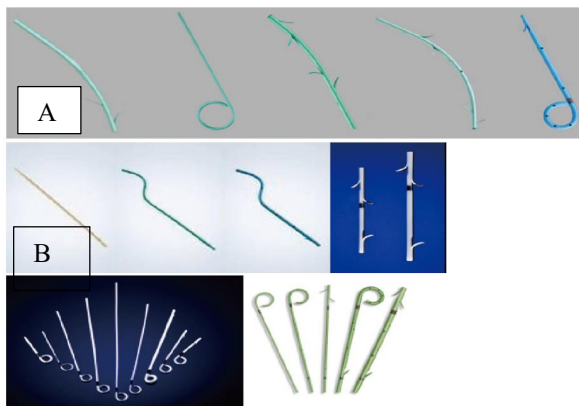


Fig. 1 - Example of prophylactic (A) and therapeutic (B) pancreatic plastic stents, Boston Scientific Advanix Pancreatic stents (Pictures: Ellrichmann, Conrad)(open access) [23]

Single pigtail stents are frequently used in the pancreatic duct to prevent inward migration. Limited data suggest that smaller stents will lead to less damage when used in a normal pancreatic duct and that elimination of side holes and flaps may prolong patency and promote spontaneous migration of pancreatic stents. New pancreatic stents have become available recently that are constructed to have running channels and no side holes (GI Supply, Camp Hill, PA). Limited data are available in reference to their superiority over currently used stents [2,3].

Stents are usually removed using snares, baskets and foreign body forceps. Large bore (10 Fr) stents can be removed through the channel of a therapeutic endoscope with the aid of a snare. Smaller stents, i.e. 3 Fr and 5 Fr pancreatic stents

can also be removed via the working channel of the endoscope using a foreign body forceps (e.g. rat tooth forceps). The Soehendra stent retriever (Cook Endoscopy, Winston-Salem, NC) consists of a screw-tipped wire-guided device that allows stent removal while maintaining guidewire position. It is also available with an extended tip design to facilitate cannulation. In patients with difficult strictures, maintaining wire access can also be accomplished by using a wire and a snare [2,3].

3. Definition of postoperative pancreatic fistula

Pancreatic fistulae have been described by various authors using non-standardised definitions in the past. In general, the leakage of enzyme-containing fluid from the pancreatic tissue or duct, of any origin and cause, is regarded as a pancreatic fistula. With regard to the postoperative situation, a leakage from the pancreatic stump or the anastomosis can frequently be observed in the very early phase after a resection. Therefore, it is necessary to further clarify the fistula definition with regard to fluid amount, enzyme content and duration of the secretion as well as to correlate these biochemical parameters with the clinical symptoms to evaluate their impact on the patients condition and to stratify risk levels for possible consequent complications. Up to 2005, twenty-six different definitions of postoperative fistula were used (4), resulting in a confusing variety of scoring systems with limited clinical value. Furthermore, the reported incidences of fistula of 2-50% in different studies were not comparable, making a scientific approach to address this problem difficult [4,6]. The initial approaches to standardise this definition go back to 2004, when Bassi et al.[4] introduced a scoring system including the different features of fourteen fistula definitions based on fluid output measurement and duration of the output. The authors proposed a scoring system in which they summarized four major definitions, which were applied to the studies reviewed for the definition. However, even these four definitions showed significant differently fistula incidences, which led the authors to the conclusion that a consensus conference on this topic was inevitable. Following this consensus, the standardised fistula definition was proposed in 2005 (5). The ISGPF consensus paper defined a postoperative pancreatic fistula as the existence of any fluid output via an intraoperatively placed or postoperatively inserted drain on or after postoperative day three with an amylase content greater than three times the upper normal serum value [5]. This definition facilitates the diagnosis of a fistula, as no further radiographic or clinical findings are mandatory for the diagnosis. When the diagnosis of a fistula has been established from this simple laboratory finding, it should be further classified regarding the clinical

Table 1

International Study Group for Pancreatic Fistula (ISGPF) Classification [5]

Definition of pancreatic fistula, modified after ISGPF				
Criteria	No fistula	Grade A	Grade B	Grade C
Ecography /CT	Negative	Negative	Negative/positive	Positive
Specific therapy	No	No	Yes/No	Yes
Clinical condition	Good	Good	Mediocre	Critical
Drainage > 21 days	No	No	Yes(often)	Yes
Infection	No	No	Yes	Yes
Amilase in drainage	< 3 x serum amilase	>3 x serum amilase	>3 x serum amilase	>3 x serum amilase
Sepsis	No	No	No	Yes
Relaparotomy	No	No	No	Yes
Readmission	No	No	Yes/No	Yes/No
Cause of death	No	No	No	Yes (possibly)

condition, specific therapeutic measures, the duration of treatment, consecutive complications and the outcome of the patient. Table 1 summarises the grading system. With this easy-to-apply three category system, a standardised definition was proposed which has meanwhile been widely accepted and is currently used worldwide by all major study groups for the categorisation of their patient data [5].

4.Material and methods

The 74-year-old patient, with a history of surgery: Whipple pancreatoduodenectomy for Vaterian ampulla cancer T3N1M0 stage III in 2008 in another hospital unit, who also received neoadjuvant therapy, operated a year later for postoperative incisional hernia - single-plane procedure and reoperated in 2009 for incisional hernia recurrence for which prosthetic material – polypropylene mesh was fitted, presented to our department for the appearance of a purulent-like secretion at the level of the postoperative right subcostal wound, which occurred 24 hours before admission.

Clinical examination revealed supple abdomen, mobile with respiratory movements, painless spontaneously or on palpation, without signs of peritoneal irritation, without palpable tumor or pseudotumoral mass. At the level of the right subcostal segment of the old postoperative scar, there is a skin hole of approximately 1 cm with the exteriorization of purulent-bloody liquid upon expression, with the highlighting of the partially exposed textile prosthesis.



Fig.2 – Final postoperative aspect

A sample was collected from the wound for bacteriological and biochemical examination.

Paraclinical tests revealed mild inflammatory syndrome, without leukocytosis, the value of procalcitonin being slightly increased. We decided to perform a thoraco-abdominal-pelvic computer tomograph with i.v. contrast substrate, which shows an aspect of parietal suppuration possibly caused by the transparietal migration of an anastomotic tutor tube (pancreatic stent previously used for the pancreatico-jejunal anastomosis) with the pancreatic abutment, without elements of oncological recurrence. For a more detailed description of the lesion, an abdominal MRI was also performed, which confirmed the presence of a digestive pancreatic fistula with anastomotic segment of the jejunal loop open to the abdominal wall and subcutaneous parafluid collection in the epi-mesogastric region with a maximum thickness of 15mm. Broad-spectrum antibiotic therapy, Ceftriaxone and Metronidazole was initiated, with remission of the inflammatory syndrome, the bacteriological examination demonstrating the sensitivity of the germs to the administered antibiotic therapy.

A percutaneous drainage was placed through the fistulous opening and with a flow rate of 30-50 ml/24h, serohematous liquid in the first 3 days, then it acquires a cloudy-purulent appearance. Biochemical examination of the drainage fluid reveals elevated concentrations of amylase and lipase, certifying the late postoperative pancreatic fistula. We decided to perform an echoendoscopy to explore the Wirsung



Fig. 3 - Suprainfected stent in the Wirsung Duct after pancreatic section

duct, which establishes the existence of a calcified pancreatic stent at its level.

Following imaging, endoscopic and laboratory investigations, the diagnosis of **infection of alloplastic material due to late postoperative pancreatic fistula** is issued and the indication for surgery is established.

Surgery is performed on October 24th, 2022 by iterative laparotomy, followed by the total extraction of the suprainfected prosthetic material with the sanitation of the septic focus. When entering the peritoneal cavity, purulent peritonitis was found localized through jejunal perforation by the transanastomotic plastic stent of the pancreatico-jejunal anastomosis, with no other changes visible on inspection.

Initially, an attempt to restore the pancreatico-jejunal anastomosis was performed, followed by the extraction of the stent, but due to its strong impact in the main pancreatic duct with necrosis and fibrosis, this was not possible. Consequently, we decided to abolish the pancreatico-jejunal anastomosis and perform a total pancreatectomy and the complete excision of the suprainfected polypropylene mesh (Fig. 2,3).

The postoperative evolution was favorable, the patient resumed her bowel movements starting on the 2nd postoperative day, with good digestive tolerance, without any other subjective complaints. Discharge was performed on postoperative day 10.

4. Discussions

Some surgeons place intraluminal pancreatic stents across the anastomosis in an attempt to decrease the frequency of anastomotic leak. This technique is used almost exclusively for pancreaticoenteric anastomosis because of the high risk of a leak. These free-floating stents facilitate a duct-to-mucosa anastomosis and are designed to assure anastomotic patency and to decompress the pancreatic duct into the jejunum during the early postoperative period while anastomotic edema resolves. Although many favor the use of pancreatic-enteric stents, others discourage their use because of the lack of data to indicate a benefit [6-9].

The optimal duration of stent placement is uncertain. Short-term insertion is likely to ameliorate the risk of leakage, because the epithelium of the jejunal mucosa becomes well healed with the pancreatic ductal epithelium by the 14th postoperative day [10]. However, because the pancreaticojejunal anastomosis may require 6 months to mature [11], prolonged stent placement may ensure patency. The potential benefit of prolonged stent placement must be balanced against the potential risks. Limited data support the long-term use of pancreatic stents, and some studies suggest that long-term transanastomotic

stent placement is of no benefit and potentially is harmful.

Pancreatic stent occlusion is an expected occurrence that develops as a result of protein deposition, calcium carbonate crystal formation, accumulation of necrotic cells, and bacterial colonization on the inner surface of the stent [12,13]. These changes develop as early as 2 weeks after endoscopic stent insertion and after a mean of 1 to 2 months [14]. Smaller diameter stents occlude faster than larger stents. Pancreatic duct stents also induce inflammation, fibrosis, and ductal and parenchymal changes of chronic pancreatitis in animal models [15,16]. Similar changes can be seen in 36% to 100% of patients with endoscopically inserted stents and appear to be most closely associated with the proximal end of the stent [17,18].

Many issues remain unresolved regarding placement of a pancreatic stent at the pancreaticojejunal anastomosis during pancreaticoduodenectomy. A prospective randomized trial is needed to clearly define the benefits and the risks of this practice. Such a study should include a careful assessment of the clinical outcomes, timing, and ability of various imaging modalities to document spontaneous stent passage. Also, more data are needed regarding the optimal duration of stent placement, use of internal vs. external stents, need for creation of barbs to discourage early migration, and utility of biodegradable and radiopaque stents [19].

It is likely that many of these issues are seldom of clinical importance for patients with pancreatic cancer because of their short life expectancy. As the present case demonstrates, the possibility of a retained stent in the appropriate clinical setting should be considered, even when surgery was performed in the remote past. Even greater vigilance should be exercised in the search for retained stents in patients with benign disease or slowgrowing tumors, because retained stents are likely an under-recognized cause of diminished pancreatic function (e.g., steatorrhea) and recurrent pancreatitis or, as shown, a digestive fistula [7, 19].

5. Conclusions

Postoperative pancreatic fistula is the leading cause of morbidity and mortality in patients undergoing pancreatic resection. In addition, between 2-20% of patients die from this complication. Therefore, many surgical techniques have been undertaken and tested to prevent the occurrence of pancreatic fistula and its related complications, also useful for decreasing mortality rates among these patients. Despite some surgical strategies that have been shown to have a positive effect on decreasing the frequency of pancreatic fistula occurrence, among which we list: invagination anastomosis, "duct to mucosa"

anastomosis, anastomosis protected by the insertion of a stent in the main pancreatic duct, none of these methods were able to eliminate it [21].

Current literature on this subject comparing the type of anastomosis performed: anastomosis without drainage of the Wirsung canal vs anastomosis protected with a stent, argues that there is no statistically significant difference between the 2 surgical techniques [19,21].

The appearance of new resorbable materials for bilio-pancreatic stenting could eliminate the risk of their migration and petrification, representing a possible solution for decreasing the incidence of pancreatic fistula. Single-center studies were performed on small groups of patients with promising results, proving their effectiveness [20,22,23].

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