

Assessing spontaneous passage of prophylactic pancreatic duct stents by X-ray: is a radiology report adequate?

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Abstract

Background: Pancreatic duct stents are frequently placed for prophylaxis of post-endoscopic retrograde cholangiopancreatography pancreatitis. Because of concern for possible secondary ductal changes from a retained stent, these stents need to be monitored and removed if retained. Usually an abdominal X-ray is performed to assess retained stent, and if present, an esophagogastroduodenoscopy is performed to remove the stent. Limited data is published on false-negative radiology reports for spontaneous passage of stents.

Methods: Using an Institutional Review Board–approved stent log, a retrospective chart review of all pancreatic duct stents placed at our institution from 2008 to 2014 was performed.

Results: A total of 856 pancreatic duct stents were placed during the study period. Of these, 435 (50.8%) were prophylactic stents and 421 (49.2%) were therapeutic. Complete follow-up data were available in 426 (97.9%) patients with prophylactic stents. Six patients (1.4%) were lost to follow up and three (0.7%) expired prior to removal. In all, 283 (66%) had follow-up imaging, with 167 (39.2%) having the official radiology read with no retained pancreatic duct stent in place. Eight of these cases were “false-negative” radiology interpretation (4.8% of cases read as “no stent,” NNH=20). The stent was found either by review of image by an endoscopist or incidental stent discovery during a follow-up procedure.

Conclusion: Radiologist interpretation of abdominal X-rays to assess spontaneous passage of prophylactic pancreatic ducts stents resulted in a false-negative interpretation in approximately 5% of cases. Independent review of the images by the endoscopist may be beneficial given unfamiliarity of these stents by radiologists.

Keywords: false negative, pancreatic stent, post-endoscopic retrograde cholangiopancreatography pancreatitis

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Introduction

The most common and potentially serious complication following an endoscopic retrograde cholangiopancreatography (ERCP) is acute pancreatitis.^{1,2} In this case, the pancreatitis often manifests secondary to postprocedural papillary edema and spasm of the Sphincter of Oddi, impairing pancreatic drainage and resulting in retention of pancreatic juice.³ To prevent post-ERCP pancreatitis, the endoscopist may place a pancreatic duct (PD) stent. There remains controversy over which type of stent provides the

most effective post-ERCP pancreatitis prophylaxis. Some of the more commonly used PD stents include 7Fr, 5Fr, and 3Fr stents with or without internal flanges.⁴

PD stenting has become increasingly common in current clinical practice. A meta-analysis aiming to determine whether PD stents reduce the risk of post-ERCP pancreatitis demonstrated that patients who did not receive a stent had a significant, three times higher risk of developing post-ERCP pancreatitis when compared with those

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who did receive a PD stent.⁵ PD stents are versatile in that they can be used therapeutically and prophylactically. They may be placed to seal disruptions, drain pseudocysts, and treat pancreatitis.⁶ In terms of prophylaxis, the main goal of implementing a PD stent is to prevent or significantly reduce the risk of pancreatitis in post-ERCP patients.⁷ Typically, prophylactic stents are reserved for those patients who are at high risk of developing post-ERCP pancreatitis, such as those with a significant history of pancreatic pathology, small common bile duct diameter (<10mm), Sphincter of Oddi dysfunction, and other conditions.^{3,8}

Prior to stent placement, the majority of patients show no signs of PD damage on imaging modalities such as pancreatogram. Thus, pancreatic duct changes from the stent impose an undesirable consequence.⁷ Upstream or proximal migration of PD stents has been reported to occur at about a frequency of 5%. Retained PD stents are associated with stricture formation and other secondary changes to the duct. Complications may include pancreatic ductitis, infection and bleeding, cholangitis, cholecystitis, duodenal perforation, stent occlusion, and stent migration.^{9,10} Vigilant surveillance measures should be taken to monitor and remove a retained stent.

In most cases, the PD stent spontaneously passes without major complications. Lawrence and colleagues retrospectively determined that in approximately 88% of cases, the PD stent spontaneously passed within 30 days. Usually, an abdominal X-ray is performed to assess the presence of a retained stent and if present, a subsequent esophagogastroduodenoscopy (EGD) is performed to remove the stent.¹¹ Potential limitations of abdominal X-rays include whether the patient is obese or has prior surgical hardware, which may interfere with stent visualization. Until now, there has not been a study describing the false-negative radiology reports for spontaneous passage of stents. In our single-center cohort experience, we aim to delineate the false-negative rate of spontaneous passage of stents based on radiology reports.

Methods

This study was approved by the Penn State Institutional Review Board (IRB), study number 00002344. Informed consent was waived by the IRB committee as the study involved use of

existing data and records that were deidentified and posed no more than minimal risk to the subject.

A retrospective chart review of all documented PD stent placements at the Penn State Health Milton S. Hershey Medical Center from 2007 to 2014 was conducted. Inclusion criteria included prophylactic PD stents with an existing follow-up radiology report documenting the presence or absence of a PD stent. Based on available documentation, all cases of PD stenting were reviewed and stratified into a “therapeutic” or “prophylactic” group. For the purpose of this study, prophylactic PD stents served as the main focus. Procedures with stent placement were reviewed and documented with pertinent patient and procedural characteristics, indication of stent placement, stent length and diameter, and presence of internal flanges.

In addition, radiology reports along with clinic notes and document messages were reviewed. For cases where the radiology report documented passage of the stent, future notes, radiology reports, and documented messages were reviewed to confirm that a retained stent was not found at a later occasion. Radiographs were ordered as a standardized abdominal X-ray with two views to assess for the presence or absence of a PD stent following ERCP. All imaging was independently reviewed by an endoscopist following data collection.

Results

Figure 1 outlines the steps taken to determine the false-negative rate of spontaneous prophylactic stent passage in our cohort. During the study period, 856 PD stents were placed. In total, 435 (50.8%) of the stents were placed as a prophylactic measure, whereas 421 (49.2%) were therapeutic. Upon review of the 435 prophylactic PD stents, complete follow-up data were available on 426 (97.9%) stents. The remaining nine patients died (six patients, 1.4%) or were lost to follow-up (three patients, 0.7%) prior to stent passage. Among the 426 cases that were reviewed to completion, 283 (66%) had follow-up imaging with abdominal X-ray, and the remaining 143 (34%) did not undergo surveillance imaging. The patients who were managed without surveillance imaging were predominantly done so during cases that required subsequent procedure(s) for other reasons, such as removal of biliary duct stents.

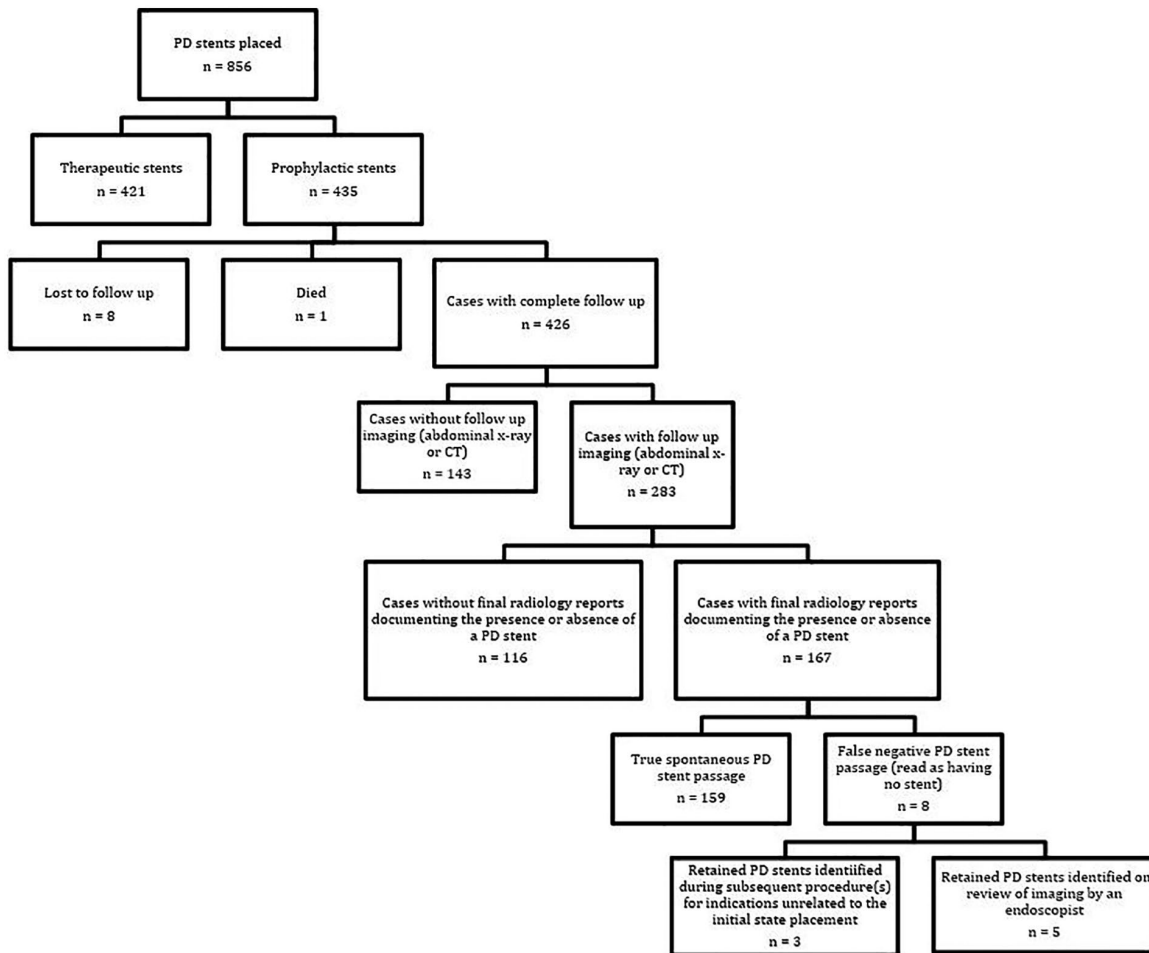


Figure 1. Inclusion criteria for prophylactic PD stenting in our cohort.

Out of 283 cases with follow-up imaging, 167 cases had final radiology reports that documented either the presence or absence of a PD stent. Out of 283 cases with follow-up imaging, 116 patients did not have a final radiology report documenting the presence or absence of a PD stent. Imaging was obtained approximately 2 weeks following PD stent placement. Eight out of 167 images initially read as having an absent PD stent were later identified as being “false-negative,” indicating that the PD stent was indeed retained (4.8% of cases read as “no stent,” number needed to harm (NNH) = 21). In five of the eight cases, the stent was identified on review of imaging by an endoscopist/gastroenterologist in the clinic setting, as seen in Figure 2. The remaining three retained PD stents were identified during subsequent procedure(s) for indications unrelated to the initial indication for stent placement, as seen in Figure 3. In our cohort, no complications were identified or attributable to the retained stent.

Further characterization revealed that of the 426 prophylactic PD stents with complete follow-up data, 381 had at least one internal flange present whereas 45 had the internal flanges removed. In total, 387 charts identified stent size (diameter); 3Fr stents were used in 18 cases, 5Fr stents in 342 cases, and 7Fr stents in 27 cases. Out of the 159 stents that were confirmed to have spontaneously passed, 27 had no flanges and 11 were 3Fr, 138 were 5Fr, and 10 were unspecified size. We confirmed that the 3Fr PD stents utilized in our study did indeed have flanges present. One of 11 3Fr stents (9%) failed to pass and 7 of 138 5Fr stents (5%) failed to pass. All eight retained stents had internal flanges and were 3 cm in length.

Discussion

The main findings of this study suggest that there does exist a considerable false-negative rate in utilizing radiography to assess spontaneous passage

of a PD stent. Our single-center retrospective experience demonstrates that the radiologist's interpretation of abdominal X-rays to assess spontaneous passage of prophylactic PD stents yielded a false-negative interpretation in almost 5% of cases.

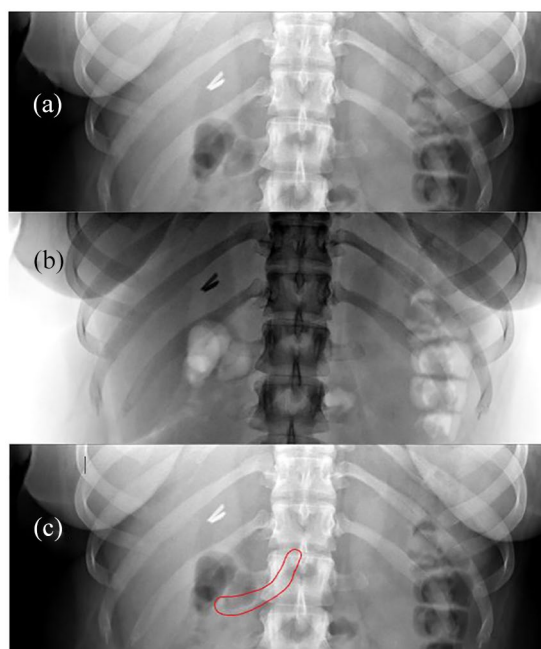


Figure 2. Example of a false-negative reading in which the PD stent was later identified by an endoscopist reviewing the abdominal X-ray. (a) KUB and (b) inverted image with official read saying, "No retained stent." (c) Highlight of retained stent.

In our cohort, out of the 167 cases that had a final radiology report confirming the spontaneous passage of the PD stent, 8 reports were later identified as a false-negative report. That is, although the report asserted that the PD stent has passed, follow-up analysis revealed that the PD stent was retained. Confirmation of a retained PD stent was done so by either an endoscopist reviewing the image in the clinical setting (5/8 cases) or during a subsequent procedure where the stent was coincidentally found (3/8 cases). We did not observe any complications with the retained stents in these eight patients.

PD stent characteristics seem to play an important role in whether the stent will spontaneously pass. In these eight false-negative cases, seven stents were reported to be 5Fr compared with one 3Fr stent. In addition, all were 3 cm in length. All eight false-negative charts were PD stents with internal flanges. There is conflicting evidence as to which type of prophylactic stent is associated with higher rates of spontaneous passage. In a randomized controlled trial, Zolotarevsky and colleagues determined that in terms of prophylactic PD stenting, there was no significant difference in spontaneous passage between the 5Fr and 3Fr groups. However, they demonstrated that placing 5Fr stents for post-ERCP pancreatitis is easier and faster to perform when compared with 3Fr stents.⁴ On the other hand, Rashdan and colleagues⁷ demonstrated that small diameter, unflanged PD stents

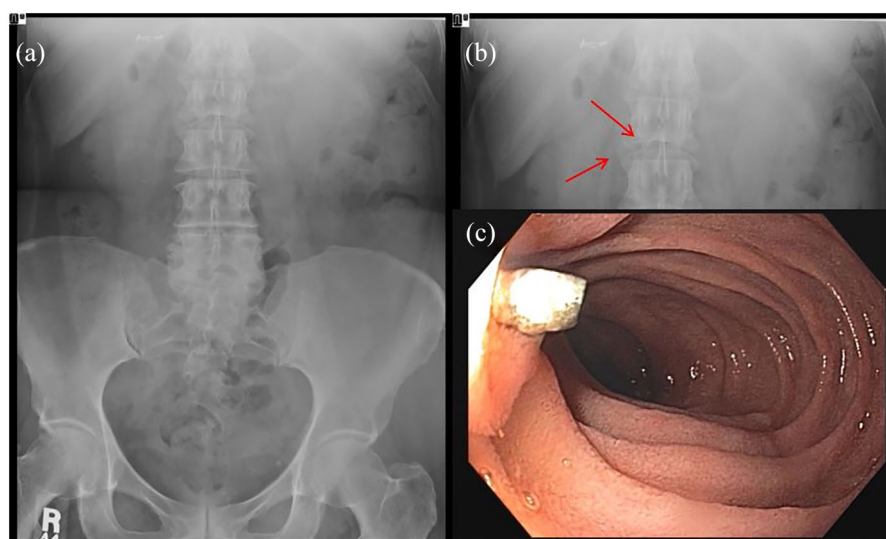


Figure 3. Evidence of an inaccurately reported "passed" stent that was later found and retrieved upon incidental endoscopy. (a) KUB with official read "no retained pancreatic stent," (b) highlighted stent, and (c) endoscopic image of retained stent when pulled.

(such as the 3Fr) had the highest spontaneous passage rate ($p < 0.0001$) when compared with the larger diameter, unflanged stents such as the 5Fr. Therefore, there is evidence to suggest that smaller-diameter stents without flanges are more likely to spontaneously pass when compared with spontaneous passage of larger, flanged stents.

Prophylactic stenting of the pancreatic duct is a widely used means of preventing post-ERCP pancreatitis. However, there remains a legitimate concern to its use. Aside from the aforementioned stent-induced damage to the pancreas parenchyma, there remains the risk of technical difficulty in placing the stent. Prolonged attempts and failure to place the stent can cause significant damage to the duct in approximately 10% of cases, with a study demonstrating that number to be as high as two thirds of cases.^{11,12}

The consequences of a retained PD stent may be significant. If not passed, the PD stent can damage the pancreatic duct leading to infection, ductitis, and bleeding, all of which may contribute to an increased morbidity. In addition, there is evidence suggesting that a retained stent can lead to repeated bouts of pancreatitis or steatorrhea.¹³ This study is limited in that it evaluates the false-negative stent passage rate of a single institution. However, the main goal of our study is to highlight that false-negative imaging reports related to spontaneous passage of PD stents do occur. In addition, given the retrospective nature of the study, there is limited long-term follow-up data to assess for any potential long-term complications of a retained PD stent, although no short-term complications were noted in this cohort. Future studies aim to include a multicenter approach to expand the data and will also focus on potential long-term outcomes of retained PD stents. Given that there is no other comparable data in the literature, we suggest an ongoing heightened awareness by endoscopists to assess for spontaneous passage for stents. Independent review of the images by an endoscopist is warranted given the understandable unfamiliarity of these stents to radiologists.


Conflict of interest statement

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