



# Fishbone migration to bile ducts after pancreaticoduodenectomy: a case series

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## Abstract

We reviewed six cases suspected of having fish bones in the bile ducts on follow-up CT following pancreaticoduodenectomy. The period from surgery to CT examination in which fishbone migration was first suspected ranged from 282 to 1157 days with a median of 517 days. The fish bone in the bile duct disappeared in five out of six cases on subsequent CT. One case was complicated by hepatolithiasis, and the other five cases showed no biliary complications. In two cases, wandering of fish bones in the jejunal limb was observed on CT images before their migration into the bile ducts. Asymptomatic migration of fish bones to the bile ducts following pancreaticoduodenectomy is not rare, but serious complications can occasionally occur. Indications of intervention may be controversial in asymptomatic cases, but once fish bones are observed in the biliary tree or the jejunal limb, dietary instructions advising not to swallow fish bones may be a good option to prevent complications.

**Keywords** Foreign bodies · Pancreaticoduodenectomy · Bile ducts · Gallstones · Cholangitis

## Introduction

Fish bones in the bile duct are known to be a rare cause of bile duct stones [1, 2]. Even after pancreaticoduodenectomy, a fish bone can migrate into the bile duct and act as a nidus of stone formation [3, 4]. A majority of the reported cases of fish bones in the bile duct were complicated by choledocholithiasis or cholangitis, but asymptomatic migration and subsequent disappearance can be observed in routine clinical practice. In this case series, we aimed to review imaging findings and clinical course of the cases of fish bones in the bile duct following pancreaticoduodenectomy.

## Cases

In this paper, we present six cases wherein linear hyperattenuating structures suspected as fish bones were observed in the bile ducts on the follow-up CT after pancreaticoduodenectomy. Cases were reviewed from the database of our department, which included data from 2013 to 2016. Patient ages ranged from 58 to 73 years, with four males and two females included. Of these six cases, two had pancreatic head cancer, three had distal bile duct cancer, and one had duodenal cancer. They underwent pancreaticoduodenectomy between 2011 and 2014. During that period, 26 pancreaticoduodenectomies were performed in our hospital. Follow-up CT was performed every three to six months. Migration to the left lobe was observed in one case (Case 1), and to the right lobe in five cases (Case 2–6). The interval between the surgery and the CT examination in which fishbone migration was first detected ranged from 282 to 1157 days with a median of 517 days. In the follow-up CT, the fish bone in the bile duct disappeared in five out of six cases, and the interval between appearance and disappearance on CT ranged from 90 to 728 days with a median of 176 days. One case was complicated by hepatolithiasis and consequent cholangitis (Case 6). The other five cases had no biliary complications. The presence of fish bones in the jejunal limb was observed

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on CT images before their migration into the bile ducts in two cases (Case 5, 6), including the case complicated by hepatolithiasis.

### Case 1

A male patient in his fifties after pancreaticoduodenectomy for distal bile duct cancer. CT obtained six months after the operation showed pneumobilia but no bone in the left hepatic duct (Fig. 1a). On the next follow-up CT obtained 12 months after the operation (Fig. 1b: axial, Fig. 1c: oblique coronal), a 3-cm long curvilinear hyperdense structure (arrowheads) was noted incidentally without any signs or symptoms. The fish bone disappeared on follow-up CT 18 months after the operation (Fig. 1d).

### Case 2

A female patient in her sixties after pancreaticoduodenectomy for duodenal cancer. A fish bone in the bile duct of segment 8 was noted on routine follow-up CT 18 months after the operation (Fig. 2a). The bone remained until the follow-up CT 30 months after the operation, and disappeared on the next follow-up CT (Fig. 2b).

### Case 3

A male patient in his seventies after pancreaticoduodenectomy for distal bile duct cancer. A fish bone in the bile duct of segment 5 was noted on routine follow-up CT 16 months after the operation (Fig. 3a). The bone remained until the follow-up CT 37 months after the operation, and disappeared on the next follow-up CT (Fig. 3b).

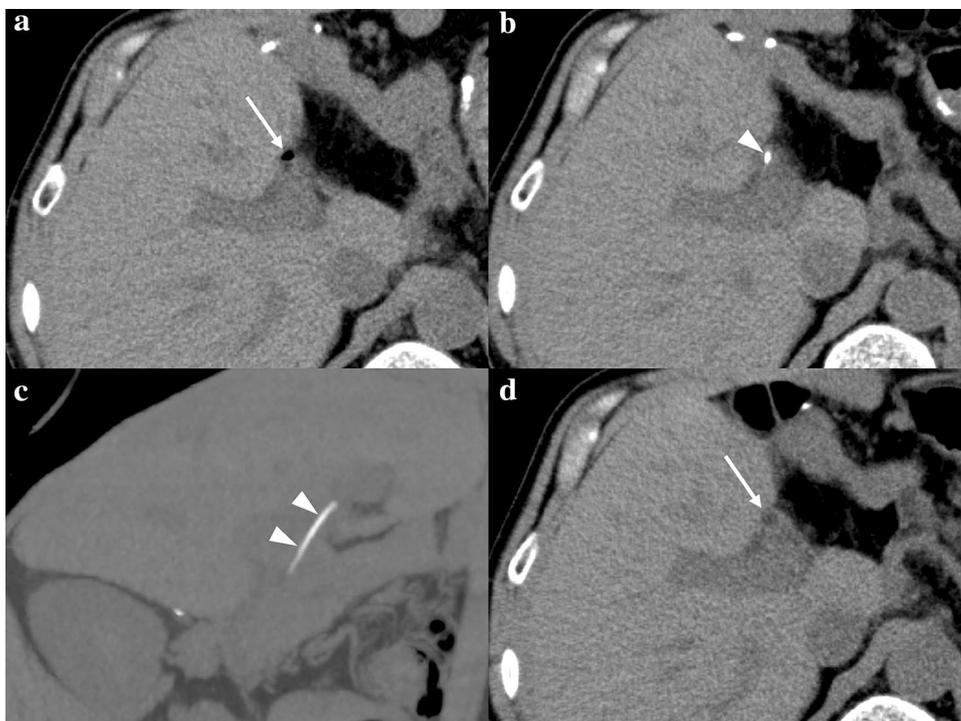
### Case 4

A male patient in his seventies after pancreaticoduodenectomy for distal bile duct cancer. A fish bone in the bile duct of segment 6 was noted on the follow-up CT nine months after the operation (Fig. 4a). The bone remained until the last follow-up CT 15 months after the operation (Fig. 4b) without any symptoms related to the bone. Further follow-up CT was not performed because cancer recurrence became uncontrollable.

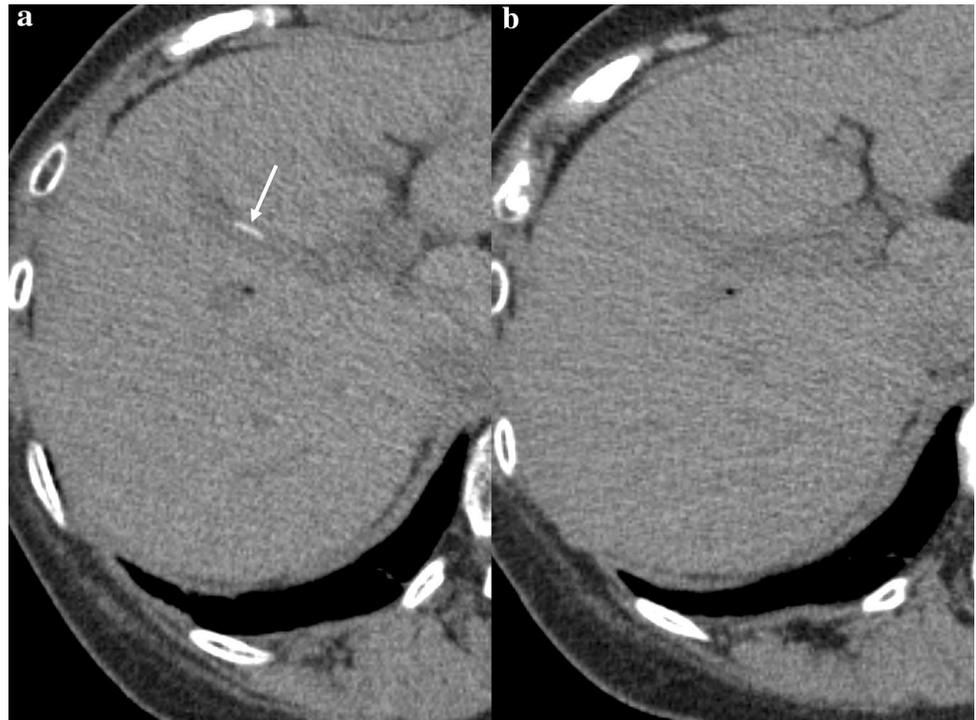
### Case 5

A female patient in her sixties after pancreaticoduodenectomy for pancreatic cancer. A fish bone in the jejunal limb was first noted on CT three years after the operation (Fig. 5a). On the next follow-up CT, the fish bone migrated

**Fig. 1** Case 1: Asymptomatic migration in a male patient in his fifties. No bone can be seen six months after the operation (a). CT obtained 12 months after the operation (b: axial, c: oblique coronal) reveals a 3-cm long fish bone in the left hepatic duct (arrowheads), which has disappeared at 18 months after the operation (d)



**Fig. 2** Case 2: Asymptomatic migration in a female patient in her sixties. CT obtained 18 months after the operation shows a fish bone (arrow) in the bile duct of segment 8 (a). The bone remained until 30 months after the operation, and disappeared on the next follow-up CT (b)



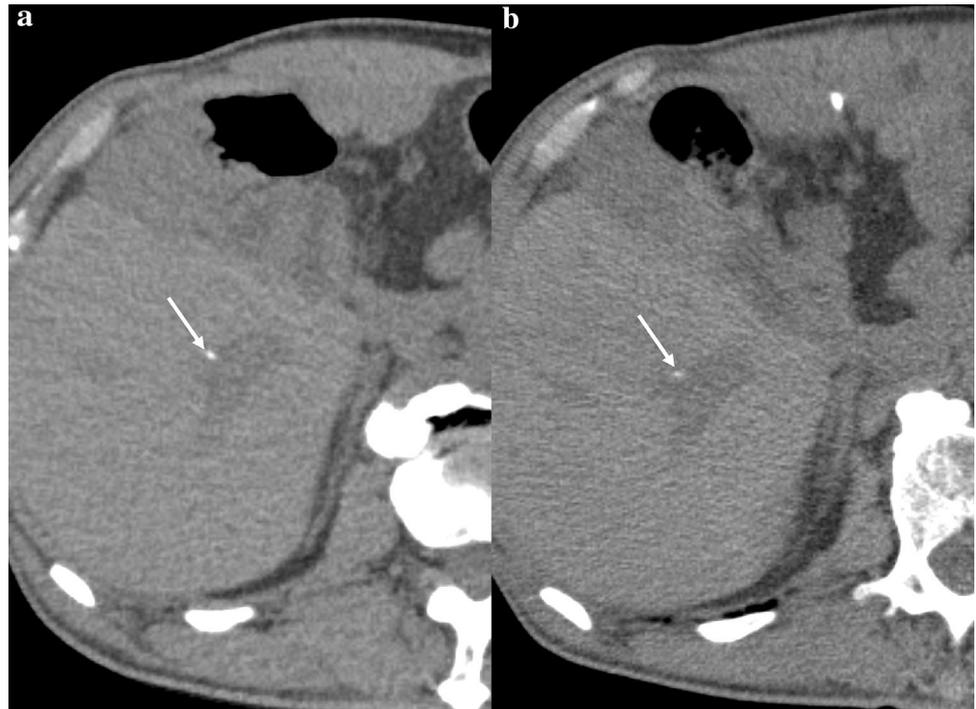
**Fig. 3** Case 3: Asymptomatic migration in a male patient in his seventies. A fish bone (arrow) in the bile duct of segment 5 is noted on routine follow-up CT 16 months after the operation (a). The bone remained until 37 months after the operation, and disappeared on the next follow-up CT (b)



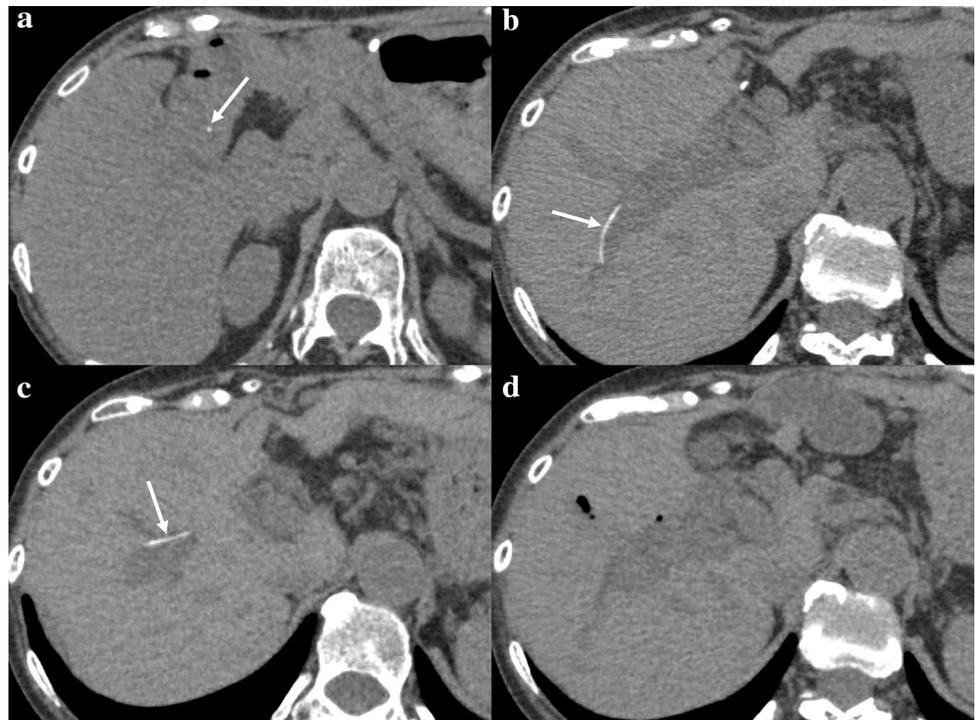
to the anterior branch of the bile duct (Fig. 5b) and moved down to the right hepatic duct three months after (Fig. 5c).

Subsequently, the fish bone disappeared, and some pneumobilia was noted on the next follow-up CT (Fig. 5d).

**Fig. 4** Case 4: Asymptomatic migration in a male patient in his seventies. A fish bone (arrow) in the bile duct of segment 6 is noted nine months after the operation (a). The bone remains on the last follow-up CT 15 months after the operation (b) without any symptoms related to the bone



**Fig. 5** Case 5: Fish bone in the jejunal limb before migration to biliary tree in a female patient in her sixties. CT obtained three years after the operation shows a fish bone (arrow) in the jejunal limb (a). On the next follow-up CT, the fish bone (arrow) has migrated to the anterior branch of the bile duct (b), and back to the right hepatic duct three months after (c). The fish bone has disappeared on the next follow-up CT, and some pneumobilia is noted (d)

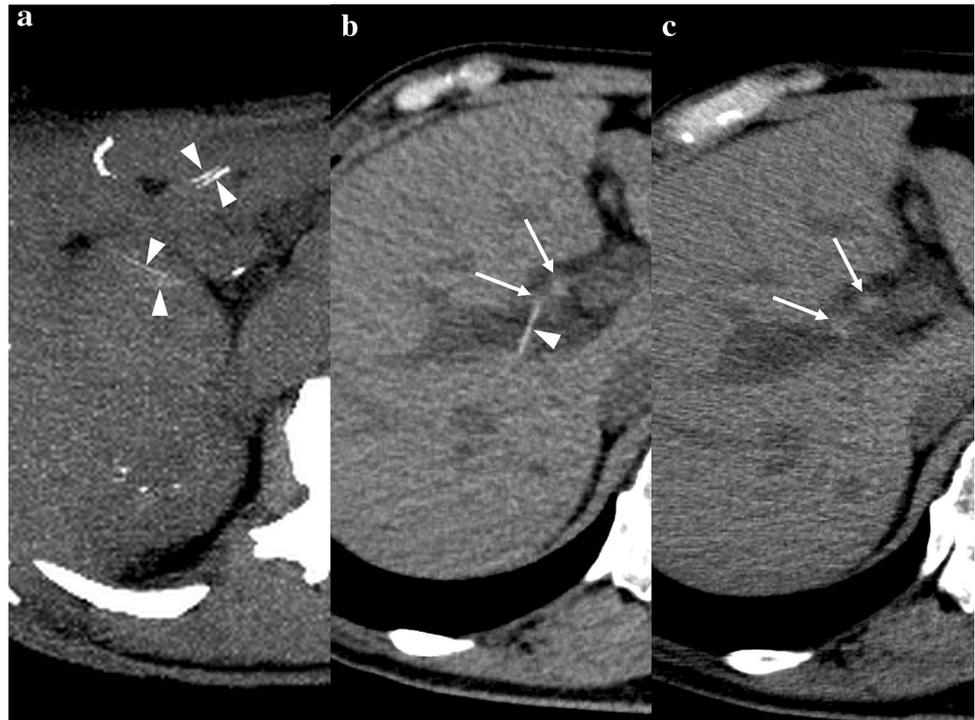


### Case 6

A male patient in his sixties after pancreaticoduodenectomy for pancreatic cancer, followed by CT every three months. Four fish bones in the jejunal limb were observed

on the second follow-up CT six months after the operation (Fig. 6a), but there was no bone observed in the bile duct at that time. Fish bones in the jejunal limb were observed every time in all the following CT examinations, but the size and the location of bones were different each time. Eventually, a fish bone migrated into the right posterior

**Fig. 6** Case 6: Migration complicated by hepatolithiasis in a male patient in his sixties. Four fish bones in the jejunal limb (arrowheads) are noted on CT obtained six months after the operation (**a**: thin-slab maximum intensity projection). CT obtained 21 months after the operation demonstrates a fish bone (arrowhead) having migrated into the right posterior branch of the bile duct, and slight high density representing stones (arrows) in the right and left hepatic ducts as well (**b**). On the next follow-up CT 24 months after the operation, the bone has disappeared, and the stones remain in the hepatic ducts (arrows) (**c**). Two months after this CT, the patient was complicated by cholangitis



branch of the bile duct 21 months after the operation (Fig. 6b), and slight high-density representing stones appeared in the right and left hepatic ducts. However, the patient was asymptomatic. On the next follow-up CT (Fig. 6c) 24 months after the operation, the bone disappeared and the stones remained in the hepatic ducts. The patient was still asymptomatic, but two months after this CT developed cholangitis. The stones were successfully removed endoscopically, but refractory stones and cholangitis remained.

## Discussions

Foreign bodies in the bile duct are considered to be one of the causes of biliary stones [5, 6]. Most common foreign bodies causing stone formation in the biliary tract are residual objects of previous intervention, such as sutures, tubes, or clips. Ingested objects are another common foreign body, which can result in stone formation in the bile duct. Fish bones are the most common ingested object as a cause of bile duct stones [1–4, 7–10]. Other objects include chicken bones, vegetables, and toothpicks [5, 6, 11, 12].

The route for a foreign body from the gastrointestinal tract to the biliary tree can be either an extraluminal shortcut through enterobiliary fistula [5, 7], or an intraluminal reflux from the duodenum. Endoscopic sphincterotomy might be a potential risk factor of reflux [8], but cases of foreign body reflux without any previous intervention have

also been reported [1, 2, 6, 12]. Foreign bodies can even retrograde against peristalsis through the afferent loop after gastrectomy [11] or through the jejunal limb after pancreaticoduodenectomy [3, 4, 9, 10].

Most of the reported cases of fish bones in the bile duct after pancreaticoduodenectomy were symptomatic and described as rare complications (Table 1). However, asymptomatic migration of fish bones and uneventful disappearance can be occasionally observed in routine clinical practice. We found one complicated case and five asymptomatic cases in the database of our department, from 26 pancreaticoduodenectomies performed during four years in our hospital. The incidence of asymptomatic fish bone migration might be underestimated because of discrete follow-up CT examinations; the bone could migrate and pass prior to the next follow-up CT. A limited follow-up period (usually five years for pancreatobiliary cancer) can also underestimate the incident of bone migration as it may take years to develop following the operation. Asymptomatic fishbone migration to the biliary tree after pancreaticoduodenectomy might be not so rare.

Indication of intervention for asymptomatic cases is controversial. Observation might be a reasonable option in asymptomatic cases, but once complicated, choledocholithiasis and cholangitis can be refractory. For asymptomatic cases, further investigation should be warranted on a risk-benefit balance of surgical or endoscopic intervention. In the case of observation until the disappearance of fish bones, a long follow-up period might be an economic

**Table 1** Reported cases of migration of fish bones to the bile duct after pancreaticoduodenectomy

Reference	Age	Sex	Primary disease	Interval between surgery and detection of migration	Location of the bone	Disappearance of the bone	Complications
Kuga et al. [9]	63	M	Perforated duodenal ulcer	4 years	Right lobe	No	Cholangitis
Bamba et al. [3]	71	M	Intraductal papillary mucinous neoplasm	2 years	Right lobe	No	Cholelithiasis, cholangitis
Sakakida et al. [4]	78	F	Duodenal cancer	9 years	Common bile duct	No	Cholelithiasis, cholangitis
Koga et al. [10]	71	M	Cholangiocarcinoma	1 year	Right lobe	No	Cholangitis
Akahane et al. (present study)	50 s	M	Distal bile duct cancer	12 months	Left lobe	Yes	None
	60 s	F	Duodenal cancer	18 months	Right lobe	Yes	None
	70 s	M	Distal bile duct cancer	16 months	Right lobe	Yes	None
	70 s	M	Distal bile duct cancer	9 months	Right lobe	No	None
	60 s	F	Pancreatic cancer	38 months	Right lobe	Yes	None
	60 s	M	Pancreatic cancer	21 months	Right lobe	Yes	Hepaticolithiasis, cholangitis

problem, as the interval between appearance and disappearance on CT ranged from 90 to 728 days in our cases. In two of our cases, the wandering of fish bones in the jejunal limbs was observed prior to the migration to the biliary tree, and one of these two cases was eventually complicated by cholangitis. One important consideration is that these Asian patients routinely ingest fish, and thus fish bones. Advising patients to remove the bones from these fish dishes could be a good option for prevention of complications caused by migrated fish bone in the bile duct.

In conclusion, asymptomatic migration of fish bones to the bile ducts is not so rare after pancreaticoduodenectomy. However, serious complications can occur occasionally. Indications of intervention may be controversial in asymptomatic cases.

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