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Silk as the Nidus for the Formation of Gallstones

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Introduction

Gallstones sometimes develop around the foreign body such as silk ligatures. This type of silk ligature is mostly derived from the first operation, especially on the biliary tract diseases, and may migrate into the duct and lead to calculus formation.

The purpose of the present paper is to report one case in which silk ligatures migrated into the common bile duct and symptoms resembling biliary colic developed and 3 cases of gallstone formation secondary to a silk ligature, and describe an importance in selection of suture material in the biliary tract surgery.

Case Reports

Case 1. In December, 1974, a 30 year-old married woman underwent cholecystectomy, choledochotomy and transduodenal sphincteroplasty with T-tube drainage for gallstone disease at the other hospital. In this operation, the cystic duct and common bile duct were ligated or closed with silk. Her recovery was uneventful but half a year after the operation, the patient had experienced repeated attacks of upper abdominal pain and fever. Endoscopic retrograde cholangiography (ERC) showed stone like shadow within the common hepatic duct. She was admitted for treatment to our clinic in July, 1975. The serum bilirubin, SGOT, SGPT and serum alkaline phosphatase were in normal ranges. ERC revealed almost the same findings as performed before her admission (Fig. 1). At the second operation, 5 bilestained threads of silk sutures as well as biliary mud were removed from the common bile duct (Fig. 2).

Case 2. A 36 year-old man was admitted to our clinic in October, 1975, complaining of nausea, vomiting, fever and right hypochondralgia of 6 month duration. One year earlier, he had undergone a cholecystectomy for cholecystolithiasis at the other hospital. The cystic duct had been tied with silk. Laboratory data were normal except a slight elevation of serum alkaline phosphatase (11.8 King-Armstrong unit). Drip infusion cholangiography (DIC) showed slightly dilated common bile duct (1.1 cm in diameter) and the cystic duct remnant (2.0 cm in length and 1.0 cm in width), but no shadow indicating a stone (Fig. 3). ERC failed to reveal the common bile duct. The preoperative diagnosis of the remnant

Key words : Silk nidus, Gallstone formation, Absorbable suture material, Biliary tract surgery,
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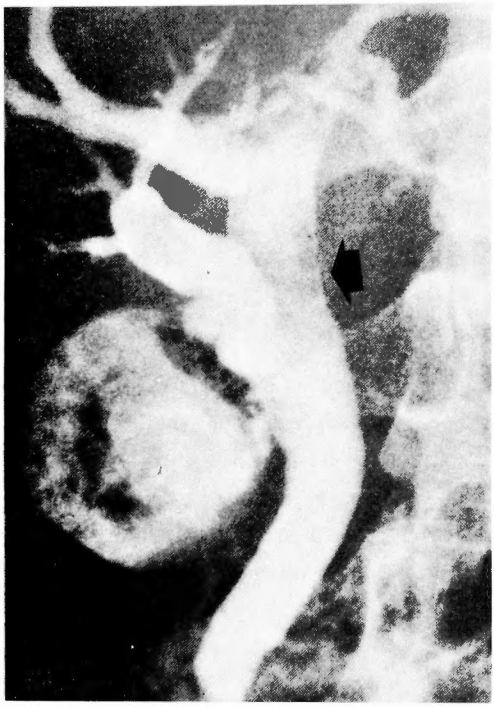

Fig. 1. ERC performed in Case 1 showing some stone like shadows in the common hepatic duct (arrow).

Fig. 2. The extracted bile-stained threads in Case 1.

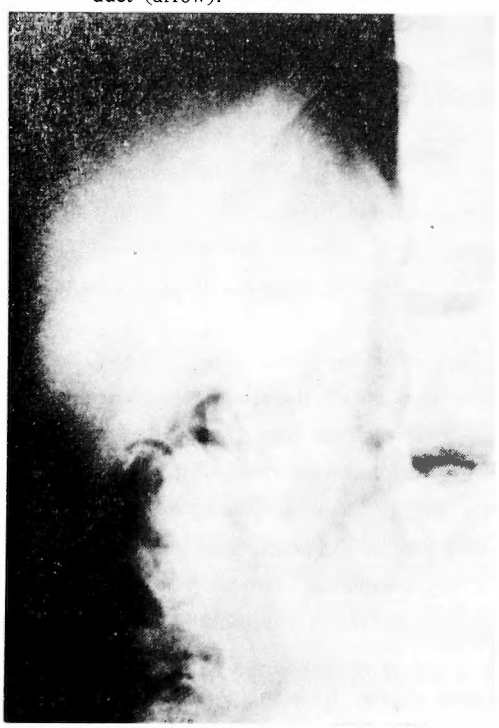

Fig. 3. DIC performed in Case 2 showing no shadow indicating a stone.

Fig. 4. One of the removed gallstones in Case 2 having a nidus of a silk suture.

of cystic duct and retained gallstones was made. At reoperation, the common bile duct contained 10 round stones consisted of calcium bilirubinate ranging from 0.5 to 1.0 cm in diameter and, in addition, one irregular shaped stone. The latter stone was brown in colour, and measured 1.8×1.0×0.3 cm (Fig. 4). It was composed of a nidus of a silk suture.

Case 3. A 68 year-old man was admitted to our clinic in May, 1976, with chief complaints of upper abdominal pain, slight jaundice and fever. In August, 1973, a cholecystolithotomy had been performed. The incised gallbladder had been closed with interrupted silk sutures. After his admission, DIC and ERC revealed a little finger tip sized stone shadow within the common bile duct (Fig. 5). At reoperation, a stone was extracted from the common bile duct. The stone was found to have a nucleus of silk ligature (Fig. 6).

Case 4. A 30 year-old man was admitted to our clinic in June, 1977, complaining of right hypochondralgia and jaundice of 4 month duration. The attacks of pain resembled biliary colic. Laboratory data included : serum bilirubin 3.8 mg/dl, SGOT 71 Karmen unit and SGPT 40 Karmen unit. No other abnormality was seen. His gallbladder had been removed for cholecystolithiasis about 6 years ago, and the cystic duct had been tied with

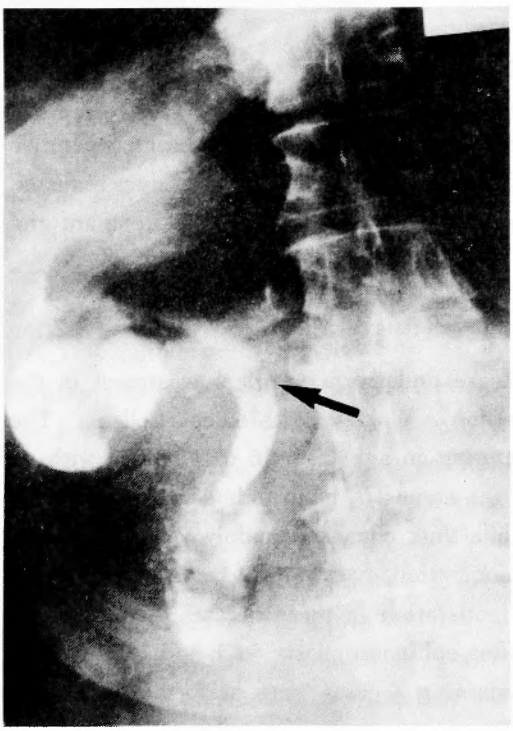

Fig. 5. ERC performed in Case 3 indicating a round shadow in the common bile duct (arrow).

Fig. 6. Common duct stone formed around silk ligature in Case 3. Portion of the stone crushed and the silk thread.

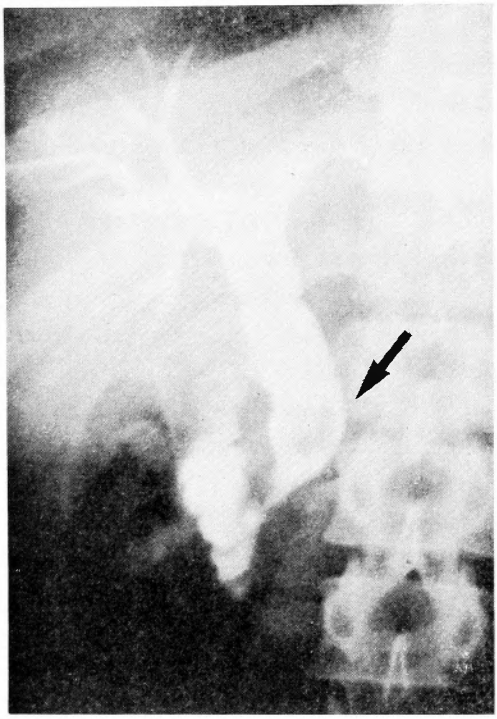

Fig. 7. ERC performed in Case 4 demonstrating a common duct stone (arrow), but no cystic duct remnant.

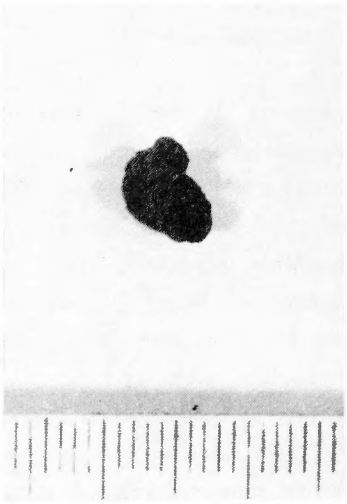

Fig. 8. The extracted stone from the cystic duct remnant containing a nidus of silk suture.

silk. ERC showed a common bile duct stone (Fig. 7). At the second operation, operative cholangiography revealed not only a common bile duct stone but also the cystic duct remnant. A 1.5×1.0×1.0 cm irregular black stone was extracted from the cystic duct remnant and demonstrated a nidus of a silk suture (Fig. 8).

Discussion

In the last 5 years, 199 cases of gallstone disease underwent surgical treatment in the Department of Surgery (Gastroenterological Division), Wakayama Medical College. The patients consisted of 84 men and 115 women ranging in age from 16 to 77 years with an average age of 48. In this series, 72 per cent of the stones in gallbladders consisted mainly of cholesterol and 77 per cent of the stones in bile duct consisted mainly of bilirubinate. Among the above patients, 13 cases underwent reoperation, in which, 9 cases had received the first operation in our clinic. The causes of reoperation in these 9 cases were retained calculi in 5, bowel obstruction in 2, bleeding after sphincteroplasty in 1 and bile leakage after Kehr's operation in 1, respectively. The remaining 4 cases were performed the first operation in the other hospital as reported above.

Biliary colic in Case 1 is thought to be caused by migration of the silk suture, which used for closing the incised bile duct, into the ductal system. These migrated threads would

either flow out to the duodenum via Vater's papilla or remain within the common bile duct and lead to the formation of stones.

In Case 2 and 4, the cystic duct had been tied with silk in the primary operation. In Case 2, the silk ligature migrated into the common bile duct, and retained there, resulting in formation of a calculus around it. In Case 4, the silk entered into the cystic duct remnant and led to stone formation.

In Case 3, a silk ligature used for closing the incised gallbladder fell into the common bile duct via the cystic duct, and there, gave rise to a calculus.

A gallstone formed around a silk ligature was first reported by HOMANS[3] in 1897. BAN et al.[2] reviewed 63 cases of foreign objects in the biliary tract seen from 1897 through 1971, including their own 2 patients. According to the report, their signs and symptoms were essentially the same as those from simple biliary calculus disease without foreign bodies. They classified foreign bodies found in the biliary tract into three main categories : 1) operative residuals, 2) missiles, and 3) ingestions. Among them, the most frequently encountered foreign bodies were those which came within the first category, that is, silk ligature used for ligating the cystic duct, for closing the incised biliary system, and for reconstructing the biliary way. They stated that 89 per cent of patients with suture material residuals in the bile ducts had stones around the foreign body nidi.

MILLBOURN[4] found out that in the 22 patients already reported in the literature with positive calculus findings at reoperation, 2 instances had shown common duct stones formed around silk ligatures. Hence, he pointed out that silk ligatures used in the biliary tract surgery may lead to the formation of a stone.

AHLBERG[1] mentioned that, while the cystic duct and cystic artery were ligated with silk as a rule at that time, 3 cases out of 493 cholecystectomies developed calculus formation around silk ligature. TOLAND[7], SILVENNOINEN et al[6] and SIGLER et al[5] separately reported similar experiences. The exact mechanism concerning a migration of nonabsorbable suture materials into the biliary ductal system is not clarified yet, but it is probable that local infection secondary to, for instance, spillage of infected bile plays an important role[6].

The incidence of silk ligature as a cause of gallstone fermation after biliary tract surgery also remains unknown. The stone with silk nidus may pass into the duodenum via the papilla of Vater or cause no symptom. Many cases presumably remain undiagnosed, and even when such a calculus is removed at the second operation, a silk ligature nucleus may well remain undetected unless a special search is made[5]. Figures 4, 6 and 8 vividly indicate that one of the most important characteristics of this type of gallstone is irregular in shape. Thus, stones of unusual shape or irregular surface should be investigated for a nidus of nonabsorbable suture material if the patient has the history of biliary surgery.

On the basis of our experience, together with the review of the literature[1-7], suture or ligature using nonabsorbable materials should not be done in the biliary tract surgery since they may migrate into the duct and lead to calculus formation. In this viewpoint, it is advisable to use absorbable suture materials such as cat gut or Dexon® (polyglycolic acid

polymer) for ligating the cystic duct, for suturing or ligating the incised bile duct, for reconstructing the biliary way and for suturing or ligating adjacent to the bile ducts.

Summary

In this paper, a case of migration of silk ligatures into the biliary way and 3 cases of gallstone formation caused by using silk sutures or ligatures in the primary surgery for gallstone diseases are reported.

It is advisable that sutures or ligatures with nonabsorbable material should not be done in the biliary tract surgery since they may migrate into the biliary ductal system and signs and symptoms resembling biliary colic develop or lead to calculus formation.

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和文抄録

絹糸に起因する胆石形成について

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初回胆道手術時に使用した絹糸を核として胆石の再発をみることが稀ながらある．私達の教室でもこの3年間に4例経験した．何れも初回手術は他施設で行なわれたものが，恐らく胆道の縫合や結紮に絹糸を用いた結果がこれが胆道内に脱落し，再発の因となったものであろう．1例目は31才の女性で，7カ月前総胆管切開術を受け，この際縫合に用いられた絹糸が胆管内に脱落したものであり，これが長期胆管内にとどまればこれを核として結石が再発するものと考えられた．2例目は36才の男性で1年前に胆嚢粘膜抜去術を受けており，胆嚢管断端の閉鎖に用いた絹糸が胆管内に脱落しこれが核となったもの，3例目は68才の男性で3年前に胆嚢切開截石術を受けた際，胆嚢の縫合閉鎖に用いた絹糸が胆管内に脱落し核となって再発したもの，4例目は30才の男性で，6年前胆嚢摘除術を受けた時の胆嚢管断端処理に用いた絹糸が脱落し，遺残胆嚢管内で再発したものであった．4症例共に通常の胆石症と同様の臨床症状を呈し，術前にこれが絹糸に起因せるものであるか否かの判定は不可能であった．

絹糸結石の報告は1897年 Homans が行なって以来既に久しいが，その発生機序については明らかにされておらず，感染胆汁による局所の汚染の如き限局性の感染が一因ではないかと説明されているが推定の域を出ない．

絹糸結石の発生頻度が不明である原因の1つに摘出した結石の検索が十分になされていないことが挙げられる．再手術例で，しかも結石の形状，表面が不規則な際は必ず割面を入れ，十分に観察する必要があろう．

このような絹糸結石の発生を未然に予防するためには，胆嚢管断端の結紮，胆道の縫合閉鎖，胆管消化管吻合などの際，吸収性の縫合糸を用いることが最も肝要である．