

肝切除术后新发胆总管结石致肝切缘胆瘘： 病例报告及肝脏手术后胆漏的文献综述

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摘 要

目的: 探讨肝部分切除术后短期因新发胆总管结石导致肝切缘胆漏(POBL)的临床特点、诊治过程及预后。方法: 报告1例51岁男性患者, 因肝血管瘤行肝部分切除术, 术后第83天出现右上腹疼痛及黄疸加重入院。影像学提示: 肝周积液、肝S8低密度灶及胆总管下段新发结石, 实验室检查显示肝功能异常。治疗过程中分阶段实施十二指肠乳头肌切开取石、内镜逆行胰胆管造影(ERCP)、短期经鼻胆管引流(ENBD)、超声引导经皮经肝胆管引流(PTCD)及内镜下胆管支架置入术, 最终瘘道愈合良好, 肝功能恢复正常。结果: 文献复习并纳入18例POBL病例, 平均年龄51.89岁, 男性占76.47%, 主要表现为右上腹痛和黄疸, 确诊多依赖CT或MRCP。POBL发生的影响因素包括术中胆管损伤、残端处理不当、术后感染、高胆红素血症、糖尿病等。胆管结石形成具有多因素渐进性特点, 时间跨度从数周至数年不等, 本例为首次明确报道术后短期结石致POBL。结论: 肝部分切除术后发生POBL除常见病因外, 应警惕早期胆管结石形成的可能。治疗应采取分阶段、多模式综合策略, 先解除梗阻, 再行支架植入与引流, 以提高瘘道愈合率和改善预后。本病例拓展了POBL病因谱, 为类似复杂病例的诊治提供了循证依据。

关键词

POBL, 胆管结石, 支气管胆管瘘, 肝部分切除术

Biliary Fistula at the Margin of Liver Caused by New Common Bile Duct Stones after Hepatectomy: A Case Report and Literature Review of Bile Leakage after Liver Surgery

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Abstract

Objective: To investigate the clinical characteristics, management, and prognosis of post-hepatectomy bile leak (POBL) at the liver resection margin caused by newly developed common bile duct (CBD) stones in the early postoperative period. **Methods:** We report a case of a 51-year-old male who underwent partial hepatectomy for hepatic hemangioma and was readmitted on postoperative day 83 with right upper quadrant pain and worsening jaundice. Imaging revealed perihepatic fluid collection, a low-density lesion in segment 8 of the liver, and a newly formed stone in the distal CBD. Laboratory tests indicated abnormal liver function. A staged therapeutic approach was adopted, including endoscopic sphincterotomy with stone extraction, endoscopic retrograde cholangiopancreatography (ERCP), short-term endoscopic nasobiliary drainage (ENBD), ultrasound-guided percutaneous transhepatic biliary drainage (PTCD), and endoscopic biliary stent placement. The bile leak eventually healed, and liver function returned to normal. **Results:** Literature review identified 18 reported cases of POBL, with a mean age of 51.89 years and 76.47% being male. The predominant clinical manifestations were right upper quadrant pain and jaundice, with diagnosis mainly relying on CT or MRCP. Risk factors for POBL included intraoperative bile duct injury, inadequate management of the bile duct stump, postoperative infection, hyperbilirubinemia, and diabetes mellitus. CBD stone formation is a multifactorial, progressive process, with a time course ranging from weeks to years. This is the first clearly documented case of early postoperative CBD stone formation leading to POBL. **Conclusion:** In addition to common etiologies, early CBD stone formation should be considered in the differential diagnosis of POBL after partial hepatectomy. A staged, multimodal treatment strategy—first relieving obstruction, then performing stent placement and drainage—can improve bile leak healing rates and patient outcomes. This case expands the etiological spectrum of POBL and provides evidence-based guidance for the management of similar complex cases.

Keywords

Post-Hepatectomy Bile Leak (POBL), Bile Duct Stones, Bronchobiliary Fistula, Partial Hepatectomy

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1. 引言

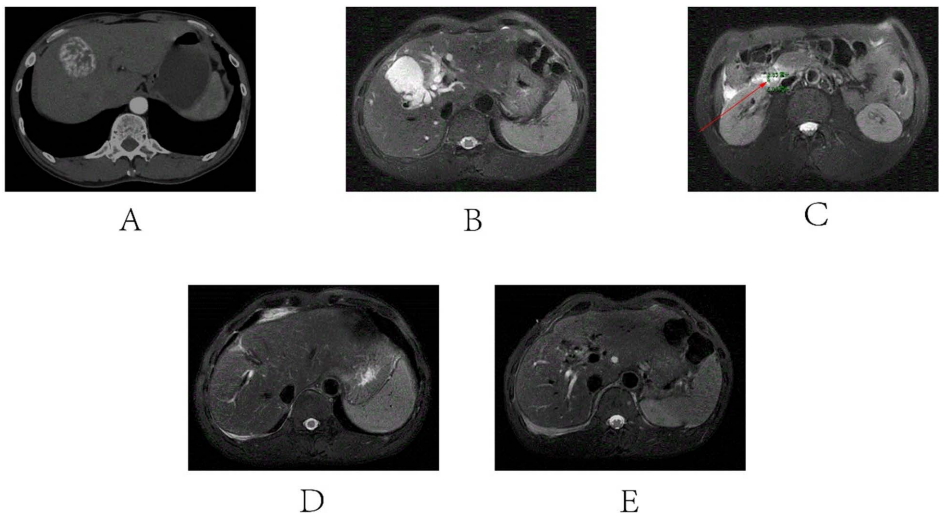
肝部分切除术是治疗原发性或转移性肝脏恶性肿瘤的首选方案,对于特定肝脏良性疾病(如症状性肝血管瘤、肝内胆管结石及肝囊肿),当保守治疗无效时,手术切除亦为重要治疗选择[1]。POBL在肝胆系统疾病中较为罕见,POBL的报告发生率在2.9%到6.5%之间[2][3]。POBL发生的影响因素有很多,术式的选择、是否有肝硬化、体重、手术时间、是否有立体定向放射的病史、肝切除的范围和部位等[4]-[7],关于肝血管瘤POBL病例报告罕见,同时关于术后短期因胆管结石形成导致POBL病例极为罕见,本例病例报告强调了POBL除考虑常见病因外,应该考虑术后胆管结石的形成,以及提供一种如何解决这种

相似病例的治疗方法。

2. 病例报告

2.1. 临床发现

一名 51 岁的男性患者，因肝血管瘤行肝部分切除术后 83 天因右上腹疼痛伴皮肤、巩膜黄染加重 2 天急诊入院，急诊检查发现，右上腹部压痛，全腹部 CT 发现：肝周积液，肝 S8 有一类圆形低密度灶，大小约 4.7 cm；胆总管下段新形成结石，大小约 0.6 * 0.2 cm，胆总管及肝内胆管扩张，胆囊切除术后改变(见图 1(A)-(C))。实验室结果检查发现：白细胞计数 $5.3 \times 10^9/L$ 总胆红素(TBIL) 76.1 $\mu\text{mol/L}$ ，结合胆红素(DBIL) 50.1 $\mu\text{mol/L}$ ，非结合胆红素 26 $\mu\text{mol/L}$ ，丙氨酸氨基转移酶(ALT) 240 U/L，天门冬氨酸氨基转移酶(AST) 126 U/L，尿胆原 70 $\mu\text{mol/L}$ ，胆红素 70 $\mu\text{mol/L}$ (见表 1)。



注：A：肝部分切除术后复查，手术创面胆管及肝内胆管形态正常，未见扩张，残腔内未见结石影。B：肝切除术后第 83 天影像，显示残腔与右肝胆管相通，肝内胆管明显扩张，残腔及胆管内可见胆汁淤积。C：肝切除术后第 83 天影像，胆总管下段可见约 0.6 cm × 0.2 cm 结石，同时伴肝外胆管扩张。D：经 ERCP 治疗后 1 个月复查，残腔及肝内胆管内胆汁淤积明显减少，残腔直径较前显著缩小。E：经 ERCP 治疗后 3 个月复查，肝 S8 血管瘤术后改变，术区未见明显积液，肝内胆管形态正常，未见扩张。

Figure 1. Relevant radiological images of the patient before and after treatment
图 1. 患者治疗前后相关影像学图像

Table 1. Liver function laboratory test values at different stages of the patient
表 1. 患者不同阶段的肝功能实验室检查数值

时间	ALT	AST	ALB	ALP	TBIL
	(9~50 U/L)	(15~40 U/L)	(40~55 g/L)	(40~150 U/L)	(2~23 $\mu\text{mol/L}$)
术前	240	126	38.6	430	76.1
术后 7 天	90	43	38.9	275	20.9
术后 1 个月	41	28	36.4	120	17.8
术后 6 个月	31	32	43.4	90	18.5

注：ALT = 丙氨酸氨基转移酶；AST = 天冬氨酸氨基转移酶；ALB = 白蛋白；ALP = 碱性磷酸酶；TBIL = 总胆红素。

2.2. 治疗干预和随访

在获得患者知情同意后，在内镜下行十二指肠乳头肌切开取石 + 内镜逆行胰胆管造影(ERCP) + 短期(7天)内镜下鼻导管引流术(ENBD)，解决胆总管梗阻后，因为患者的肝术后断面残腔内存在积液，于是在超声引导下腹腔穿针置管引流术(PTCD)，术后残腔明显缩小，肝内外胆管扩张明显改善，但残腔内胆道漏管仍未闭合，为防止切开取石水肿导致梗阻和支架的机械支撑预防胆管狭窄，于是行 ERCP + 内镜下胆管支架置入术，术后引流管引流出胆汁(见图 1(D))。患者最终治疗措施是：内镜下行十二指肠乳头肌切开取石 + 短期(7天) ENBD + PTCD + 内镜下胆管支架置入术，考虑瘘道愈合时间久，与患者沟通后，门诊拔管随访。出院后 3 个月，患者上腹部疼痛明显缓解，影像学提示肝术后断面残腔胆管瘘道愈合良好，行内镜下胆道支架拔除术 + 腹腔引流管拔除术(见图 1(E))。拔管后一个月复查，上腹部疼痛症状消失，肝功能恢复正常(见表 1)。

3. 讨论

3.1. 文献回顾与临床特征

我们对肝部分切除术后发生 POBL 的病例报告进行了系统文献检索，最终纳入 18 例(见表 2)。患者平均年龄为 51.9 岁，在报告患者性别的 17 例中，男性占 76.5%。POBL 的临床表现以右上腹痛和黄疸为主，严重者可引起肝功能异常及感染。既往病例中，腹痛和黄疸的发生率高达 75%，其中腹痛尤为常见，部分患者可进展为败血症(1 例)。在胆管漏中，支气管胆管瘘虽罕见，但具有特征性临床表现，如咳出胆汁性痰(5 例)，且多数患者伴有发热(占 BBF 的 60%)。几乎所有患者均通过 CT 或 MRCP 明确诊断，少数(20%)经 US 联合 ERCP 诊断。术后 POBL 的平均发生时间为 136.9 天，排除极端值(1460 天)后为 42.4 天；若进一步排除特殊类型 BBF，后胆漏的平均发生时间为 31.5 天(见表 2)。影像学主要表现为胸腹腔积液或胆管残端漏。治疗方面，66.7%的病例采用 PTCD 或 ENBD，其余病例接受手术治疗(见表 3) [8]-[23]。

Table 2. Basic information of POBL patients

表 2. POBL 患者基本信息

参考文献	年份	性别/年龄(岁)	影像学检查	POBL 病程(天)	POBL 发生时间(天)
[8]	2005	M/74	MRCP + ERCP	-	180
[9]	2006	M/76	CT + ERCP	Died	1460
[10]	2008	M/58	CT + ERCP	8	2
[11]	2008	M/30	ERCP/PTC + US	157	21
[11]	2008	M/44	ERCP/PTC + US	134	7
[12]	2016	M/66	CT	45	10
[13]	2017	W/-	CT and ERCP	180	10
[14]	2017	M/-	CT and MRI	15	240
[15]	2018	M/36	CT + FRCP + PTC	-	-
[16]	2018	M/43	CT	82	14
[17]	2019	-/79	CT	75	-
[18]	2019	M/81	-	19	0
[19]	2019	W/31	MRCP	60	7
[20]	2020	M/68	CT + MRCP + 支气管镜检查	60	10

续表

[21]	2022	-/3	US + PTC	180	-
[22]	2024	W/65	MRCP + 支气管镜检查	30	5
[23]	2024	M/67	CT + MRCP + 支气管镜检查	3	4
Our case	2025	M/51	ERCP/PTC + US	101	83

注：MRCP = 磁共振胆胰管成像；ERCP = 内镜逆行胰胆管造影；CT = 计算机断层扫描；PTC = 经皮经肝胆管造影；US = 超声检查。

Table 3. Basic clinical characteristics and treatment regimens of POBL patients

表 3. POBL 患者基本临床特征和治疗方案

参考文献	主要影像学发现	主要临床表现	主要治疗措施
[8]	与支气管树相通的胸腔积液	右上腹痛、发热、胆汁性痰	ENBD
[9]	膈下液体积聚	发热、胆汁性痰	PTCD + 手术
[10]	肝切除腔内积液	引流管持续引流胆汁	引流 + 门静脉栓塞术
[11]	右肝胆管残端漏	腹痛、发热	PTED + ERCP + Rendezvous
[11]	右肝胆管残端漏	持续胆汁引流	PTED + ERCP + Rendezvous
[12]	胆管汇合部附近积液	腹痛、发热	PTCD
[13]	肝周液体积聚	胆汁性皮肤瘘	胆道内圈闭器置入术
[14]	胸腔及肝下积液	发热、胆汁性痰	PTCD
[15]	肝管造影剂外漏	持续胆汁引流	Roux-en-Y
[16]	腹腔脓肿	持续胆汁引流、发热	PTCD
[17]	胸腔积液	持续胆汁引流	胆管闭塞术 + PTCD
[18]	-	-	ENBD
[19]	胆管断裂	腹痛、黄疸	手术修复
[20]	气胆征	发热、胆汁性痰	ENBD
[21]	肝周积液	发热	Rendezvous
[22]	胆道-肺瘘	胆汁性痰	PTCD + ENBD + 手术修复
[23]	胸腔积液	胆汁性痰	手术修复
Our case	肝周积液 + 胆总管结石	腹痛、黄疸	内镜取石术 + PTCD

注：POBL 指肝切除术后胆漏；RUQ 为右上腹；PTCD 为经皮经肝胆管引流；ENBD 为经鼻胆管引流；PTED 为经皮经肝外引流；ERCP 为内镜逆行胰胆管造影；Rendezvous 技术是放射学与内镜联合的“会师”技术；Roux-en-Y 为 Roux-en-Y 肝空肠吻合术；CBD 为胆总管；Pneumobilia Sign 指胆道系统内存在气体的影像学征象，即气胆征；Bilious sputum 为含有胆汁成分的痰液；Biliary cutaneous fistula 指胆管与皮肤之间形成异常通道，导致胆汁外漏。

3.2. POBL 的病因与危险因素

POBL 的发生与多种因素相关，包括体外引流管移位或拔除、医源性胆管损伤、残端处理不当、术中广泛分离肝门部、术后高胆红素血症、术后感染、体重指数(BMI > 30)、糖尿病、既往立体定向放射治疗史、肝切除范围及部位等[4]-[7] [24]-[26]。胆管结石的形成时间在循证医学中常以“复发时间”或“无结石间期”量化评估。有研究报道，内镜下乳头大球囊扩张术后结石平均复发时间约为 12 个月，但标准差较大，提示个体差异显著[27]；另有研究指出，内镜括约肌切开术(EST)后结石的中位复发时间为 4~72 个

月[28]。胆管结石亦存在短期复发风险,在胆总管结石经内镜取石并行胆囊切除的患者中,短期复发多发生于术前或围手术期,中位复发时间仅 40 天,尤其合并胆囊管结石者风险显著升高(HR = 15.6)[29];胆囊管残端过长(≥ 15 mm)亦显著增加复发率[30]。若胆管损伤合并肝动脉损伤,可显著加速结石形成过程。肝动脉血栓形成可在 3 个月内导致胆管壁缺血性坏死,继而发生纤维化狭窄[31]-[33],此类患者的中位结石形成时间缩短至 4~6 个月[33]。糖尿病不仅显著增加胆管结石的发生风险,还可通过代谢紊乱(胆汁酸代谢异常)、动力障碍(Oddi 括约肌功能障碍)及胆汁成分改变等机制,加速结石形成[34][35]。综上,胆管结石的形成是一个多因素参与的渐进性病理过程,时间跨度存在显著个体差异,通常需数月至数年演化。本文所述 POBL 的病因系术后新发胆管结石,这是首次相关病例报告。其诱因可能包括术中牵拉导致的胆管损伤、胆囊切除及糖尿病等。提示在肝部分切除术前应严格控制血糖,术中尤其在合并胆囊切除时,应全面评估胆囊情况,谨慎处理胆囊结石,避免过度牵拉胆管,并对肝脏胆管残端进行规范处理,以降低术后 POBL 的发生风险。

在迟发性 POBL 的流体力学机制中,出口阻力驱动的近端高压是核心病理环节[36]。术后第 83 天,本例患者因远端胆总管结石形成固定性出口阻力,导致近端胆道压力平台显著抬升;在此基础上,十二指肠乳头 Oddi 括约肌的相位性高张收缩可叠加产生瞬时压力峰值,使系统在力学“短板”——肝切除切缘残腔及小胆管断端——优先泄压,而非单纯将压力转化为胆管弹性扩张或黄疸表现[36][37]。肝切除切缘在愈合早中期(数周至数月)主要依赖纤维化封闭层,其抗拉与抗渗强度显著低于原生胆管壁,临床队列显示术后胆漏多起源于此类残端或被消融的肝表面,符合“薄弱点优先失稳”的力学规律[38]。当“胆道压力 $\times$ 作用时间”的综合负荷超过切缘封闭层的耐受阈值时,系统将沿阻力最低路径泄压,表现为胆汁外渗、积液及腹痛/炎症加重;若不存在更弱的泄压点,则表型更可能以胆管扩张与黄疸为主[39]。本例“术后 83 天迟发性胆漏”可由“远端梗阻 $\pm$ Oddi 括约肌高张 $\rightarrow$ 近端高压 $\rightarrow$ 切缘薄弱点失稳外泄”的压力-结构失配模型解释;与“仅扩张/黄疸”表型不同,是否存在更弱的泄压路径决定临床呈现。

3.3. POBL 的治疗策略

对于 POBL 的治疗方案,参考 SGLS 于 2011 年提出的分级标准,其定义和分级依据为胆汁引流液胆红素浓度与血清胆红素浓度的比值及临床干预需求[25]。Grade A: 引流液胆红素/血清胆红素比值 ≥ 3 ,发生于术后第 3 天或之后,但无需调整临床管理,通常为自限性[25]。Grade B: 需积极干预但不必再次开腹手术,ERCP 是 Grade B 胆漏的首选治疗方式,可行内镜下括约肌切开术(EST)或支架植入[25][40]-[42];对于伴严重感染或需反复胆道造影的患者,可选择 ENBD;当 ERCP 失败或存在解剖结构改变时,PTCD 可作为替代方案[41]。Grade C: 当内镜治疗失败且患者存在以下任一情况时——完全性胆管横断、胆汁性腹膜炎伴脓毒症休克、合并血管损伤、支架治疗后持续漏 > 2 周——可行胆管空肠 Roux-en-Y 吻合术或肝管空肠吻合术,成功率可达 98% [25]。对于 BBF 它的早期治疗是保守治疗和内镜治疗[43];若非手术治疗失败,可行开胸肺叶切除联合膈肌瘘管修补及大网膜包埋术,作为根治性方案[44][45]。对于由胆管结石引起的 POBL,应同步处理结石与漏口,急诊行 ERCP、十二指肠乳头肌切开取石,并在 EST 后常规置入塑料支架[42][46]。

本病例为首次明确报道肝部分切除术后短期因新发胆总管结石导致 POBL 的病例,拓展了 POBL 的病因谱,并强调在术后胆漏的鉴别诊断中应考虑早期胆管结石形成的可能性。治疗上,本病例采取分阶段、多模式的综合策略,先解除梗阻,再行支架植入与引流,体现了在复杂 POBL 病例中精准、个体化处理的有效性。该成功经验为未来制定针对术后胆管结石并发 POBL 的诊疗指南提供了重要参考,也为进一步研究其发病机制及最佳治疗方案奠定了基础。综上,本病例不仅提高了临床医生对术后早期胆管结石形成并发 POBL 的警惕性,也为类似复杂病例的诊治提供了可行的循证依据,对改善患者预后具有重要意义。

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