

胰十二指肠切除术后出血的危险因素分析及治疗策略

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【摘要】 目的 探讨胰十二指肠切除术后出血(PPH)的危险因素及治疗策略。**方法** 采用回顾性病例对照研究方法。收集 2012 年 1 月至 2021 年 11 月北京大学第一医院收治的 712 例行胰十二指肠切除术患者的临床资料;男 392 例,女 320 例;中位年龄为 62 岁,年龄范围为 16~89 岁。观察指标:(1)PPH 诊断情况。(2)PPH 影响因素分析。(3)PPH 治疗情况。偏态分布的计量资料以 M (范围)表示。计数资料以绝对数或百分比表示。单因素分析采用 χ^2 检验或 Fisher 确切概率法,多因素分析采用 Logistic 回归模型。**结果** (1)PPH 诊断情况。712 例患者中,72 例发生 PPH,其中 7 例死亡。PPH 发生率为 10.11%(72/712),PPH 相关病死率为 9.72%(7/72)。72 例患者中,早期 PPH 7 例,晚期 PPH 65 例;轻度 PPH 23 例,重度 PPH 49 例。(2)PPH 影响因素分析。单因素分析结果显示:术前血清总胆红素(TBil)、扩大切除、术后胰瘘、术后胆瘘、术后腹腔感染是影响晚期 PPH 的相关因素($\chi^2=13.17$, 3.93, 87.89, 22.77, 36.13, $P<0.05$)。多因素分析结果显示:术前血清 TBil $\geq 171 \mu\text{mol/L}$ 、术后胰瘘为 B 级或 C 级、术后胆瘘、术后腹腔感染是影响晚期 PPH 的独立危险因素(优势比=1.91, 8.10, 2.11, 2.42, 95% 可信区间为 1.09~3.33, 4.62~14.20, 1.06~4.23, 1.35~4.31, $P<0.05$)。(3)PPH 治疗情况。①早期 PPH 治疗:7 例早期 PPH 患者中,轻度 PPH 4 例,重度 PPH 3 例。4 例轻度 PPH 患者经保守治疗成功止血。3 例重度 PPH 患者的出血部位分别为胰肠吻合口后壁、胰腺钩突残端、空肠营养管穿刺腹壁导致左季肋区腹壁血管副损伤,均经再次手术成功止血。7 例早期 PPH 患者均无其他并发症,顺利出院。②晚期 PPH 治疗:65 例晚期 PPH 患者中,轻度 PPH 19 例,重度 PPH 46 例。19 例轻度 PPH 患者中,18 例行保守治疗成功止血(其中 2 例死于胰瘘和腹腔感染),1 例行内镜治疗成功止血。46 例重度 PPH 患者中,18 例生命体征稳定、出血速度缓慢者行保守治疗成功止血(其中 1 例死于感染中毒性休克);28 例行有创治疗,首选内镜治疗 2 例,首选介入治疗 20 例,首选二次手术治疗 6 例。22 例首选内镜及介入治疗患者中,5 例再出血,2 例死亡,再出血率和病死率分别为 22.7%(5/22)和 9.1%(2/22);6 例首选二次手术治疗患者中,3 例再出血,2 例死亡,再出血率和病死率分别为 3/6 和 2/6;两者再出血率和病死率比较,差异均无统计学意义($P>0.05$)。28 例行有创治疗患者中,10 例行二次手术治疗(首选手术治疗 6 例,首选介入治疗再出血 4 例),死亡 4 例,病死率为 4/10;18 例未行二次手术治疗患者均生存;两者病死率比较,差异有统计学意义($P<0.05$)。**结论** 术前血清 TBil $\geq 171 \mu\text{mol/L}$ 、术后胰瘘为 B 级或 C 级、术后胆瘘、术后腹腔感染是影响晚期 PPH 的独立危险因素。早期重度 PPH 应果断手术止血。晚期重度 PPH 保守治疗无效者,首选内镜治疗或介入治疗止血,若上述措施无效,可行手术治疗。

【关键词】 胰腺肿瘤; 胰十二指肠切除术; 术后出血; 胰瘘; 并发症; 外科手术; 手术; 诊断; 治疗

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Risk factors analysis and treatment of postpancreaticoduodenectomy hemorrhage

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【Abstract】 Objective To investigate the risk factors and treatment of postpancreaticoduodenectomy hemorrhage(PPH). **Methods** The retrospective case-control study was conducted. The clinical data of 712 patients who underwent pancreaticoduodenectomy in Peking University First Hospital from January 2012 to November 2021 were collected. There were 392 males and 320 females, aged from 16 to 89 years, with a median age of 62 years. Observation indicators: (1) diagnosis of PPH; (2) analysis of influencing factors for PPH; (3) treatment of PPH. Measurement data with skewed distribution were represented as $M(\text{range})$. Count data were described as absolute numbers or percentages. Univariate analysis was performed using the chi-square test or Fisher exact probability, and multivariate analysis was performed using the Logistic regression model. **Results** (1) Diagnosis of PPH. Of the 712 patients, 72 cases had PPH and 7 cases died. The incidence of PPH was 10.11%(72/712), and PPH related mortality was 9.72%(7/72). There were 7 cases of early PPH and 65 cases of delayed PPH. There were 23 cases of mild PPH and 49 cases of severe PPH. (2) Analysis of influencing factors for PPH. Results of univariate analysis showed that preoperative serum total bilirubin (TBil), extended surgery, postoperative pancreatic fistula, postoperative biliary fistula, postoperative abdominal infection were related factors for delayed PPH ($\chi^2=13.17, 3.93, 87.89, 22.77, 36.13, P<0.05$). Results of multivariate analysis showed that preoperative serum TBil $\geq 171 \mu\text{mol/L}$, postoperative grade B or C pancreatic fistula, postoperative biliary fistula, postoperative abdominal infection were independent risk factors for delayed PPH (odds ratio=1.91, 8.10, 2.11, 2.42, 95% confidence interval as 1.09–3.33, 4.62–14.20, 1.06–4.23, 1.35–4.31, $P<0.05$). (3) Treatment of PPH. ① Treatment of early PPH. Of the 7 cases with early PPH, 4 cases had mild PPH and 3 cases had severe PPH. The 4 cases with mild PPH were stanching by conservative treatment. The bleeding location of the 3 cases with severe PPH were the posterior wall of pancreatoenteric anastomosis, the pancreatic uncinate stump and the unintentional puncture of the jejunostomy tube of the left upper abdominal wall vessels and the 3 cases were stanching by reoperation. All the 7 cases were discharged without other complications. ② Treatment of delayed PPH. Of the 65 cases with delayed PPH, 19 cases had mild PPH and 46 cases had severe PPH. Of the 19 cases with mild PPH, 18 cases were stanching by conservative treatment including 2 cases died of pancreatic fistula and abdominal infection, 1 case were stanching by endoscope therapy. Of the 46 cases with severe PPH, 18 cases with stable vital signs and slow bleeding were stanching by conservative treatment including 1 case died of infectious toxic shock and the other 28 cases underwent invasive treatment, including 2 cases undergoing gastroscopy, 20 cases undergoing interventional treatment and 6 cases undergoing reoperation as the initial treatment. Of the 22 cases taking endoscope or interventional treatment as the initial treatment, 5 cases underwent rebleeding and 2 cases died, with the rebleeding rate and mortality as 22.7%(5/22) and 9.1%(2/22), respectively. Of the 6 cases taking reoperation as the initial treatment, 3 cases underwent rebleeding and 2 cases died, with the rebleeding rate and mortality as 3/6 and 2/6, respectively. There was no significant difference in the rebleeding rate and mortality in patients taking endoscope or interventional treatment as the initial treatment and patients taking reoperation as the initial treatment ($P>0.05$). Of the 28 cases undergoing invasive treatment, 10 cases underwent secondary surgical treatment, including 6 cases taking reoperation and 4 cases taking interventional treatment as the initial treatment for hemorrhage, and 4 cases died with the mortality as 4/10, and the other 18 cases who did not receive secondary surgical treatment survived. There was a significant difference in the mortality between patients with or without secondary surgical treatment ($P<0.05$). **Conclusions** Preoperative serum TBil $\geq 171 \mu\text{mol/L}$, postoperative grade B or C pancreatic fistula, postoperative biliary fistula, postoperative abdominal infection are independent risk factors for delayed PPH. Surgical treatment should be performed decisively for early severe PPH. For delayed severe PPH patients who undergoing conservative treatment without effect, endoscope therapy and interventional treatment should be the first choice, and surgical treatment should be performed if those above procedures not working.

【Key words】 Pancreatic neoplasms; Pancreaticoduodenectomy; Postoperative hemorrhage; Pancreatic fistula; Complication; Surgical procedures, operative; Operation; Diagnosis; Treatment

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胰十二指肠切除术(pancreaticoduodenectomy, PD)是治疗壶腹周围良恶性肿瘤的经典手术方式,手术操作复杂,围手术期并发症发生率高达30%~40%^[1-3]。PD后出血(postpancreaticoduodenectomy hemorrhage, PPH)是PD最严重的并发症,发生率为3%~30%,病死率高达11%~31%^[4-10]。因此,探讨PPH的危险因素及其治疗策略具有重要临床意义^[11-13]。本研究回顾性分析2012年1月至2021年11月我科收治的712例行PD患者的临床资料,探讨PPH的危险因素及治疗策略。

资料与方法

一、一般资料

采用回顾性病例对照研究方法。收集712例行PD患者的临床资料;男392例,女320例;中位年龄为62岁,年龄范围为16~89岁。712例患者中,原发疾病为胰腺恶性肿瘤213例,胆管肿瘤212例,十二指肠肿瘤120例,壶腹部肿瘤79例,胰腺囊性肿瘤40例,慢性胰腺炎20例,胃癌7例,肾转移癌5例,胰腺神经内分泌瘤4例,十二指肠炎性病变4例,胆总管炎症病变3例,胆囊癌2例,结肠癌累及十二指肠2例,胰头及十二指肠壁内动静脉畸形1例。本研究通过我院医学伦理委员会审批,批号为(2018)科研第15号。患者及家属均签署知情同意书。

二、纳入标准和排除标准

纳入标准:(1)行PD。(2)临床资料完整。

排除标准:临床资料缺失。

三、治疗方法

712例患者行保留或不保留幽门的PD,采用改良Child方式进行消化道重建。合并黄疸患者不常规行术前减轻黄疸治疗,仅对合并胆道感染或因其他原因短期内不宜手术患者行术前减轻黄疸治疗。减轻黄疸治疗采用内镜胆道引流术或PTCD。

PPH治疗:PPH患者保守治疗措施包括生命体征监护、补液、输血、抑酸、给予生长抑素等;如治疗无效继续出血,进一步行内镜下治疗、介入治疗、二次手术止血治疗等^[14-19]。

四、观察指标和评价标准

观察指标:(1)PPH诊断情况包括发生例数、出血类型。(2)PPH影响因素分析:性别、年龄、术前血清ALT、术前血清TBil、术前血清Alb、术前行减轻黄疸治疗、合并原发性高血压、合并糖尿病、腹部手术史、美国麻醉医师协会(ASA)评分、手术方式、扩大

切除、手术时间、术中出血量、术后胰瘘、术后胆瘘、术后腹腔感染、术后胃排空延迟。(3)PPH治疗情况:早期PPH治疗、晚期PPH治疗。

评价标准:(1)术后出现以下表现之一即考虑PPH可能。①术后腹腔引流管或胃管出现血性液体。②呕血或黑便。③无明显原因的低血压或心动过速。④实验室检查Hb水平下降。(2)参考国际胰腺外科研究小组(ISGPS)发布的诊断标准对PPH进行分类:①按出血严重程度,将PPH分为轻度和重度^[20]。②按出血时间,以术后24h为界,将PPH分为早期和晚期^[20]。(3)扩大切除定义为PD联合标准切除范围以外的脏器切除或联合门静脉或肠系膜上静脉等血管切除重建。(4)术后并发症胰瘘、胆瘘、胃排空延迟、腹腔感染的诊断均参考ISGPS和中华医学会外科学分会胰腺外科学组制订的胰腺术后并发症诊断标准^[20-21]。

五、统计学分析

应用SPSS 26.0统计软件进行分析。偏态分布的计量资料以 M (范围)表示。计数资料以绝对数或百分比表示。单因素分析采用 χ^2 检验或Fisher确切概率法,多因素分析采用Logistic回归模型。 $P<0.05$ 为差异有统计学意义。

结 果

一、PPH诊断情况

712例患者中,72例发生PPH,其中7例死亡。PPH发生率为10.11%(72/712),PPH相关病死率为9.72%(7/72)。72例患者中,早期PPH 7例,晚期PPH 65例;轻度PPH 23例,重度PPH 49例。

二、PPH影响因素分析

(一)早期PPH影响因素分析

单因素分析结果显示:性别、年龄、术前血清ALT、术前血清TBil、术前血清Alb、术前行减轻黄疸治疗、合并原发性高血压、合并糖尿病、腹部手术史、ASA评分、手术方式、扩大切除、手术时间、术中出血量不是影响早期PPH的相关因素($P>0.05$)。见表1。

(二)晚期PPH影响因素分析

单因素分析结果显示:术前血清TBil、扩大切除、术后胰瘘、术后胆瘘、术后腹腔感染是影响晚期PPH的相关因素($P<0.05$);性别、年龄、术前血清ALT、术前血清Alb、术前行减轻黄疸治疗、合并原发性高血压、合并糖尿病、腹部手术史、ASA评分、

表 1 影响 712 例行胰十二指肠切除术患者术后早期出血的单因素分析

Table 1 Univariate analysis of 712 patients undergoing early postpancreaticoduodenectomy hemorrhage

临床因素	赋值	例数	早期胰十二指肠切除术后出血(例)	χ^2 值	P 值
性别					
男	1	392	4	0.00	1.000
女	0	320	3		
年龄(岁)					
≥60	1	469	2	2.86	0.091
<60	0	243	5		
术前血清丙氨酸氨基转移酶(U/L)					
≥120	1	253	3	0.00	0.992
<120	0	459	4		
术前血清总胆红素(μ mol/L)					
≥171	1	211	0	—	0.111 ^a
<171	0	501	7		
术前血清白蛋白(g/L)					
≥40	0	291	2	0.08	0.780
<40	1	421	5		
术前行减轻黄疸治疗					
是	1	109	0	—	0.603 ^a
否	0	603	7		
合并原发性高血压					
是	1	262	1	0.72	0.397
否	0	450	6		
合并糖尿病					
是	1	183	1	0.07	0.795
否	0	529	6		
腹部手术史					
是	1	185	4	2.12	0.145
否	0	527	3		
美国麻醉医师协会评分(分)					
1~2	0	549	6	0.01	0.926
3~4	1	163	1		
手术方式					
胰十二指肠切除术	1	584	7	—	0.362 ^a
保留幽门胰十二指肠切除术	0	128	0		
扩大切除					
是	1	79	2	0.77	0.382
否	0	633	5		
手术时间(min)					
≥300	1	481	6	0.39	0.532
<300	0	231	1		
术中出血量(mL)					
≥600	1	217	3	0.09	0.762
<600	0	495	4		

注:“—”表示此项无;^a采用 Fisher 确切概率法

手术方式、手术时间、术中出血量、术后胃排空延迟不是影响晚期 PPH 的相关因素($P>0.05$)。见表 2。

多因素分析结果显示:术前血清 TBil $\geq 171 \mu\text{mol/L}$ 、术后胰瘘为 B 级或 C 级、术后胆瘘、术后腹腔感染是影响晚期 PPH 的独立危险因素($P<0.05$)。见表 3。

三、PPH 治疗情况

(一)早期 PPH 治疗

7 例早期 PPH 患者中,轻度 PPH 4 例,重度 PPH 3 例。4 例轻度 PPH 患者经保守治疗成功止血。3 例重度 PPH 患者的出血部位分别为胰肠吻合口后壁、胰腺钩突残端、空肠营养管穿刺腹壁导致左季肋区腹壁血管副损伤,均经再次手术成功止血。7 例早期 PPH 患者均无其他并发症,顺利出院。

(二)晚期 PPH 治疗

65 例晚期 PPH 患者中,轻度 PPH 19 例,重度 PPH 46 例。19 例轻度 PPH 患者中,18 例行保守治疗成功止血(其中 2 例死于胰瘘和腹腔感染),1 例行内镜治疗成功止血。46 例重度 PPH 患者中,18 例生命体征稳定、出血速度缓慢者行保守治疗成功止血(其中 1 例死于感染中毒性休克);28 例行有创治疗,首选内镜治疗 2 例,首选介入治疗 20 例,首选二次手术治疗 6 例。22 例首选内镜及介入治疗患者中,5 例再出血,2 例死亡,再出血率和病死率分别为 22.7%(5/22)和 9.1%(2/22);6 例首选二次手术治疗患者中,3 例再出血,2 例死亡,再出血率和病死率分别为 3/6 和 2/6;两者再出血率和病死率比较,差异均无统计学意义($P=0.311, 0.191$)。28 例行有创治疗患者中,10 例行二次手术治疗(首选手术治疗 6 例、首选介入治疗再出血 4 例),死亡 4 例,病死率为 4/10;18 例未行二次手术治疗患者均生存;两者病死率比较,差异有统计学意义($P=0.010$)。

讨 论

PD 手术操作复杂,术后并发症发生率较高。PPH 是导致围手术期死亡的危险因素。本研究结果显示:PPH 发生率为 10.11%,相关病死率为 9.72%,与文献报道基本一致^[6-10]。

一、PPH 危险因素分析

早期 PPH 多与手术操作相关^[9]。血管结扎闭合脱落、胰腺钩突处理不当可导致腹腔出血,胃肠吻合器械不合理使用可造成消化道出血,表现为呕血和便血。

晚期 PPH 受多种因素影响。已有的研究结果显示:男性、肥胖症、黄疸、术前肝功能差、营养状态差、术中出血量大、联合血管或多脏器切除及术后胰瘘、腹腔感染等均有可能增加 PPH 发生率^[1,10,13]。本研究结果显示:术前血清 TBil $\geq 171 \mu\text{mol/L}$ 、术后胰瘘为 B 级或 C 级、术后胆瘘、术后腹腔感染是晚期 PPH 的独立危险因素。有研究结果显示:行 PD 患者术前存在梗阻性黄疸导致肝功能和凝血功能障碍,容易发生术后腹腔、吻合口或应激性溃疡出血^[22-29]。本研究结果显示:术前行减轻黄疸治疗不是影响晚期 PPH 的相关因素,推测可能与术前减轻黄疸治疗时间较短,肝功能和凝血功能未完全恢复有关;同时行减轻黄疸治疗的患者通常一般状况差、合并胆管炎、需行新辅助治疗等,手术难度增加^[30]。因此,笔者团队认为:针对重度黄疸患者术前行减轻黄疸治疗时间需充分,积极防治胆道感染,改善营养状态后再手术。

术后胰瘘、术后胆瘘是 PD 后常见并发症,引流不畅可继发腹腔感染,易腐蚀手术创面,致结扎线或血管夹脱落而导致出血^[31-33]。同时胰瘘也是假性动脉瘤破裂出血的危险因素,处理不及时后果严重^[34]。

二、PPH 治疗策略

PPH 的处理应依据出血时间、出血量、出血部位,个体化制订治疗策略。早期轻度 PPH 建议保守治疗,早期重度 PPH 积极手术探查,若未发现活动性出血,及时清理血块、通畅引流,促进患者术后康复^[35-38]。对于早期重度呕血者,首选内镜检查,止血效果确切,应尽量在全身麻醉气管插管下进行,以避免内镜操作过程中的误吸风险。

晚期轻度 PPH 多为创面渗血,在密切观察并积极抗感染治疗的同时应保障引流管通畅,必要时再次行超声或 CT 检查引导下穿刺置管。“哨兵”出血应予重视,或提示晚期动脉性大出血,特别是合并剧烈腹痛时,应警惕胃十二指肠动脉假性动脉瘤形成的可能。晚期重度 PPH 多为胃十二指肠动脉、胃右动脉、胰腺钩突血管残端或胰肠吻合口出血。对于生命体征平稳、出血速度较慢的患者,应密切观察,药物保守治疗止血。对于出血迅速、心率及血压等生命体征短时间恶化者,应根据医疗技术条件及时果断选择抢救性止血方式。介入血管造影检查具有微创优势,诊断阳性率高,动脉栓塞、覆膜支架等止血成功率亦较高^[39-40]。本研究结果显示:介入治疗或内镜治疗可有效止血。

表 2 影响 712 例行胰十二指肠切除术患者术后晚期出血的单因素分析

Table 2 Univariate analysis of 712 patients undergoing delayed postpancreaticoduodenectomy hemorrhage

临床因素	赋值	例数	晚期胰十二指肠切除术后出血(例)	χ^2 值	P 值
性别					
男	1	392	37	0.10	0.751
女	0	320	28		
年龄(岁)					
≥60	1	469	43	0.00	0.960
<60	0	243	22		
术前血清丙氨酸氨基转移酶(U/L)					
≥120	1	253	24	0.06	0.806
<120	0	459	41		
术前血清总胆红素(μ mol/L)					
≥171	1	211	32	13.17	<0.001
<171	0	501	33		
术前血清白蛋白(g/L)					
≥40	0	291	22	1.46	0.227
<40	1	421	43		
术前行减轻黄疸治疗					
是	1	109	8	0.50	0.481
否	0	603	57		
合并原发性高血压					
是	1	262	20	1.12	0.290
否	0	450	45		
合并糖尿病					
是	1	183	14	0.65	0.420
否	0	529	51		
腹部手术史					
是	1	185	14	0.74	0.391
否	0	527	51		
美国麻醉医师协会评分(分)					
1~2	0	549	45	2.51	0.113
3~4	1	163	20		
手术方式					
胰十二指肠切除术	1	584	53	0.01	0.915
保留幽门胰十二指肠切除术	0	128	12		
扩大切除					
是	1	79	12	3.93	0.047
否	0	633	53		
手术时间(min)					
≥300	1	481	44	0.00	0.980
<300	0	231	21		
术中出血量(mL)					
≥600	1	217	22	0.38	0.536
<600	0	495	43		

续表 2

临床因素	赋值	例数	晚期胰十二指肠切除术后出血(例)	χ^2 值	P 值
术后胰瘘					
无或生化瘘	0	586	26	87.89	<0.001
B 级或 C 级	1	126	39		
术后胆瘘					
是	1	62	16	22.77	<0.001
否	0	650	49		
术后腹腔感染					
是	1	139	31	36.13	<0.001
否	0	573	34		
术后胃排空延迟					
是	1	188	21	1.28	0.257
否	0	524	44		

表 3 影响 712 例行胰十二指肠切除术后患者术后晚期出血的多因素分析

Table 3 Multivariate analysis of 712 patients undergoing delayed postpancreaticoduodenectomy hemorrhage

临床因素	b 值	标准误	Wald 值	优势比	95% 可信区间	P 值
术前血清总胆红素 $\geq 171 \mu\text{mol/L}$	0.65	0.28	5.15	1.91	1.09~3.33	0.023
扩大切除	0.69	0.39	3.12	1.99	0.93~4.27	0.077
术后胰瘘(B 级或 C 级)	2.09	0.29	53.29	8.10	4.62~14.20	<0.001
术后胆瘘	0.75	0.35	4.47	2.11	1.06~4.23	0.035
术后腹腔感染	0.88	0.30	8.91	2.42	1.35~4.31	0.003

对于无法行介入造影检查治疗或介入治疗无法控制的活动性出血者,应予手术止血,但此时患者病情较严重,预后极差。患者再次手术应本着损伤控制的原则缝扎止血,必要时可结扎肝动脉。针对胰肠吻合口出血,可在 Prolene 线缝扎止血后,胰管支架经腹壁引流至体外后对拢缝合胰肠吻合口。

综上,术前血清 TBil $\geq 171 \mu\text{mol/L}$ 、术后胰瘘为 B 级或 C 级、术后胆瘘、术后腹腔感染是影响晚期 PPH 的独立危险因素。早期重度 PPH 应果断手术止血。晚期重度 PPH 保守治疗无效者,首选内镜治疗或介入治疗止血,若上述措施无效,可行手术治疗。

利益冲突 所有作者均声明不存在利益冲突

作者贡献声明 高红桥: 酝酿和设计试验、实施研究、起草文章; 李宝毅、马永祚: 收集数据、统计分析和解释数据; 田孝东、庄岩: 对文章的知识性内容作批评性审阅和指导; 杨尹默: 酝酿和设计试验,对文章的知识性内容作批评性审阅,获取研究经费

参 考 文 献

- [1] Uggeri F, Nespoli L, Sandini M, et al. Analysis of risk factors for hemorrhage and related outcome after pancreaticoduodenectomy in an intermediate-volume center[J]. Updates Surg, 2019, 71(4): 659-667. DOI: 10.1007/s13304-019-00673-w.
- [2] Greenblatt DY, Kelly KJ, Rajamanickam V, et al. Preoperative factors predict perioperative morbidity and mortality after pancreaticoduodenectomy[J]. Ann Surg Oncol, 2011, 18(8): 2126-2135. DOI: 10.1245/s10434-011-1594-6.
- [3] Bourgouin S, Ewald J, Mancini J, et al. Predictive factors of severe complications for ampullary, bile duct and duodenal cancers following pancreaticoduodenectomy: multivariate analysis of a 10-year multicentre retrospective series[J]. Surgeon, 2017, 15(5): 251-258. DOI: 10.1016/j.surge.2015.11.003.
- [4] 刘磊, 刘付宝, 谢坤, 等. 胰十二指肠切除术后发生延迟性消化道出血的危险因素分析[J]. 中华消化外科杂志, 2021, 20(4): 414-418. DOI: 10.3760/cma.j.cn115610-20210222-00085.
- [5] Gaudon C, Soussan J, Louis G, et al. Late postpancreatectomy hemorrhage: predictive factors of morbidity and mortality after percutaneous endovascular treatment[J]. Diagn Interv Imaging, 2016, 97(11): 1071-1077. DOI: 10.1016/j.diii.2016.08.003.
- [6] Byrling J, Andersson R, Sasor A, et al. Outcome and evaluation of prognostic factors after pancreaticoduodenectomy for distal cholangiocarcinoma[J]. Ann Gastroenterol, 2017, 30(5): 571-577. DOI: 10.20524/aog.2017.0169.
- [7] Bassi C, Falconi M, Molinari E, et al. Reconstruction by pancreaticojejunostomy versus pancreaticogastrostomy following pancreatectomy: results of a comparative study [J]. Ann Surg, 2005, 242(6): 767-773. DOI: 10.1097/01.sla.0000189124.47589.6d.
- [8] Welsch T, Eisele H, Zschäbitz S, et al. Critical appraisal of the International Study Group of Pancreatic Surgery (ISGPS) consensus definition of postoperative hemorrhage after pancreaticoduodenectomy[J]. Langenbecks Arch Surg, 2011, 396(6): 783-791. DOI: 10.1007/s00423-011-0811-x.
- [9] Correa-Gallego C, Brennan MF, D'Angelica MI, et al. Contemporary experience with postpancreatectomy hemor-

- rhage: results of 1,122 patients resected between 2006 and 2011[J]. *J Am Coll Surg*, 2012, 215(5): 616-621. DOI: 10.1016/j.jamcollsurg.2012.07.010.
- [10] Malleo G, Vollmer CM Jr. Postpancreatectomy complications and management[J]. *Surg Clin North Am*, 2016, 96(6): 1313-1336. DOI:10.1016/j.suc.2016.07.013.
 - [11] Shah MF, Pirzada MT, Nasir I, et al. Surgical outcome of pancreaticoduodenectomy in pancreatic and periampullary neoplasms[J]. *J Coll Physicians Surg Pak*, 2017, 27(9): 559-562.
 - [12] Chua TC, Roseverne LO, Edwards PD, et al. Gastrointestinal: Intractable delayed gastrointestinal bleeding after pancreaticoduodenectomy[J]. *J Gastroenterol Hepatol*, 2017, 32(4): 735. DOI:10.1111/jgh.13583.
 - [13] Feng F, Cao X, Liu X, et al. Two forms of one complication: late erosive and nonerosive postpancreatectomy hemorrhage following laparoscopic pancreaticoduodenectomy[J]. *Medicine (Baltimore)*, 2019, 98(30): e16394. DOI:10.1097/MD.00000000000016394.
 - [14] Staerke RF, Gundara JS, Hugh TJ, et al. Management of recurrent bleeding after pancreaticoduodenectomy[J]. *ANZ J Surg*, 2018, 88(5): E435-E439. DOI:10.1111/ans.13976.
 - [15] 彭琳, 韩文军, 陆小英. 胰十二指肠切除术出血的风险评估与防范护理策略[J]. *中华胰腺病杂志*, 2020, 20(4): 318-321. DOI:10.3760/cma.j.cn115667-20200218-00020.
 - [16] Fathala A, Alduraibi A, Abouzied MM. Successful localization of the source of hemorrhage in patient with post-Whipple surgery by ^{99m}Tc-labelled red blood cell scintigraphy[J]. *Case Rep Radiol*, 2018, 2018: 1381203. DOI: 10.1155/2018/1381203.
 - [17] Nagai M, Sho M, Akahori T, et al. Risk factors for late-onset gastrointestinal hemorrhage after pancreaticoduodenectomy for pancreatic cancer[J]. *World J Surg*, 2019, 43(2): 626-633. DOI:10.1007/s00268-018-4791-7.
 - [18] Moore TA, Al-Habbal Y, Choi JM. Retrograde jejuno gastric intussusception presenting as haematemesis in a patient following pancreaticoduodenectomy[J]. *BMJ Case Rep*, 2020, 13(3): e233851. DOI:10.1136/bcr-2019-233851.
 - [19] D'Amore K, Swaminathan A. Massive gastrointestinal hemorrhage[J]. *Emerg Med Clin North Am*, 2020, 38(4): 871-889. DOI:10.1016/j.emc.2020.06.008.
 - [20] Wente MN, Veit JA, Bassi C, et al. Postpancreatectomy hemorrhage (PPH): an International Study Group of Pancreatic Surgery (ISGPS) definition[J]. *Surgery*, 2007, 142(1): 20-25. DOI:10.1016/j.surg.2007.02.001.
 - [21] 中华医学会外科学分会胰腺外科学组, 中国研究型医院学会胰腺病专业委员会, 中华外科杂志编辑部. 胰腺术后外科常见并发症诊治及预防的专家共识(2017)[J]. *中华外科杂志*, 2017, 55(5): 328-334. DOI: 10.3760/cma.j.issn.0529-5815.2017.05.003.
 - [22] Blanc T, Cortes A, Goere D, et al. Hemorrhage after pancreaticoduodenectomy: when is surgery still indicated?[J]. *Am J Surg*, 2007, 194(1): 3-9. DOI: 10.1016/j.amjsurg.2006.08.088.
 - [23] Wellner UF, Kulemann B, Lapshyn H, et al. Postpancreatectomy hemorrhage--incidence, treatment, and risk factors in over 1,000 pancreatic resections[J]. *J Gastrointest Surg*, 2014, 18(3): 464-475. DOI:10.1007/s11605-013-2437-5.
 - [24] Das S, Ray S, Mangla V, et al. Post pancreaticoduodenectomy hemorrhage: a retrospective analysis of incidence, risk factors and outcome[J]. *Saudi J Gastroenterol*, 2020, 26(6): 337-343. DOI:10.4103/sjg.SJG_145_20.
 - [25] Chen JS, Liu G, Li TR, et al. Pancreatic fistula after pancreaticoduodenectomy: risk factors and preventive strategies[J]. *J Cancer Res Ther*, 2019, 15(4): 857-863. DOI:10.4103/jcrt.JCRT_364_18.
 - [26] Kasumova GG, Eskander MF, Kent TS, et al. Hemorrhage after pancreaticoduodenectomy: does timing matter?[J]. *HPB (Oxford)*, 2016, 18(10): 861-869. DOI:10.1016/j.hpb.2016.07.001.
 - [27] Gao F, Li J, Quan S, et al. Risk factors and treatment for hemorrhage after pancreaticoduodenectomy: a case series of 423 patients[J]. *Biomed Res Int*, 2016[2022-02-01]. <https://pubmed.ncbi.nlm.nih.gov/27975049/>. DOI:10.1155/2016/2815693.[Epub ahead of print]
 - [28] 习一清, 谢伟, 杨张翔, 等. 胰十二指肠切除术后并发胰瘘的危险因素的 Meta 分析[J]. *中华实验外科杂志*, 2019, 36(10): 1857-1860. DOI:10.3760/cma.j.issn.1001-9030.2019.10.037.
 - [29] van der Gaag NA, Rauws EA, van Eijck CH, et al. Preoperative biliary drainage for cancer of the head of the pancreas[J]. *N Engl J Med*, 2010, 362(2): 129-137. DOI:10.1056/NEJMoa0903230.
 - [30] 杨尹默, 刘光年. 胰腺癌合并肝脏寡转移: 联合切除还是姑息治疗[J]. *中华消化外科杂志*, 2021, 20(4): 376-380. DOI:10.3760/cma.j.cn115610-20210219-00082.
 - [31] Ellis RJ, Brock Hewitt D, Liu JB, et al. Preoperative risk evaluation for pancreatic fistula after pancreaticoduodenectomy[J]. *J Surg Oncol*, 2019, 119(8): 1128-1134. DOI:10.1002/jso.25464.
 - [32] Chatani S, Inoue A, Ohta S, et al. Transcatheter arterial embolization for postoperative bleeding following abdominal surgery[J]. *Cardiovasc Intervent Radiol*, 2018, 41(9): 1346-1355. DOI:10.1007/s00270-018-2019-8.
 - [33] Liang X, Shi LG, Hao J, et al. Risk factors and managements of hemorrhage associated with pancreatic fistula after pancreaticoduodenectomy[J]. *Hepatobiliary Pancreat Dis Int*, 2017, 16(5): 537-544. DOI: 10.1016/S1499-3872(17)60061-4.
 - [34] Chipaila J, Kato H, Iizawa Y, et al. Prolonged operating time is a significant perioperative risk factor for arterial pseudoaneurysm formation and patient death following hemorrhage after pancreaticoduodenectomy[J]. *Pancreatol*, 2020, 20(7): 1540-1549. DOI:10.1016/j.pan.2020.08.021.
 - [35] 吕永双, 周健, 郑鹏, 等. 胰十二指肠切除术后早期并发症的回顾性分析[J]. *中国现代普通外科进展*, 2016, 19(1): 50-52, 58. DOI:10.3969/j.issn.1009-9905.2016.01.017.
 - [36] 毕永辉, 孙绍伟. 胰十二指肠切除术后延期出血的防治措施[J]. *中国现代普通外科进展*, 2014, 17(1): 50-51. DOI:10.3969/j.issn.1009-9905.2014.01.016.
 - [37] Tan J, Ng JJ, Yeo M, et al. Propensity score-matched analysis of early outcomes after laparoscopic-assisted versus open pancreaticoduodenectomy[J]. *ANZ J Surg*, 2019, 89(5): E190-E194. DOI:10.1111/ans.15124.
 - [38] Kim S, Yoon YS, Han HS, et al. Evaluation of a single surgeon's learning curve of laparoscopic pancreaticoduodenectomy: risk-adjusted cumulative summation analysis[J]. *Surg Endosc*, 2021, 35(6): 2870-2878. DOI: 10.1007/s00464-020-07724-z.
 - [39] Zhang L, Wang J, Jiang J, et al. The Role of interventional radiology in the management of late postpancreaticoduodenectomy hemorrhage[J]. *Biomed Res Int*, 2020, 2020: 8851950. DOI:10.1155/2020/8851950.
 - [40] Guan Y, Zhang JL, Li XH, et al. Postpancreatectomy hemorrhage with negative angiographic findings: outcomes of empiric embolization compared to conservative management[J]. *Clin Imaging*, 2021, 73: 119-123. DOI:10.1016/j.clinimag.2020.12.009.