DOI:10.1111/hpb.12205 HPB

REVIEW ARTICLE

Anticoagulation policy after venous resection with a pancreatectomy: a systematic review

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Abstract

Background: Portal vein (PV) resection is used increasingly in pancreatic resections. There is no agreed policy regarding anticoagulation.

Methods: A systematic review was performed to compare studies with an anticoagulation policy (AC+) to no anticoagulation policy (AC–) after venous resection.

Results: There were eight AC+ studies ($n = 266$) and five AC– studies ($n = 95$). The AC+ studies included aspirin, clopidogrel, heparin or warfarin. Only 50% of patients in the AC+ group received anticoagulation. There were more prosthetic grafts in the AC+ group (30 versus 2, Fisher's exact $P < 0.001$). The overall morbidity and mortality was similar in both groups. Early PV thrombosis (EPVT) was similar in the AC+ group and the AC– group (7%, versus 3%, Fisher's exact $P = 0.270$) and was associated with a high mortality (8/20, 40%). When prosthetic grafts were excluded there was no difference in the incidence of EPVT between both groups (1% vs 2%, Fisher's exact test $P = 0.621$).

Conclusion: There is significant heterogeneity in the use of anticoagulation after PV resection. Overall morbidity, mortality and EPVT in both groups were similar. EPVT has a high associated mortality. While we have been unable to demonstrate a benefit for anticoagulation, the incidence of EPVT is low in the absence of prosthetic grafts.

Received 20 August 2013; accepted 30 October 2013

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Introduction

Portal vein involvement in pancreatic cancer historically represented unresectable disease.[1,2] Numerous contemporary reports have highlighted acceptable morbidity, mortality and respectable survival outcomes from venous resection provided an R0 resection is performed.[3–8] Pancreatic adenocarcinoma with portal vein involvement is no longer a contraindication to resection.[9] The clincher of unresectable disease now lies in superior mesenteric arterial (SMA) invasion and resectability has now shifted to clearance of the medial or SMA margin to facilitate an R0 resection when combined with a venous resection.[10]

There are several techniques of performing mesentericoportal vein resection and reconstruction. These include tangential or lateral wedge venous resections with a non-occlusive side biting vascular clamp, and where a more extensive length of vein is resected this may be reconstructed primarily with an end-to-end anastomosis or with a venous or prosthetic graft. In the latter, portal vein clamping is required for the duration of the anastomosis, which may lead to bowel oedema that may complicate the subsequent pancreatico-enteric anastomosis. To prevent this some centres perform superior mesenteric arterial occlusion, and several Japanese centres have described the use of antithrombogenic bypass catheters to prevent portal congestion or hepatic ischaemia.[11] In view of the vast differences in technique,

This paper was presented at the Annual Scientific Congress of the Royal Australasian College of Surgeons (RACS), in May 2013, in Auckland, New Zealand and the RACS Tri-state Western Australia, South Australia and Northern Territory Annual Scientific Meeting 2013.

we can expect significant heterogeneity in the population of patients undergoing venous resection in the literature. To add to this, several major Eastern centres perform arterial resections in addition to venous resection, which make comparisons between Eastern and Western patients difficult.[12]

Portal vein resection and clamping would intuitively be associated with an increased risk of portal vein thrombosis compared with patients not undergoing venous resection. The risk of venous thrombosis after a PV/SMV resection is estimated to be as high as 21–26% in some series.[13–15] There appears to be no published guidelines regarding anticoagulation after a venous resection with a pancreatic resection and no current systematic review addressing this question.

The aim of this study was to review the different published anticoagulation policies and outcomes of patients with and without anticoagulation after a venous resection with a pancreatic resection, with special reference to early portal vein thrombosis.

Methods

Study protocol

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines[16] (Fig. 1). Three databases (MEDLINE from 1946, PubMed from 1946, and EMBASE from 1949) were searched to June 2013. The search terms included 'pancreatectomy OR pancreaticoduodenectomy', 'portal vein OR mesenteric vein', and 'resection OR reconstruction'. A search for unpublished literature was not performed.

Study selection

The studies that were included described patients that underwent a pancreatic resection (pancreaticoduodenectomy, distal pancreatectomy and total pancreatectomy) and a venous resection (portal and/or superior mesenteric vein). Studies were only included if they described a policy with respect to anticoagulation, of either administering this or not administering this. This resulted in two groups of publications, those with a policy of administering anticoagulation (AC+) and those with a policy of not administering anticoagulation (AC–). Studies that described an extended pancreatic resection, including an arterial resection involving the celiac axis or SMA in combination with venous resection were excluded. Studies that included an arterial resection alone without a portal vein resection were excluded from this review.

Data extraction

Data extraction was done using a standardized data extraction form. Information collected included the year of publication, country of origin, number of pancreatic resections, number of cases of venous resection, overall morbidity, mortality, incidence of bleeding, re-operations and portal vein thrombosis.

Anticoagulation

Anticoagulation (AC) was defined as the use of heparin, warfarin and included antiplatelet use such as aspirin and clopidogrel in the immediate post-operative period, irrespective of the duration. Although the purpose of this study was to assess anticoagulation beyond standard thromboprophylaxis, some patients in the anticoagulation group received only routine thromboprophylaxis. The dosing and duration of these anticoagulation is further elaborated in Table 1.

Intra-operative techniques

We have reported the practice of intra-operative heparinization in each of the studies and the practice of superior mesenteric artery occlusion at the time of venous anastomosis to prevent congestion and intestinal oedema in Tables 1 and 2.

Venous resection and reconstruction

Venous resection included tangential and segmental resections Tangential venous resections are lateral wedge resections of the portal vein (PV) or SMV or the SMV-PV confluence. Segmental venous resections involved resection of a cyclindrical portion of the portal vein, superior mesenteric vein or mesentericoportal confluence. Reconstruction after a tangential or segmental venous resection was with a primary repair or with the use of a graft (venous or prosthetic).[17] We have defined the type of venous resection used in these studies in Tables 1 and 2.

Portal vein thrombosis

The diagnosis of portal vein thrombosis was within 30 days, and is termed early portal vein thrombosis (EPVT). The basis for the diagnosis of EPVT varied between studies, but invariably used a combination of clinical, biochemical and imaging studies including Doppler ultrasound.

Statistical analysis

The data have been compared as descriptive statistics, with patient demographic and clinical characteristics reported as percentages for discrete characteristics. All *P*-values calculated were two-tailed; the alpha level of significance was set at 0.05. Analysis was done on an 'intention-to-treat' basis. Fisher's exact test was used for statistical analysis of categorical variables.

Results

Thirteen studies were included in this review. Eight studies (n = 266 patients) described a policy for anticoagulation after venous resection (AC+ group, Table 1).[14,15,18–23] There were five studies (n = 95 patients) that described a policy of no post-operative anticoagulation (AC– group, Table 2).[24–28]

Pancreatic resection

There was no significant difference between the two groups for the types of pancreatic resection. The AC+ group had similar proportions of pancreatoduodenectomies (242/266, 91% versus 86/95, 91%) and total pancreatectomies (14/266, 5% versus 9/95, 9%