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Aorto-hepatic bypass graft for repair of an inferior pancreatico-duodenal artery aneurysm associated with coeliac axis occlusion: A case report

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ABSTRACT

INTRODUCTION: Inferior pancreatico-duodenal artery (IPDA) aneurysms are very rare and commonly associated with coeliac axis stenosis or occlusion due to atherosclerosis, thrombosis or median arcuate ligament syndrome. We present a case of a surgical repair of an IPDA aneurysm with the use of a supra-coeliac aorto-hepatic bypass with a polytetrafluoroethylene (PTFE) graft, following a failed initial attempt at an endovascular repair.

PRESENTATION: A 75 year old female, who was under investigation for night sweats, was referred to our team with an incidental finding of a 19 mm fusiform IPDA aneurysm. Initial attempt at endovascular coiling of the aneurysm was unsuccessful. Elective surgical repair involved excision of the aneurysm and to restore arterial inflow to the hepatic artery, a PTFE bypass graft was used from the supra-coeliac aorta to the hepatic artery. The patient was well 2 months following the procedure with a patent graft shown on contrast enhanced computer tomography (ceCT).

DISCUSSION: Management options for IPDA aneurysms include radiologically guided endovascular approach or surgical repair. Given the high mortality of greater than 50% with ruptured aneurysms intervention is indicated in all detected cases.

CONCLUSION: Surgical excision with bypass grafting from the supra-coeliac aorta, as reported by our team, represents a satisfactory management option in patients where interventional approaches have failed or are not appropriate.

1. Introduction

Inferior pancreatico-duodenal artery (IPDA) aneurysms are rare visceral aneurysms that most often represent incidental findings in asymptomatic patients. They can also be detected during investigations for mesenteric ischaemia or in the acute setting due to rupture [1]. Management options include radiologically guided endovascular repair or surgery, with the latter being reserved for those that are not amenable to an endovascular approach [2].

We present a case of a surgical repair of an IPDA aneurysm with the use of a supra-coeliac aorto-hepatic bypass with polytetrafluoroethylene (PTFE) graft, following a failed initial attempt at an endovascular repair.

2. Presentation of case

A 75 year old female, who was under investigation for night sweats, was referred to our team with an incidental finding of a 19 mm fusiform IPDA aneurysm, detected on triple phase contrast enhanced computerised tomography (ceCT) of the abdomen and pelvis (Fig. 1). Concurrent coeliac axis occlusion and collateralisation of the arterial inflow to the liver via the IPDA aneurysm was also noted. The patient's medical history was only significant for hypertension and hypercholesterolaemia under medical management.

After discussion in the hepato-pancreato-biliary (HPB) multidisciplinary team (MDT) meeting, an urgent angiography followed by stenting or embolization of the aneurysm was favoured. During the procedure the aneurysm was identified arising from the

Abbreviations: IPDA, inferior pancreatico-duodenal artery; PTFE, polytetrafluoroethylene; ceCT, contrast enhanced computerised tomography; HPB, hepato-pancreato-biliary; MDT, multidisciplinary team; GDA, gastroduodenal artery; SMA, superior mesenteric artery; HA, hepatic artery.

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Fig. 1. ceCT illustrating the 19 mm IPDA aneurysm.

IPDA at the level of a division of the vessel into two branches, one of which anastomosed with the gastroduodenal artery (GDA) (Fig. 2). As there was no suitable aneurysm neck to undergo liquid embolization, this was performed with multiple interlocking coils (Fig. 3). There were no complications following the procedure and the patient was discharged after 2 days. A follow up ceCT one month later identified that the aneurysm was still partially arterialised. A second endovascular approach was deemed inappropriate by the interventional radiology team due to the complex anatomy and the risks of non targeted embolization of other superior mesenteric artery (SMA) branches. The subsequent MDT decision was to proceed with an elective surgical repair due to the risk of rupture.

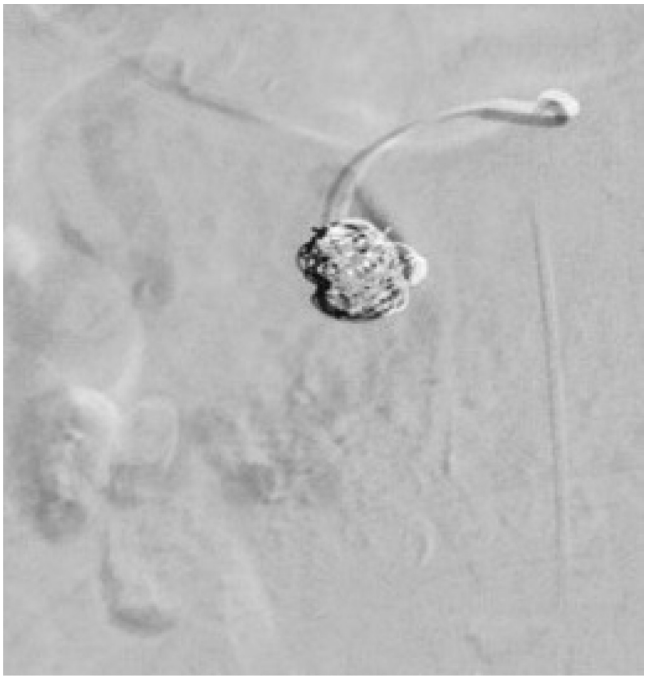

Fig. 3. Microcatheter coil embolization of the IPDA aneurysm.

The procedure was performed with the patient in the supine position through a Mercedes Benz incision. After Kocherisation of

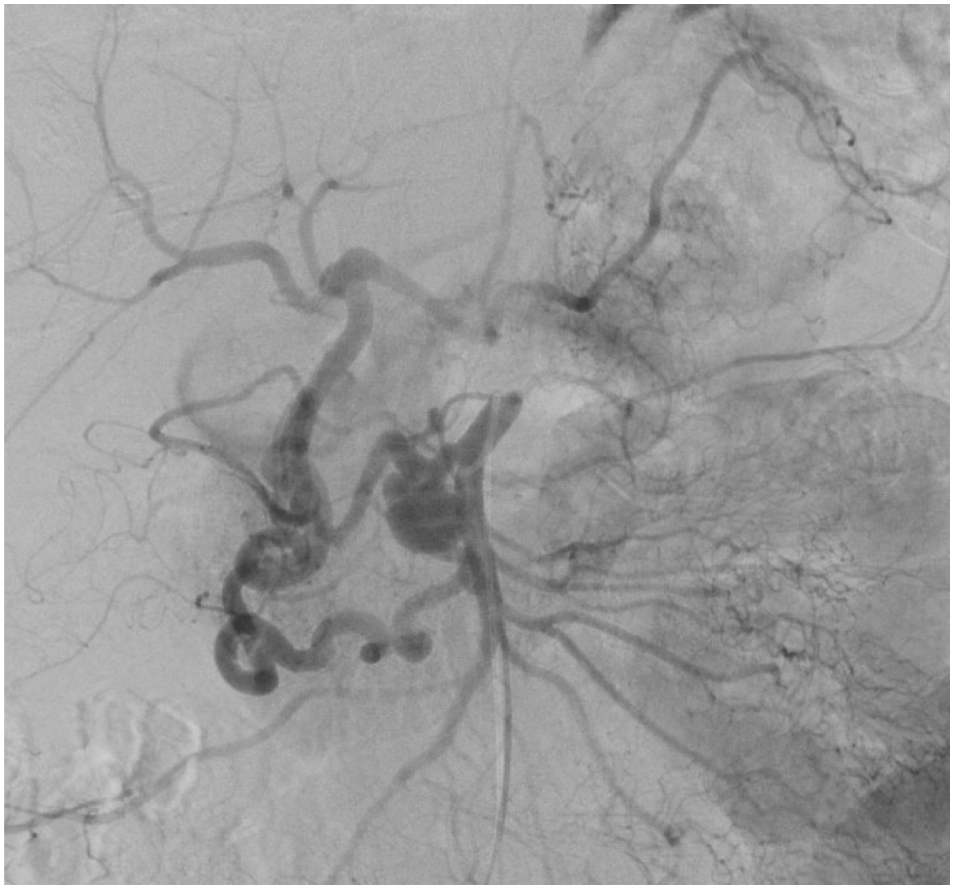

Fig. 2. IPDA aneurysm present at the junction of its division.

Fig. 4. ceCT imaging 2 months post operatively indicating patent graft.

the duodenum and hilar dissection, the IPDA, hepatic artery (HA) and GDA were identified and dissected free. Trial clamping of the IPDA substantially reduced liver arterial inflow, indicating the significance of the collateralised retrograde flow through the GDA. Therefore, further dissection of the supra-coeliac aorta was performed in preparation for an aorto-hepatic conduit if required. The origin of the SMA was dissected and, after obtaining proximal and distal control, the IPDA aneurysm was completely excised with ligation of the IPDA main trunk and any feeding branches. Subsequently, no pulse was palpable in the HA despite a weak arterial flow in the GDA identified on intraoperative ultrasound Doppler. Therefore, the decision was made to proceed with an aorto-hepatic conduit. After administration of 5000 units of heparin, the HA was divided proximally to the GDA (to maintain any additional retrograde flow to the liver) and a 6 mm (PTFE) graft was used to form a conduit from the supra-coeliac aorta. At the end of the procedure excellent arterial flow was demonstrated. The patient was commenced on antiplatelet therapy with aspirin and discharged after an 8-days uneventful hospital stay. The patient was well during clinic follow-up 2 months post-operatively with a patent graft on ceCT imaging (Fig. 4) and normal liver function tests. Histology of the aneurysm showed evidence of hypertensive changes with fibrous sclerosis and intimal atheroma.

3. Discussion

Aneurysms of the pancreatico-duodenal arterial arcades are a commonly encountered problem in HPB surgery and their pathological causes include: trauma, surgery, endoscopic retrograde cholangiopancreatography, pancreatitis and more rarely systemic vasculitis [1]. However, IPDA aneurysms are rare and commonly associated with coeliac axis stenosis or occlusion due to atherosclerosis, thrombosis or median arcuate ligament syndrome [1,3,4]. Association with SMA stenosis has also been described [5]. The pathophysiology of IPDA aneurysms is thought to be related to increased collateral flow through the pancreatico-duodenal arcades with subsequent local hypertension, leading to the development of true aneurysms, that can be single or multiple in nature [1]. The risk of rupture may be lower than reported in the literature, however follow up of untreated aneurysms is advisable [6]. The reported cases do not indicate any relation between the size of the aneurysm and risk of rupture [1,7] and given the high mortality of greater than 50% with ruptured aneurysms [7,8] intervention is indicated in all detected cases.

Management options for IPDA aneurysms include radiologically guided endovascular approach or surgical repair. The former is the preferred option in both elective and emergency settings, as it is less invasive and considered to have less associated morbidity and mortality [1]. Stenting or embolization of the aneurysm may both be possible depending on the: anatomy, size and neck of the aneurysm. Surgical repair is most commonly performed in cases that are not amenable to or after failed endovascular approach [2]. Possible surgical approaches include the in situ repair of the aneurysm with the use of a graft or the excision of the aneurysm. In any case, optimisation of the hepatic arterial inflow may be contemplated in cases of severe coeliac or HA stenosis or occlusion with significant retrograde flow through the IPDA. Stenting of the stenosed vessel is the preferred option [9], but may not always be possible, as for example in cases of complete occlusion. Direct anastomosis of the IPDA to the SMA has been described [10], but adequate vessel length is a prerequisite. Another option is the formation of a conduit to the HA from either the aorta [11,12] or the iliac arteries [13].

In our case, surgical management of the aneurysm was decided after a failed endovascular approach. Coeliac stenting was not possible due to the complete occlusion of the coeliac axis. A conduit between the origin of the SMA and the distal end of the IPDA was not preferred due to the lack of available length of IPDA. This surgical approach may also carry additional risks due to the small calibre of the arterial anastomosis, the anatomical position of the SMA behind the pancreas and the risk of small bowel ischaemia in cases of propagating graft thrombosis. Therefore, excision of the IPDA aneurysm with supra-coeliac aorto-hepatic graft placement to maintain adequate liver inflow was performed.

In the management of IPDA aneurysms, caution must be maintained to preserve optimal hepatic arterial inflow in the case of concurrent coeliac axis stenosis. Surgical excision with bypass grafting represents a satisfactory management option in patients where interventional approaches have failed or are not appropriate.

Conflict of interest

None.

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Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Consent

Full informed and documented consent was given at the time of the operation.

Authors contributions

All authors contributed equally to the writing and assembly of this case report and the operation was performed by the senior author (SH).

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