

Successful Resection and Vascular Ligation of a Large Hepatic Artery Aneurysm – A Case Report and Literature Review

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Abstract. *The occurrence of hepatic artery aneurysms is rare and might be incidentally diagnosed, as the patient remains asymptomatic for a long period of time. However, due to the fact that these lesions are associated with a high risk of developing life threatening complications, such as intraperitoneal rupture, it has been stated that all cases should be submitted to treatment by endovascular or surgical approach. We present the case of a 68-year-old patient, who presented with recurrent upper digestive tract bleedings and was diagnosed with a large aneurysm of the common and the proper hepatic artery, and the gastroduodenal artery. The preoperative angiography revealed an anatomic variation consisting of the common hepatic artery originating from the celiac trunk, and the left hepatic artery originating from the left gastric artery. A percutaneous right portal vein embolization was performed in order to induce hypertrophy of the left lobe and prepare the patient for a right hepatectomy and aneurysmal resection. However, at the time of surgery, after performing the aneurysmal resection and arterial ligation, the vascular supply of the entire liver was efficiently provided by the left hepatic artery and its collaterals. Concluding, hepatic resection was no longer necessary.*

Hepatic artery aneurysms account for up to 20% of all reported visceral aneurysms and might remain asymptomatic for a long period of time (1, 2). In cases presenting large lesions, compression on the elements of the hepatic pedicle might be encountered, inducing portal hypertension. It is estimated that the risk of aneurysmal rupture ranges between 20% and 80%, and the mortality rate reaches up to 21% (3, 4). Due to this reason, and the fact that there is no strong evidence to demonstrate any correlation between aneurysm size and rupture risk, all hepatic aneurysms should be treated (5). The main therapeutic procedures in uncomplicated aneurysms include endovascular techniques, such as percutaneous embolization or classical surgical approach, consisting of aneurysmal resection with or without vascular reconstruction. On the other hand, reconstructive procedures are mainly indicated when a patent collateral vascularization is not present (6).

Case Report

A 68-year-old patient, who was investigated for recurrent upper digestive tract bleeding, was diagnosed during a computed tomography examination with a large aneurysm affecting the common and the proper hepatic artery as well as the gastroduodenal artery, and compressing the portal vein. The imagistic examinations revealed the presence of an accessory left hepatic artery entering the left liver lobe, originating from the left gastric artery. Due to the presence of the large, partially thrombosed aneurysm involving the common and the proper hepatic artery, as well as the gastroduodenal artery, the patient was initially submitted to a percutaneous right portal branch embolization in order to induce a left hemiliver hypertrophy. Two months later the patient was submitted to surgery; intraoperatively the findings of the imagistic examinations were confirmed. The

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aneurysm was successfully resected without vascular reconstruction (Figures 1-3) and the vascularization was provided through the patent left hepatic artery and its collaterals. Consequently, the planned right hepatectomy was not performed, as the vascular supply through the left hepatic artery and its collaterals was efficient for both the left and the right hepatic lobe. The postoperative course was uneventful.

Discussion

Visceral artery aneurysms that were initially described by Beaussiers in 1770 and were discovered during an autopsy, involved the splenic artery (7). Five decades later an aneurysm of the hepatic artery was described by Wilson at London while in 1871 the first symptomatic hepatic artery aneurysm was reported by Quincke (8, 9). However, only one century later the first successful surgical treatment of an aneurysm was reported by Kehr, who proceeded to the ligation of a large hepatic artery aneurysm in order to prevent effraction (10).

Visceral arterial aneurysms remain rare cases, with a reported incidence of 0.1-0.2% in autopsy studies (11-13). This pathology usually occurs during the fifth and the sixth decade of life and induces unspecific symptoms, such as diffuse abdominal pain, jaundice or portal hypertension depending on the location of the aneurysm (14-17).

One of the largest studies regarding the surgical treatment of visceral artery aneurysms involved 55 patients diagnosed with the aforementioned pathology during a 25-year period. Among these cases, there were seven patients diagnosed with common hepatic artery aneurysms which were treated by performing an isolated aneurysectomy and primary closure in three cases, aneurysectomy and arterial ligation in two cases, aneurysectomy and patch closure in one case, and aneurysmorrhaphy in one case. None of these cases developed any significant perioperative complications; moreover, after a mean follow-up period of 82.1 months there was no reported aneurysm-related death (18).

Grotemeyer *et al.* (6) conducted a similar study concerning the therapeutic options in visceral artery aneurysms, which was published in 2009. The study included 23 cases of various visceral aneurysms, diagnosed during a 15 year period. Six of the cases involved the hepatic artery. Depending on the association of collateral circulation and the dimensions of the aneurysms, the most commonly performed procedures were i) resection of the aneurysm and end-to-end anastomosis, and ii) resection and allograft or venous graft reconstruction. After a mean follow up of 54.6 months, in one case the reconstructed right artery had become occluded without any symptoms (6).

When it comes to the hepatic atrophy-hypertrophy concept, the first studies were conducted in 1920, when Rous

and Larimore demonstrated that the ligation of a main branch of the portal vein in rabbits leads to apparition of an atrophy of the homolateral liver lobe and a hypertrophy of the contralateral lobe (19). Honjo *et al.*, in 1975, applied this concept in patients with hepatocellular carcinoma in order to suppress tumor growth (20). Although the objective was not achieved, hypertrophies of the contralateral lobe in association with atrophy of the homolateral liver lobe were observed. One decade later, the procedure was successfully performed in patients with hilar bile duct carcinoma, when an extended hepatic resection was performed (21).

It has been widely demonstrated that extended liver resection in the absence of previous portal vein embolization might be associated with various disadvantages. The main inconvenience that might be encountered after performing an extended hepatic resection without previous portal vein embolization is related to the appearance of an increased portal venous pressure in the remnant liver, and also to the incapacity of the remnant liver to meet the metabolic demands (22).

Once the portal vein embolization is performed, hepatocyte regeneration in the non-embolized liver occurs immediately. However, it has been demonstrated that only after seven to nine weeks after embolization the atrophy-hypertrophy process is ended and extended liver resections can be safely performed (23). Meanwhile, this interval is strongly influenced by other factors, such as the extent of embolization, the nature of the embolization material or the association of other comorbidities, including diabetes, cirrhosis, perioperative chemotherapy and active hepatitis (22). Most often this procedure has been reported as part of the treatment of primary or secondary hepatic malignancies such as hepatocellular carcinoma, cholangiocarcinoma, or hepatic metastases with colorectal origin (24-26).

In our case, the embolization of the right branch of the portal vein has been performed eight weeks before the moment at which the surgical procedure was planned. The decision of performing the right portal vein embolization was taken due to the fact that the initial arteriography revealed the presence of an extended arterial aneurysm involving the common and the proper hepatic artery, as well as the gastroduodenal artery. These preoperative aspects in addition to the fact that a patent left hepatic artery from the left gastric artery was revealed, orientated the therapeutic strategy to a aneurysmal resection in association with a right hepatectomy. In this eventuality, the postresectional hepatic function had to be provided by the remnant left hepatic lobe, and its vascularization through the left hepatic artery. However, due to the long evolution of the aneurysmal process, multiple collaterals had been developed so the vascular supply of the entire liver was successfully preserved after aneurysmal resection and ligation of the arterial stumps, hence right hepatectomy was no longer necessary.

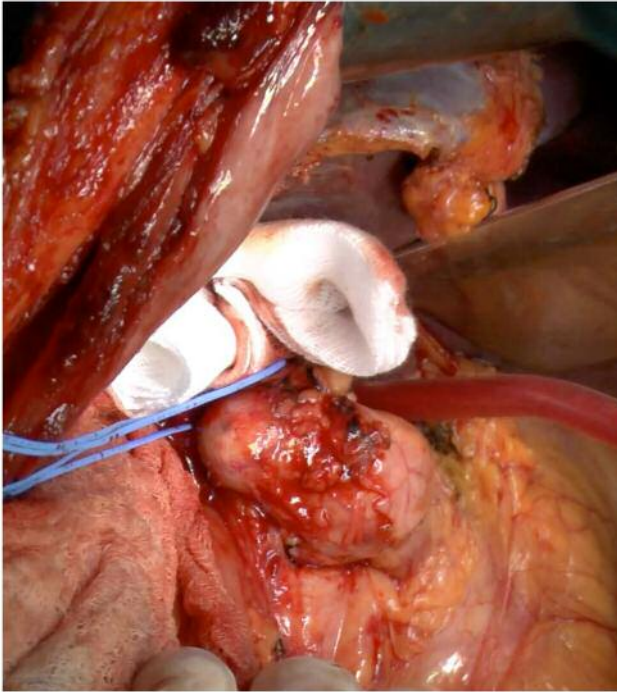


Figure 1. Initial intraoperative aspect: large thrombosed aneurysm of the common and proper hepatic artery.



Figure 2. The specimen of aneurysmal resection.



Figure 3. The sectioned specimen of aneurysectomy.

Conclusion

Hepatic artery aneurysms are rarely encountered and might be associated with a long asymptomatic evolution. In certain cases, these visceral arterial aneurysms might induce potentially life threatening complications associated with a high mortality rate. Due to this fact, when they are diagnosed, therapeutic options, such as percutaneous embolization or surgical resection, should be taken into consideration. In cases presenting a long period of aneurysmal evolution, a strongly represented collateral circulation might also be associated. In these situations the aneurysm can be safely resected and the vascular stumps can be ligated without any kind of vascular reconstruction or parenchymatous resection.

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