

New technique for a safer segment VIII liver resection

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ABSTRACT

Colorectal cancer is one of the leading causes of death worldwide. Approximately 70% of patients with colorectal cancer will develop liver metastasis (LM). Hepatic resections are considered the gold standard treatment and can cure the disease. The preservation of a suitable future liver remnant is the most relevant factor to prevent postoperative liver failure and mortality. However, in certain situations parenchymal sparing surgery may be challenging in view of the location of metastasis, such as, for example, near the confluence of the hepatic veins. The goal of this technical note is to describe a new approach for segmental or subsegmental resection of the VIII, used in surgery to remove LM in segment VIII involving the middle hepatic vein. During resection of the node in segment VIII, the surgeon places the left index finger in the space created between the right hepatic vein and the trunk formed by the middle and left hepatic vein near the vena cava, and between the liver and the IVC thus creating a safe zone for parenchymal division. This technique allows a safer sparing liver resection of segment VIII.

Keywords: *liver resection, segment VIII, sparing liver surgery.*

INTRODUCTION

Colorectal cancer is one of the leading causes of death worldwide. Approximately 70% of patients with colorectal cancer will develop liver metastasis (LM), 20-25% at the time of initial diagnosis and 40-50% during the course of the disease [1].

Hepatic resections are considered the gold standard treatment and can cure the disease. Only 20% of patients can present with potentially resectable lesions at the time of diagnosis [2]. Resectability may be even lower in certain anatomical locations that are more amenable to complications, due to the proximity of the vessels around the liver; ex: segments I IVa and VIII.

Although hepatectomy is considered a safe procedure nowadays, rates of morbidity and mortality are still higher when we compare major hepatectomies with minor resections [3, 4].

Avoidance of haemodynamic instability, prolonged ischemia, control of intraoperative hemorrhage and preservation of a suitable future liver remnant are the most relevant factors to prevent postoperative liver failure and mortality.

In this scenario, sparing liver surgery has been a consensus among the various centers [3-6]. In addition to reducing the possibility of liver dysfunction, it also increases the chance of future new resections in case of recurrences, which occur between 60-70%. However, in certain situations parenchymal sparing surgery may be challenging in view of the location of metastasis, such as, for example, in between the confluence of the hepatic veins.

The goal of this technical note is to describe a new approach for segment VIII segmental or subsegmental, used in one surgery to remove LM in segment VIII involving the middle hepatic vein (VHM).

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CASE REPORT

A 69-year-old male patient, with prior history of right colectomy was referred to our institution due to G2, pT3N2 adenocarcinoma in the surgical specimen. Staging showed synchronous liver metastases in segments V and VIII. He was submitted to conversion chemotherapy, followed by partial response (Figure 1), and was later referred to surgery.

The carcinoembryonic antigen (CEA) was stable during treatment, with values between 3 and 4ng / ml and both nodules exhibited partial response.

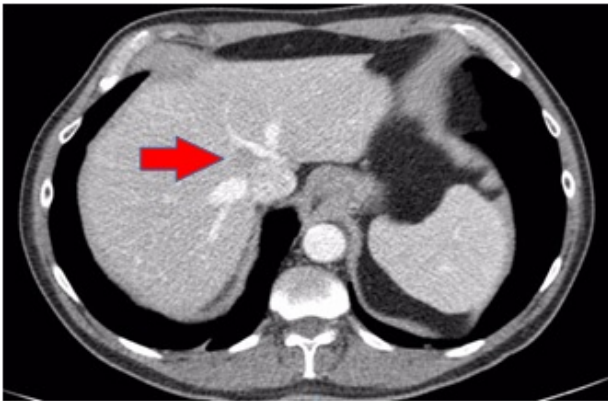


Figure 1: Liver metastasis at supra hepatics confluence (red arrow).

Description of the technique

The surgery was performed with the patient in supine position. A J-shaped incision was made on the right subcostal quadrant to access the abdominal cavity. Inspection, palpation and ultrasonography confirmed the two lesions and involvement of the wall of the MHV (Figure 2).



Figure 2: Transoperative US showing involvement of the MHV (red arrow).

Segment V nodulectomy was performed first. The maneuvers performed for resection of the segment VIII are now described in 8 steps as it follows:

- 1) The liver was extensively mobilized through the section of the round, falciform, triangular and coronary ligaments;
- 2) We accessed and encircled the hepatic pedicle in preparation for vascular exclusion maneuver.
- 3) Dissection, ligation and division of the Spiegelian veins of the superior anterior lateral right half of the retro-hepatic vena cava;
- 4) Dissection and encircling of the inferior vena cava (IVC) suprahepatic and infrahepatic in preparation for total hepatic exclusion;
- 5) Dissection and division of the hepatocaval ligament;
- 6) Dissection, isolation and encircling of the right hepatic vein (RHV) and the trunk of the middle hepatic vein with the left, to avoid injury during metastasectomy;
- 7) The hepato-gastric ligament and the Arantius Duct were sectioned, preserving an accessory arterial branch to the left liver, originating from the left gastric artery;
- 8) Intermittent total vascular liver exclusion (ITVLE) was applied during resection of the node in segment VIII, and the surgeon, who was right-handed, placed the left index finger in the space created between the right hepatic vein and the trunk formed by the middle and left hepatic vein close the vena cava, in between segment VIII and the IVC (Figure 3).

This maneuver allowed to elevate segment VIII and use the insinuated finger as an anvil against which instrument pressure could be applied (energy instruments or forceps) and as a shield to the IVC.

For hepatoclasia we used bipolar and monopolar energy, clips, ligature, suture and a sealing device (Ligasure) for parenchymal division and hemostasis.

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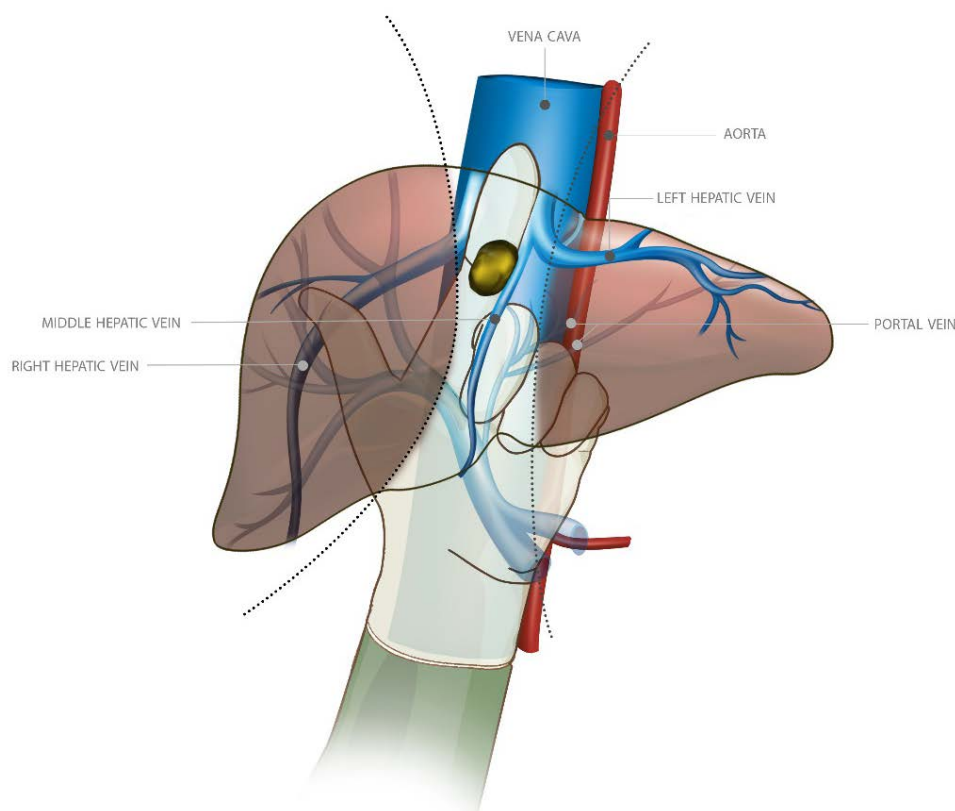


Figure 3: Technical detail of fingertip maneuver.

It was necessary to accomplish a proximal partial resection of the MHV due to macroscopic vascular invasion, without compromising the hepatic out-flow as show in a post-operative angioCT (Figure 4).

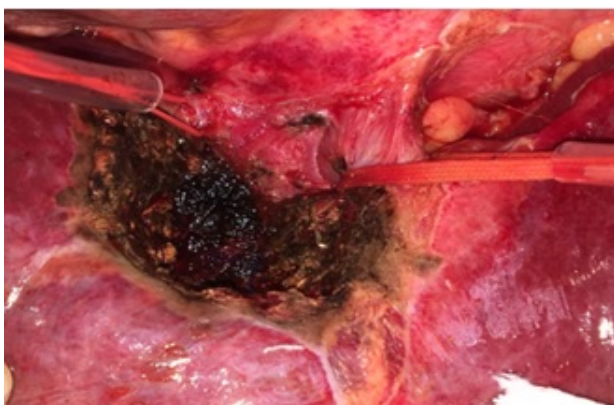


Figure 4: Aspect of the liver after removal of liver metastases with resection of the middle hepatic vein.

We dissected, ligated and divided the MHV above and below the extent of invasion. A nodulectomy with free margins was completed

(subsegmental resection). Frozen section confirmed free margin.

The color and consistence of the liver parenchyma did not change, and the color Doppler scan examination of segments V and IVb showed that the ligation of the MHV did not significantly impair the venous drainage.

Estimated intraoperative blood loss was 300ml, ITVLE duration was 20 minutes; and there was no need for blood transfusion.

The patient had an uneventful postoperative course and was discharged on the sixth postoperative day. Surgical margins were free and vascular invasion was confirmed.

DISCUSSION

Liver surgery, with or without neoadjuvant or conversion chemotherapy, is considered the gold standard treatment for LM. There has been a lot of effort to improve the results and safety of this procedure. In this scenario, parenchymal sparing surgery emerges as an extremely important

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technique, sacrificing the least amount of hepatic parenchyma as possible [1, 3-6].

This approach is increasingly necessary since the indications for aggressive surgery have expanded and it is not uncommon for the disease to present as multinodular and bilobar. However, parenchymal sparing surgery has been limited to peripheral nodulectomies or anatomic segmentectomies. Several authors have described numerous "radical but conservative" hepatic resection techniques [3, 6-8].

The most important is to preserve the in-flow and out-flow of the liver, as well as an intact biliary drainage and liver volume.

The in-flow refers to the portal pedicle, which must be preserved when it is desired to maintain a liver segment. In the scenario of vascular involvement, it may be necessary to exchange a R0 an R1 excision, since it seems that both circumstances show similar results [2]. But whenever the flow will not be harmed, vascular resection with or without reconstruction should be performed to achieve R0 resection.

Outflow refers to drainage of the liver through the hepatic and Spigelian veins. There are several routes (communicating vessels - CV) for this drainage, which makes possible the resection of the RHV, LHV, MHV or even combined resections of these vessels. However, it is mandatory to confirm these CV during preoperative imaging, as well as in the intraoperative US [8, 9]. Despite following a certain pattern, there are innumerable anatomic variations in the territories of the hepatic veins, which are reasons for constant studies, especially when considering live donor liver transplantation [10-12].

Isolated segment VIII resections present another challenge in hepatic surgery. It is a relatively large segment, with no clear surface anatomical landmarks, with variations in presentation of its portal pedicle and located in-between the middle and the right hepatic veins. Many authors use combined thoracic and abdominal incisions to access and control the hepatic veins in these cases [13]. We have never needed to do so, so far.

In addition, some series report greater difficulty in bilestasia during such resections, as well

as a considerable increase in biliary fistulae and subphrenic collections [14, 15].

Some authors have reported cases of segment VIII resection with the advent of thoracoscopy and diaphragmatic incision with safety [16]. Another factor to be taken into account is the tumor behavior and its relation with the hepatic veins - encapsulated or infiltrative tumor; involvement of the vessel wall [17, 18].

In the present case the middle and left hepatic veins, converged on a trunk, as usual, allowing us to isolate the trunk and the MHV before resection (Figure 5 - without the segment VIII node). We did not sever the inferior posterior Spigelian branches of the right lobe of the liver, what may have contributed to the satisfactory drainage of the V segment even with partial proximal resection of the MHV.

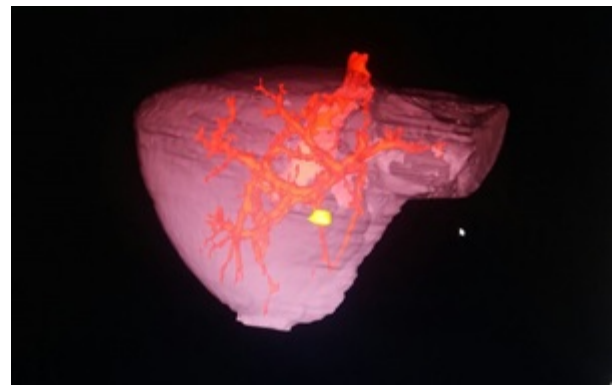


Figure 5: Vascular anatomy before resection.

It was also possible to identify drainage of segment VIII through a tributary of the RHV, which was probably another reason to the lack of parenchymal congestion. Late postoperative angiotomography shows vicarious dilation of an accessory branch of RHV, which partially drains segments V and the reminiscences of segment VIII (Fig 6 and 7). Segment IV branches communicated with the LHV, therefore this medial sector was also not be affected by surgery.

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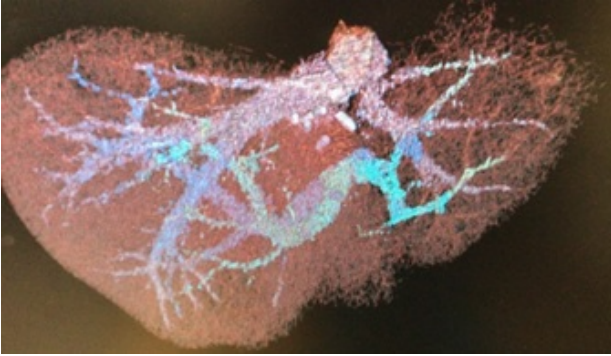


Figure 6: Vascular anatomy after resection.

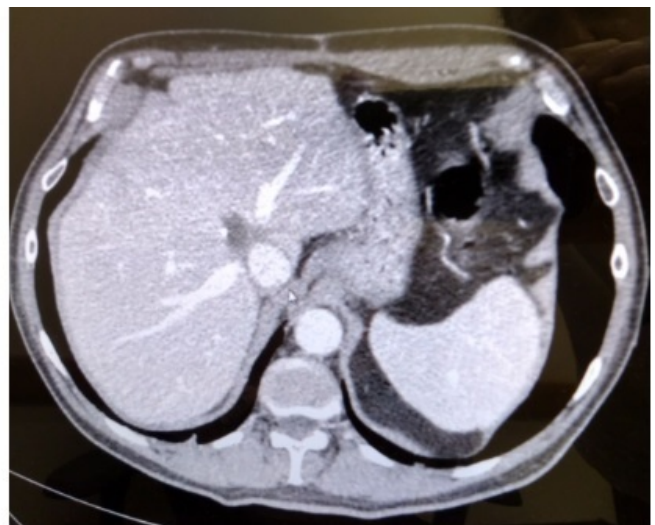


Figure 7: CT scan after liver resection.

CONCLUSION

Taking all of this into account, and in view of the oncological and postoperative results we made the decision of radical but conservative parenchymal sparing surgery.

This new technique is very step forward, easy to learn and secure to help surgeons resect part or the totality of segment VIII, with or without concomitant hepatic vein resection.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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None.

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RESUMO

Nova técnica para uma ressecção hepática segura de segmento VIII

O câncer colorretal é uma das principais causas de morte no mundo. Aproximadamente 70% dos pacientes com câncer colorretal desenvolverão metástase hepática. As ressecções hepáticas são consideradas como o tratamento padrão-ouro e podem curar a doença. A preservação de um remanescente hepático adequado é o fator mais relevante para prevenir a insuficiência hepática e a mortalidade pós-operatória. Entretanto, em certas situações, a cirurgia poupadora de parênquima pode ser um desafio, tendo em vista a localização de metástases, como, por exemplo, próximo à confluência das veias hepáticas. O objetivo desta nota técnica é descrever uma nova abordagem para ressecção segmentar ou subsegmentar do oitavo segmento (VIII), usado em cirurgia para remover a metástase no segmento mencionado envolvendo a veia hepática média.

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Durante a ressecção no segmento VIII, o cirurgião introduz o dedo indicador esquerdo no espaço criado entre a veia hepática direita e o tronco formado pela veia hepática média e esquerda próxima à veia cava, e entre o fígado e a veia cava inferior, o que gera uma zona segura para divisão parenquimatosa. Esta técnica permite uma ressecção hepática poupadora do segmento VIII mais segura.

Palavras-chave: ressecção hepática; segmento VIII; cirurgia poupadora de fígado.