



## Associating liver partition with portal vein ligation for staged hepatectomy : case report and literature review

Abid Mourad, Ouadfel Brahim, Bouzouag R, Chaibeddour F, Kordjani Z, Hammouda N

Department of Oncological Surgery, Cancer Center of Batna, Algeria

### Correspondence

Abid Mourad

Department of Oncological Surgery, Cancer Center of Batna, Algeria

- Received Date: 15 Jan 2021
- Accepted Date: 01 Feb 2021
- Publication Date: 07 Feb 2021

### Copyright

© 2021 Science Excel. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International license.

### Abstract

**Introduction:** In 2012, a multicentric study from Germany introduced a new two-stage hepatectomy technique to obtain extensive and rapid volumetric growth of the FLR in patients requiring right extended hepatectomies. The new technique consisted in adding a liver parenchymal partition to the portal vein ligation in the first step of a two-staged resection. The waiting interval was reduced to about 1 week.

**Method and materials:** This case Clinic of hepatic metastases of colorectal cancer, illustrates this surgical technique. It's the male L.S. patient, 59 years old, with a well differentiated adenocarcinoma of the right colon with synchronous hepatic metastases classified T3N1M1; remaining liver volume (left lobe after right hepatectomy) of 30%, which is incompatible with a minimum threshold of hepatic function, what alternative therapy to consider?

**Results:** A hepatic embolization of the right portal vein was made; in the fourth week the morphological assessment of the remaining liver volume was less than the expected 40% rate, especially since it was a patient who had received chemotherapy and targeted therapy; The decision to operate the patient was made by adopting the ALPPS technique, as an intervention of choice the patient had two operating times ALPPS laboratories, the second-stage operative suites were marked by the installation of a seven-day final hepatic failure table, and a biliome occupying the lodge of the radiologically drained straight liver.

**Discussion:** The most recent publication of the International SPLA Registry in 320 patients shows more acceptable results in terms of 90-day mortality of 9% for the overall series and 5% for hepatic metastases of colorectal cancers. In this study, patients with hepatic metastases had the best results in terms of complications and mortality, and through this clinical case we can show the feasibility of this technique in well-selected patients.

**Conclusion:** The ALPPS is a good option for some patients with bilobar tumors with a high risk of IHP. Since SPLA is a complex surgical innovation that is currently being developed, it should only be carried out in specialized centers, in patients selected by a multidisciplinary team and listed in the international SPLA registry.

### Introduction

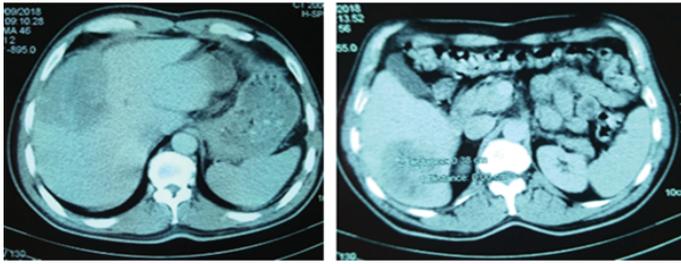
Surgical resection is the treatment of choice in patients with colorectal liver metastases, with 5-year survival rates reported in the range of 40%–58%. Over the past 10 years, there has been an impetus to expand the criteria for defining resectability for patients with colorectal metastases. In the past, such features as the number of metastases (three to four), the size of the tumor lesion, and a mandatory 1-cm margin of resection dictated who was resectable. More recently, the criteria for resectability have been expanded to include any patient in whom all disease can be removed with a negative margin and who has adequate hepatic volume/reserve.

### Method and materials

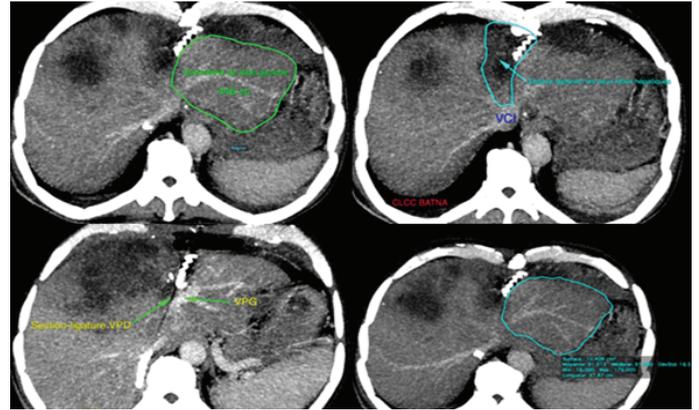
The 59-year-old male L.S. patient with no particular pathological history that has a well-differentiated adenocarcinoma of

the right colon with synchronous hepatic metastases T3N1M1 Objective clinical examination a patient in good general condition WHO: 0 .Objective total recto-colonoscopy objective non-stenosing formation of the lower caecal bottom, the rest of the colon and rectum The thoraco-abdomino-pelvic scanner looks healthy, at the extension balance, objective two large hepatic masses: the first seat on segment VIII: measuring (90 x 71mm), the second seat on segment VI: Measuring (65 x 63mm) A hepatic magnetic resonance imaging with diffusion sequence confirmed the mapping of hepatic lesions and their metastatic secondary characters. Tumor markers are greatly increased: the ACE rate is 100 times the normal value, the CA19.9 rate is 35 times the normal value and the alpha-FP rate is normal. The case of the patient was discussed at a multidisciplinary consultation meeting (PCR) whose decision was to adopt a reverse operating strategy after induction chemotherapy.

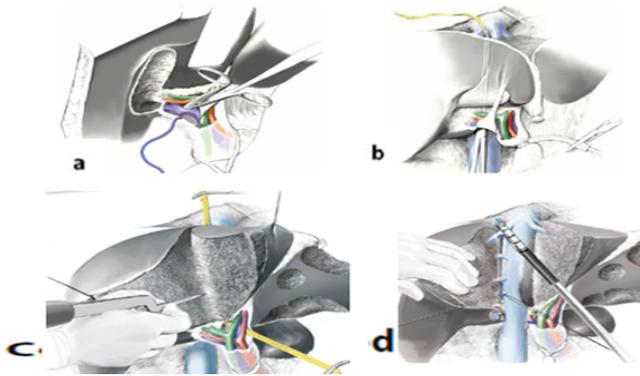
**Citation:** Mourad A, Brahim Q, Bouzouag R, Chaibeddour F, Kordjani Z, Hammouda N. Associating liver partition with portal vein ligation for staged hepatectomy : case report and literature review. Med Clin Sci. 2021;3(1):1-4.



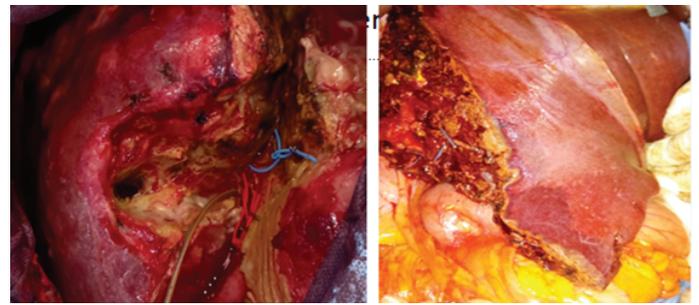
**Figure 1.** Abdominopelvic scanner, hepatic metastases segment VIII and segment VI



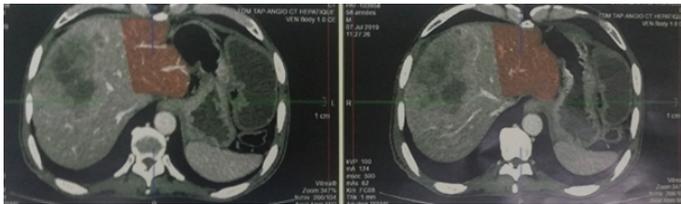
**Figure 5.** Abdominal scan of evaluation after the first time of operation of ALPPS with left liver increased volume



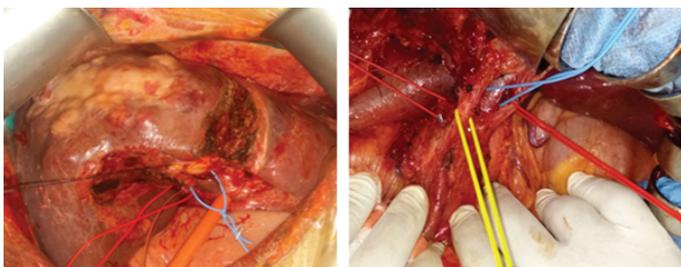
**Figure 2.** (A) Control of the right portal vein. (B) hinging maneuver (C) hepatic parenchymal transection (D) 2° right hepatectomy time



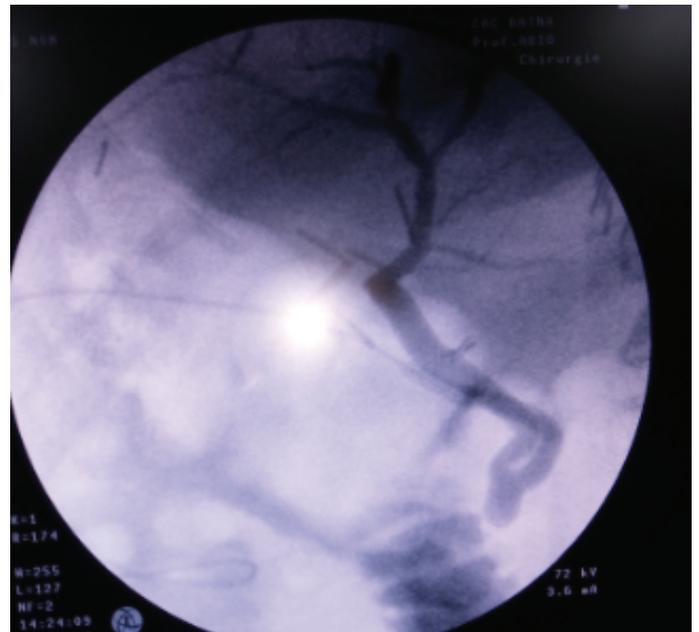
**Figure 6.** (A) Appearance just at the beginning of 2° ALPPS, lakes and gallbladder in place (B) Left liver aspect remaining



**Figure 3.** Volume: insufficient left liver volume remaining



**Figure 4.** (A) aspect after hepatic transection at first time of ALPP (B): introduction of vascular and biliary elements on lakes



**Figure 7.** Peroperative Cholangiography, integrity of the left liver's gallbladder remains.

Indeed The patient received a type of chemotherapy FOLFIRI (06 cures) + targeted therapy PANITUMIMAB (06 cures).The MRI and abdominal scanner evaluation showed a 20% reduction in metastatic volume, and a remaining volume of the future liver (left lobe after right hepatectomy) of 30%, which is incompatible with a minimum hepatic function threshold, what alternative therapy to consider.

## Results

In July 2019, a hepatic embolization of the right portal vein was performed; in the fourth week, the morphological assessment of the remaining liver volume was less than the expected rate of 40%, especially since it was a patient who had received chemotherapy and targeted therapy; The decision to operate the patient was made by adopting the ALPPS technique as an intervention of choice.

Indeed, the patient was operated on in September 2019. A MACCKUCHI type incision was used, after careful exploration of the abdominal cavity and a peroperative ultrasound of the liver, in search of bilateral liver lesions developed during the waiting period after venous embolization, the portal branch of the sick hemi-liver is severed and it is not performed a total parenchymatous transection (up to the lower basement vein), transcystic cholangiography was performed after cholecystectomy, in order to avoid post-operative biliary leakage.

The bile and vascular structures of the sick hemi-liver were identified and placed on lakes to facilitate their identification during the second stage. Finally, to minimize adhesion, a plastic blade was placed between the two hepatic section surfaces and used to drain space between the two hepatic section slices, and can be removed without returning with a new laparotomy. However, good results were also reported without the use of hardware on the partition site. It is important to note that when a patient has a synchronous disease, the simultaneous resection of his primary colorectal tumor during the first time is recommended by some teams, in our case we have preferred to postpone the surgical gesture on the primary tumor because it is two major surgical procedures.

The second time was in a good general condition patient with sufficient FFR volume and function. In fact, the morphological assessment of the remaining volume of future liver was estimated at 45% of total liver volume at 10° day after the first time of ALPPS. Abdominal exploration is carried out gently after release of adhesion. The remaining liver volumetric hypertrophy and liver atrophy to be resurrected are observed in peroperative surgery. The bile and vascular structures of the sick hemi-liver are recognized by the identification of the lakes left in place. Resection of the sick hemi-liver is done using vascular staplers. Finally, a peroperative cholangiography was carried out through the cystic canal, in order to avoid post-operative biliary leaks and to ensure the integrity of the biliary arborization of the remaining liver

No special features were highlighted in the first-time ALPPS operating pot. The second stage of the operation was marked by the installation of a table of hepatic failure, which resulted in an increase in the rate of hepatic transaminases to ten times normal, a rate of total and direct bilirubin to five times normal, and a decrease in the rate of five-fold by 50%. The medication received by the patient was minimized and rectal washings were made to the seventh digestive laxative day liver function begins to normalize. One was led to radiologically draining a biliome occupying the lodge of the right liver.

## Discussion

Post-operative hepatic failure (HPI) is the leading cause of death after major hepatectomy and is strictly related to the

volume and quality of the remaining future liver (FFR). In order to minimize this risk of HPI and to increase the resectability rate in patients with insufficient FFR, several strategies have been developed such as The occlusion of the portal branch of the tumor-bearing lobe has become the gold-standard to induce healthy controlateral parenchyma hypertrophy [4].

- Portable ligation (LP) is applied as part of the two-step procedures for patients with bilobar disease who require an initial cleaning of FFR.
- Portable embolization (EP) is used prior to surgery when there is no tumor in the FRF, while the portal ligation .Our patient had a portal embolization with an estimate of the remaining volume of future liver less than 30% of the total hepatic volume

Due to insufficient parenchymal hepatic hypertrophy, i.e. because of progression of the disease over long intervals 40% of patients who had the two preceded mentioned above, never reach the hepatic resection for this purpose

A new strategy, known as ALPPS: Associating Liver Partition and Portal vein ligation for Staged hepatectomy, was described by Schnizbauer [2] in 2011 whose technical steps have been previously described, forming part of the two-stroke surgical strategies

A scientific team in Buenos Aires [3] recently proposed to restrict the indications of SPLA to patients with an inadequate FRF associated with at least one of the following:

- Bilobar disease with a contraindication to EP as a strategy in one time;
- Tumor margin very close to FFR or its vascular pedicula;
- Embolization or portable ligation failed; or our case is part of this ALPPS indication figure.
- Need for major hypertrophy (> 65%) in patients with very small FFR.

The choice of this surgical technique is mainly based on the absence of contraindications, i.e.

- The presence of non-resectable hepatic metastases in FFR or non-resectable extra-hepatic metastases,
- Severe portal hypertension,
- High anesthetic risk,
- The impossibility of a complete resection of the tumor or the presence of a non-resectable primitive tumor.

Before proceeding with the second phase, it is essential to ensure that there is no sign of hepatic failure after the first phase of SPLA through biological explorations.

On the technical aspect of the ALPPS procedure, the partial ALPPS technique (up to the middle subhepatic vein) known as mini-ALPPS has recently been described. Since the partial partition of the liver is associated with a comparable hypertrophy induction but with a significantly lower rate of complications compared to the total transect (38.1% vs 88.9%; P=0.049), partial transect is preferred, except in patients with a tumor very close to the FFR with a risk of invasion in the interval between the two procedures [3].

After cholecystectomy, peroperative trans-cystic cholangiography was recommended by several teams and even to leave the bilar drain in place, in order to avoid post-operative biliary leaks and to have the opportunity to explore bile pathways in post-operative periods, since high levels of biliary leakage were reported as a cause of bilioma formation in the ALPPS series (1999). 20-87%) and associated with increased morbidity and mortality [2,4,5].

Many technical variants of the ALPPS approach have been proposed. Gauzolino et al [6] presented various technical variations of the ALPPS approach, including the "left ALPPS", the "right ALPPS" and the "life-saving ALPPS" in patients who failed an EP or LP. An additional alternative was introduced by Santibañes et al [7], retaining only segments 1 and 4 as FFR after performing a left lobectomy for an extended disease.

More recently, other authors have proposed replacing parenchymatous transection by using local radiofrequency or microwave destruction (RALPP, LAPS) to create a virtual partition of the liver with a "necrotic groove" between the two hemi-livers [8]. These approaches showed a hypertrophy profile similar to the "classic" ALPPS approach, but with only minor complications, no mortality, and good coelioscopic feasibility. On the other hand, the application of pulmonary embolization instead of portal ligation as a method of occlusion of the door vein, also known as "hybrid ALPPS", is arguably one of the most promising innovations among the different technical variations of SPLA [9]. Avoiding dissection of the liver pedicle at the first time is more in line with the oncological principle of "non-touch" and facilitates the second time by generating less adhesion.

The most recent publication of the International SPILA Registry in 320 patients shows more acceptable results in terms of 90-day mortality of 9% for the overall series and 5% for hepatic metastases of colorectal cancers [10]. In this study, patients with hepatic metastases had the best results in terms of complications and mortality. In addition, a prospective study of 30 patients recently published showed that SPLA can be achieved with sufficient safety in specialized centers, with an overall morbidity rate of 6.6% and even 0% in RDCs [9]. The relatively high morbidity and mortality rates reported with SPLA could be explained by the fact that it is a strategy consisting of two complex surgeries instead of one, applied to patients with locally advanced disease and requiring time to learn.

A recent multicenter comparative study showed that the frequency of tumor recurrence at 12 months was comparable in both groups 54% after SPLA and 52% after portals or portals [4]. Survival analysis in the ALPPS Registry in patients with CCMD showed a 1- and 2-year ILI of 76% and 62%, and an SSR of 59% and 41% respectively [4]. The median SSR of 14 months in the same study is clearly greater than the 7.5 months of median SSR recently reported with the hepatectomy in two stages in the updated Paul Brousse Hospital experiment.

## Conclusion

This new philosophy of hepatic surgery of hepatic metastases of colorectal cancers in two-stage ALPPS appears promising, and the good preliminary results of the various teams of centers specialized in hepatobiliary surgery indicate that it could improve both safety and oncological results. This clinical case of the oncological surgery department of the Batna

cancer control center in Algeria, shows the feasibility of this technique even within a framework of a reverse therapeutic strategy.

## References

1. Liu H, Zhu S. Present status and future perspectives of preoperative portal vein embolization. *Am J Surg.* 2009;197:686–90.
2. Schnitzbauer AA, Lang SA, Goessmann H, et al. Right portal vein ligation combined with in situ splitting induces rapid left lateral liver lobe hypertrophy enabling two-staged extended right hepatic resection in small-for-size settings. *Ann Surg.* 2012;255:405-14.
3. Alvarez FA, Ardiles V, de Santibañes M, Pekolj J, de Santibañes E. Associating liver partition and portal vein ligation for staged hepatectomy offers high oncological feasibility with adequate patient safety: a prospective study at a single center. *Ann Surg.* 2015;261:723-32.
4. Schadde E, Ardiles V, Robles-Campos R, et al. Early survival and safety of ALPPS: first report of the International ALPPS Registry. *Ann Surg.* 2014;260 :829-36.
5. Dokmak S, Belghiti J. Which limits to the "ALPPS" approach? *Ann Surg.* 2012;256:e6; author reply e16-7.
6. Gauzolino R, Castagnet M, Blanleuil ML, Richer JP. The ALPPS technique for bilateral colorectal metastases: three "variations on a theme." *Updates Surg.* 2013;65:141-8.
7. de Santibañes M, Alvarez FA, Santos FR, Ardiles V, de Santibañes E. The associating liver partition and portal vein ligation for staged hepatectomy approach using only segments I and IV as future liver remnant. *J Am Coll Surg.* 2014;219:e5-9.
8. Schadde E, Clavien PA. Reply to letter: "Accelerated liver hypertrophy: ALPPS and more!" *Ann Surg.* 2015;261:e46–e47.
9. Li J, Kantas A, Ittrich H, et al. Avoid "All-Touch" by Hybrid ALPPS to Achieve Oncological Efficacy. *Ann Surg.* 2016;263:e6-7.
10. Schadde E, Raptis DA, Schnitzbauer AA, et al. Prediction of Mortality After ALPPS Stage-I: An Analysis of 320 Patients From the International ALPPS Registry. *Ann Surg.* 2015;262:780-6.
11. Schadde E, Ardiles V, Slankamenac K, et al. ALPPS Offers a Better Chance of Complete Resection in Patients with Primarily Unresectable Liver Tumors Compared with Conventional Staged Hepatectomies: Results of a Multicenter Analysis. *World J Surg.* 2014;38:1510-9.
12. Faitot F, Faron M, Adam R, et al. Two-stage hepatectomy versus 1-stage resection combined with radiofrequency for bilobar colorectal metastases: a case-matched analysis of surgical and oncological outcomes. *Ann Surg.* 2014;260:822-7.