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Editorial

# Laparoscopic liver surgery. A mature option?

# Cirugía laparoscópica del hígado. ¿Una opción madura?

## Fundamentals, requirements, and objectives

Laparoscopic surgery has progressed at an unstoppable pace in the hands of technological advances and training, both technically and conceptually, for many surgeons. There are indisputable indications with advantages that have been clearly established. Within the application of laparoscopic techniques, the role of minimally invasive techniques is contemplated in the treatment of complex diseases, basically oesophageal, pancreatic, and hepatic.

Hepatic surgery can include the exeresis of a small peripheral nodule to a major adjusted resection.

The main characteristics required for laparoscopic liver surgery are the following:

- Previous intensive training and proficiency in liver surgery; perfect knowledge of anatomical, vascularisation, and organ segmenting features.
- Skill and control in advanced laparoscopic surgery.
- Adequate technology that allows for a perfect vision of the surgical field and a haemostatic parenchymal transection.
- Intraoperative ultrasound to "navigate" through the liver; identify lesions, locate them, and establish suitable resection margins.
- Option for fast resolution of major intraoperative haemorrhaging via open surgery.

Once a surgical programme via laparoscope is established, the aims should be:

- Full evaluation of the benefits to the patient.
- Technically progress through increasingly difficult situations.
- Evaluate whether the laparoscopy can modify surgical signs, as has occurred with asymptomatic gallstones or gastroesophageal reflux.

## Clinical scenarios, indications, and tendencies

The first laparoscopic liver resection[1] was performed in 1992. In Spain, laparoscopic liver surgery began in 2000[2]; although no geometric progression has occurred as in other areas of general surgery, so it is still in the development stage. This slowing down could be caused by its complexity in partial resections in which there is no sole pedicle, as in the case of the kidney or the spleen as well as the risk of severe, difficult to control haemorrhaging.

In addition, the real benefit of this approach remains to be proven with prospective and controlled studies. It is attributed with less postoperative pain, a shorter hospital stay and aesthetic advantages.[3] This last section is relevant in the treatment of benign tumours in young patients, for whom body image is very important.

The surgical treatment of benign tumours should meet the same criterion as in open surgery. However, the possibility of performing a laparoscopy should incline us towards resection-biopsy against control and follow-up in doubtful diagnostic situations. Null mortality and morbidity of less than 15% is expected, as established by standards.[5]

The most accessible lesions are those located in the left segments and right anterior segments, though it can be relatively easy to treat large cysts in posterior right segments. The ideal case is that of a small peripheral tumour.

Training to include resections of peripheral nodes in a laparoscopic liver surgery programme could begin by treating simple giant and symptomatic liver cysts. Marsupialization is a relatively simple way of familiarisation with this type of technique; even with the presence of a cystadenoma, a complete exeresis can also be performed via laparoscopic intervention.[4]

Treatment of hydatid cysts can be complex and difficult; laparoscopic surgery can easily treat cases of peripheral localisation with a cysto-pericystectomy or even via a resection. Minimally invasive surgery has commenced a new debate about the possibility of treating these patients in a less radical manner.[6] Authors from countries in which this disease is endemic use minimally invasive and less aggressive methods with encouraging results. However, it is the subsequent follow-up of these patients that will establish its possible efficiency.

Most malignant hepatic tumours treated via laparoscope are hepatocellular carcinomas on cirrhotic livers or hepatic

metastases, mainly colorectal cancer. In both cases, treatment should comply with the principles of oncological resections without fissures.

Potentially curative therapies for a hepatoma range from liver transplant to alcoholisation. Resection is a good option for patients with good hepatic reserve and low portal hypertension. A limited resection with low hepatic mobilisation should be performed to avoid complications, especially ascites and problems with the wound. If the hepatic reserve is acceptable, resection of the tumour via laparoscopy avoiding complications derived from the surgical wound is a good alternative.[7]

The results of surgery via laparoscopy as far as morbid-mortality and survival is concerned affirm that it is an appropriate therapeutic option which can also increase the resection indications.[8] It is even applicable as a bridge therapy before the liver transplant.[9]

Therefore, laparoscopic surgery should be considered "friendly" to the cirrhotic hepatocellular carcinoma patient.

The resection of hepatic metastasis mainly on colorectal cancer is the only potentially curing treatment, even in unfavourable situations such as multiple and bilobular metastases, etc.

The therapeutic formulation is included within a multidisciplinary treatment and the objective of the surgeon should be to achieve a free margin R0 resection even if it is 1 mm. The evolution of the patient depends on whether the resection margin is affected or residual non detected tumour remains.[10] Based on these premises, treatment via laparoscopy should be contemplated, where there is no manual palpation. The use of ultrasounds, which identifies and locates all of the lesions, is mandatory. This procedure also establishes the resection margin.

If the surgical series are analysed, it can be observed that the resection via laparoscopy can be performed safely (limited haemorrhaging, scarce morbidity and mortality), although there is a high percentage of margins <1 cm, a fact that could be alarming if it is not analysed carefully and it is established that the general affection of margins is near zero.[11] In any case, the patients who have been applied laparoscopy surgery are considered favourable and the results should be critically analysed when the indications are extended.

The percentage of patients treated with laparoscopy is low, given that there are frequently multiple nodes, multiple treatments, etc. An increasing progression is expected in the application, parallel to its technical refinement and to the incorporation of greater resection techniques which should by-pass these problems.

In the cases with synchronic metastasis, combined treatment in one time completely by laparoscopy is an interesting and feasible alternative, as has been substantiated in some cases. The liver resection should be performed first to avoid haemorrhaging of the area of the colonic resection due to the increase in splanchnic vascular congestion if the Pringle manoeuvre is executed.

Occlusion of the hepatic pedicle is technically simple via laparoscopy; it can be performed systematically or selectively faced with a major or persistent haemorrhage. It is essential to prepare it before the haemorrhaging episode. In our opinion, a prophylactic vascular control with limited ischemia-reperfusion damage is always better than a haemorrhage which conditions the complications and the patient's evolution.

Hepatic transection, preserving perfect haemostasis is even more important via laparoscopy, if possible, than in open surgery. The blood absorbs the light, hinders clear vision, making it difficult to continue. On the other hand, losses can be greater than one perceives (accumulated blood in another abdominal quadrant not visible through laparoscopy or the continued aspiration of the area, resulting in a large accumulation in the aspirator).

The 2 cm superficial sectioning, in which the vessels are of small calibre, can be performed with devices such as the harmonic scalpel (Ethicon®), the 5 mm LigaSure Atlas® (Tyco®), or TissueLink® (Prim®). For deeper dissections, the most appropriate is the ultrasonic dissector (CUSA®) to individualise the vessels and seal them in an isolated manner, which is essential. The hepatic pedicles should be sectioned with an endostapler. According to our experience, the use of radiofrequency with Habib® laparoscopy can be of aid in cirrhotic patients in which there is hard, difficult to dissect tissue.

The resection of segments II-III, due to their anatomical arrangement, can be considered technically accessible to most hepatic surgeons with a certain amount of experience in laparoscopy. The technique is standardised and is useful both for benign and malignant tumours.[12] In the article published in this edition, Robles et al,[13] a group with experience in this type of surgery,[14] analyse the resection of lesions on the left lobe of the liver. Their experience clearly proves the benefits of this approach, it provides the key to obtaining good results and interesting technical variations are described, such as the *hand port*.[15]

Undoubtedly, the introduction of the hand in the abdominal cavity can be of aid in complex situations and in cases of major vessel haemorrhaging. But on the other hand, it does have certain limitations: diminished vision of the area, because the hand absorbs the light, there is a smaller surgical field and the advantages of a fine dissection such as in laparoscopic surgery are reduced.

Despite the fact that major resections are technically feasible when performed by expert surgeons,[16] they present great difficulties and each group uses its own variations. In our opinion, faced with this situation, the technical and technological options should de adapted to the laparoscopy. This situation already occurs in live donor liver transplants of the left lateral section of adult donors for child recipients[17]; and in resections of the right lateral section, in which the patient is in more or less pronounced left lateral position, it can favour the approach.

## Perspectives, challenges, and the future

We believe that the evolution of laparoscopic liver surgery will condition therapeutic decisions[18]; its evolution will depend on the personal effort of different groups,[19,20] as well as the standardisation of the techniques and technologies applied.[21]

Historically, the advances in surgery occur through pioneering professionals, both in concepts and technical resources. There is a parallel technological progression in laparoscopy that accompanies and often promotes the changes. The role virtual reality could represent in surgery remains to be established, as well as image fusion, robotics, 3D and other technologies of their kind.

It is the hepatic surgeon's duty to take on the challenge of replying to situations of diverse complexity that range from a minimally aggressive resection, such as laparoscopic surgery; to major hepatectomies, which often have very complex technical requirements. In both situations, the same oncological and surgical principles should be met.

As a result, surgeons should currently acquire not only knowledge related to hepatic surgery but also have a command of laparoscopic techniques (ergonomics, optics, pneumoperitoneum haemodynamic changes, trocar, and coagulation systems, etc) Each group should resolve this situation according to its individual conditions. It may be the case that both competencies co-exist in one group or that the collaboration of a hepatic surgery unit with surgeons who are especially knowledgeable with laparoscopy is required. This should not be a reason for difficulty but for progress.

Laparoscopic liver surgery is a feasible reality with an obvious future. Over the next few years it is our obligation to establish in which situations it can be performed safely, to define surgical techniques and technical requirements, to compare the results compared with those of open surgery and to evaluate who can perform it and if it can be recreated.

The obtaining of a sufficient number of patients through the collaboration of the units and surgeons involved should enable them to meet these challenges.

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