Laparoscopic liver resection: Initial experience in a North-African single center

Résections hépatiques laparoscopiques: Expérience initiale d'un centre Nord-Africain.

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RÉSUMÉ

Prérequis : Durant ces dernières années, les hépatectomies laparoscopiques (HL) ont gagné une large popularité auprès de la communauté de chirurgiens hépatobiliaires. A ce jour, peu de données sont disponibles au sujet des programmes de résections hépatiques laparoscopiques dans les pays en voies de développement. Le but de cette étude est de démonter la faisabilité et la sécurité des hépatectomies laparoscopiques dans un département chirurgical marocain.

Méthodes: De juin 2010 à février 2013, tous les patients ayant eu une résection hépatique laparoscopique ont été sélectionnés d'une base de données prospective d'hépatectomies et inclus dans cette étude. La transsection parenchymateuse était réalisée au Scapel Harmonique combinée à la coagulation bipolaire sans échographie peropératoire ni clampage pédiculaire systématique. La difficulté de l'hépatectomie laparoscopique a été classée selon les 3 catégories de la conférence de Louisville (I-III). Toutes les données démographiques, de la lésion hépatique, peropératoires, de la marge de résection histologique et de la morbi-mortalité postopératoire à 1mois classée selon Clavien-Dindo, ont été analysées.

Résultats: Sur les 104 patients ayant eu une hépatectomies, 13(12.5%) ont eu une approche laparoscopique. Il s'agissait de 7 femmes et 6hommes avec un âge moyen de 57,5±17 ans. L'indication opératoire a consisté en une tumeur bénigne dans 3 cas et maligne dans 10 cas (77%): CHC dans 7 patients et métastases synchrones hépatiques de cancer rectal chez 3 patients. Les lésions étaient uniques dans 12 (92%) cas avec une taille médiane de 50mm (15-150mm). Les métastases hépatiques synchrones ont eu une résection combinée laparoscopique rectale et hépatique. Une approche laparoscopique pure a été réalisée chez 12 (92%) des cas et une seule approche hybride. La résection hépatique était de difficulté type I, II et III respectivement chez 3(23%), 6(46%) et 4(31%) cas. Le taux de conversion en laparotomie est de 15%. Le taux moyen de saignement est de 395mL±270mL sans clampage pédiculaire ni transfusion peroperatoire. Toutes les résections laparoscopiques étaient R0. Le taux de mortalité était nul et les complications sont survenues chez 4 (30%) patients: ascite (C-D2) et sepsis pelvien dans les résections combinées (C-D3) alors que le taux médian de séjour postopératoire était de 6 jours.

Conclusion: Les résections hépatiques laparoscopiques, dans notre contexte, sont faisables et sures chez des patients bien sélectionnés avec un taux de morbi-mortalité acceptable et une exérèse oncologique adéquate sans nécessité de transfusion post-opératoire. L'échographie peropératoire est un atout indispensable afin d'optimiser le programme de résection laparoscopique hépatique avancé.

Mots-clés

Résection hépatique, laparoscopie, hépatectomie.

SUMMARY

Background: Over past decades laparoscopic liver resection (LLR) has gained wide acceptance among hepatobiliary surgeons community. To date, few data are available concerning LLR programs in developing countries. This study aimed to assess feasibility and safety of LLR in a Moroccan surgical unit.

Methods: From June 2010 to February 2013, patients that received LLR were identified from a prospective "liver resection" database and included in this study. Parenchymal transection was performed using Harmonic scalpel and bipolar clamp with no Intraoperative ultrasound use or systematic pedicle clamping. LLR difficulty was categorized into 3categories according to Louisville-statement (I-III). Demographic informations, liver lesion informations, operative details, pathological tumor-margin and 1-months postoperative morbidity according to Clavien-Dindo(C-D) classification were analyzed.

Results: Among 104 patients who underwent liver resection 13(12,5%) had LLR. There were 7 females and 6 males with mean age of 57,5±17 years. LLR was performed for benign lesions in 3 cases and malignant ones in 10 (77%) patients: hepatocarcinoma in 7 patients and synchronous rectal-liver metastasis in 3 patients. Lesions were solitary in 12 (92%) patients with median size of 50mm (15mm-150mm). Patients with liver metastasis received combined laparoscopic rectal and liver resection. We used pure laparoscopic approach in 12 (92%) patients and hybrid one in 1 patient. LLR difficulty was category I, II and II in respectively 3(23%), 6(46%) and 4(31%)patients. Conversion rate to open liver resection was 15%. Mean blood loss was 395min±270min with no hepatic pedicle clamping or peroperative blood transfusion. All resections were tumor-free margin. Mortality rate was nil and morbidity occurred in 4(30%) patients: ascites (C-D 2) and pelvic sepsis in combined resections (C-D 3b). Median hospital stay was 6 days.

Conclusion: Laparoscopic liver resection in our context is safe in selected patients, since no operative mortality, blood transfusion requirement or palliative resection was recorded and liver related morbidity rate was low. Intraoperative ultrasound liver examination capacities are mandatory to improve laparoscopic liver resection program's quality and extend indications.

Key-words

Liver resection, laparoscopic approach, hepatectomy.

Over the past decade laparoscopic liver resection (LLR) has gained wide acceptance among hepatobiliary surgeons and has almost become a standard practice for peripherally located lesions.(1) Multiple case series comparing open to laparoscopic liver resection showed that laparoscopic approach is associated to less postoperative pain, earlier functional recovery and best cosmetic results.(2-5) These results improve the quality of life without impairing safety and efficiency of liver resection for both malignant and benign liver lesions.(6, 7) However, most of these results have been published by specialized high-volume western or eastern hepatobiliary teams with expertise in both hepatic and laparoscopic surgery.(3, 6-8) To date, no data are available concerning laparoscopic liver surgery programs in developing countries.

The aim of the present study is to assess feasibility and safety of laparoscopic liver resection in a single moroccan hepatobiliary surgical unit.

METHODS

All patients who underwent laparoscopic liver (LLR) resection were identified from a prospective all-indication consecutive "liver resection" database, from June 2010 to February 2013. All LLR techniques (pure laparoscopy, hand-assisted laparoscopy or hybrid technique) and cases converted to open liver resection (OLR) were included. Laparoscopic liver biopsies and laparoscopic exploration preceding open liver resection were excluded.

Imaging assessment of the liver included Ultrasonography, Computed Tomography and Magnetic Resonance Imaging. Lesion and/or liver biopsies were used selectively, only when diagnosis remained unclear after complete imaging investigation. Given that intraoperative laparoscopic ultrasonography was not available in our hospital, only solitary lesions with no major vascular pedicle contact were selected for resection by pure laparoscopic approach.

LLR difficulty was categorized into 3 categories according to 2008 Louisville statement1: (I) small wedge resections, (II) resections of the left lateral segments (2 and 3) or anterior hepatic segments (4b, 5,6 and left part of segment 1), and (III) hemi-hepatectomies and resections including posterior segments (4a, 7, 8 and right part of segment 1).

All patients were classified according to American Society of Anesthesiologists (ASA) physical status score. In cirrhotic patients Child-Pugh score and MELD score were calculated preoperatively and used for patient selection and extent of liver resection choice.(9)

Parenchymal transection was performed using Harmonic scalpel (Ethicon ®), bipolar clamp and metallic clips. Linear staplers were used selectively to divide larger pedicles. Hepatic pedicle was tapped systematically to ensure clamping in case of major bleeding. In left and right hemi-hepatectomies, homolateral hepatic artery and portal vein were tapped and clamped at hilar level to define liver transection line. Division level of homolateral pedicle (portal vein, hepatic artery and bile duct) and hepatic vein was intrahepatic. Resections for malignant tumors intended to be R0 (macroscopic and microscopic margin free). Uncontrolled bleeding, lesion localization difficulty and/or lack of progression were defined as indications to conversion to open surgery. Demographic data, indication for liver resection, liver lesion informations (type, number, size, location), operative details (technique, duration, blood loss, blood transfusion requirement and need for conversion to open surgery), lesion-free pathological margin in case of malignancy and 1-month postoperative morbidity according to Clavien-Dindo classification were analyzed.(10) Results were expressed as mean± standard deviation or median (extreme values).

RESULTS

From June 2010 to February 2013 (30 months), 104 patients underwent liver resection in our Unit. Among those, 13 (12,5%)

Table 1 : Patients and liver lesions details

Patient						Liver lesion assessement			
N°	Sex	Age (Years)	ASA	BMI	Child/ MELD	Type	Number	Size (mm)	Location
1	F	65	1	31	A/10	HCC	1	40	S2
2	M	55	1	20	A/9	HCC	1	120	S2-S3-S4
3	F	81	3	29	A/8	HCC	1	50	S2-S3
4	M	69	3	25,2	A/10	HCC	1	20	S8
5	M	13	1	17,8	-	LM	1	15	S3
6	F	65	3	22	-	LM	1	15	S3
7	F	43	1	29,4	-	Adenoma	1	30	S2-S3
8	M	67	1	22	-	HCC	1	50	S7
9	F	41	1	21,5	-	LM	2	60	S2 and S6-S7
10	F	56	1	26	-	Tuberculoma	1	50	S5
11	M	66	1	26	A/8	HCC	1	40	S6
12	M	69	2	24	A/8	HCC	1	31	S1
13	F	58	1	22	-	Hemangioma	1	130	S2-S3

received a laparoscopic liver resection (LLR). There were 7 females and 6 males with a mean age of 57,5±17 years. ASA physical status score was 1 in 9(69%) patients, 2 in 1 (8%)patient and 3 in 3(23%) patients. Average body mass index (BMI) was of 24,5±4. All cirrhotic patients were Child-Pugh A with a MELD score<10.

Both benign and malignant lesions were considered for LLR following the same criteria as those used for open liver resection. LLR was performed for malignant lesion in 10 patients (77%) and benign lesion in 3(31%) patients. Median nodule size was of 50mm (15mm-150mm). In 3 patients with synchronous rectal liver metastasis, a combined laparoscopic rectal and laparoscopic liver resection was planned. These 3 patients received preoperative pelvic radiotherapy with concomitant systemic chemotherapy. The 3 benign lesions that received LLR were: adenoma, symptomatic hemangioma and a mass forming liver tuberculosis. Preoperative patient and lesion assessment results are shown in Table 1.

LLR technique intended to be pure laparoscopic in 12(92%) cases and hybrid in the sole patient with "non-solitary" liver lesion. This last patient underwent laparoscopic rectal resection, segment 2 laparoscopic liver resection and laparoscopic right liver mobilization followed by segments 6 and 7 open liver resection and specimens (rectal and liver) extraction through a short right subcostal incision.

LLR difficulty was of Louisville statement category 1, 2 and 3 in respectively 3(23%), 6(46%) and 4(31%) patients. Conversion to open surgery was necessary because of localization difficulty and subsequent need to perform liver ultrasound examination in 2(15%) patients. Deep segment 8 hepatocarcinoma in 1 case and small (15mm) segment 3 liver metastasis in the other case. The mean procedure duration was of 320min ± 150min. The mean blood loss was of 395mL ± 270mL and neither hepatic pedicle clamping nor intraoperative blood transfusion were required.

In-hospital and 1-month's mortality rate were nil and 4(30%) patients experienced morbidity: ascites managed with diuretics in 2 cirrhotic patients (Clavien-Dindo 2) and pelvis sepsis managed with operative drainage in 2 patients that received a combined liver and rectal laparoscopic resection (Clavien-Dindo 3b). The median hospital stay was of 6 days (3 days-27 days). Operative details and results are shown in Table 2.

DISCUSSION

This initial experience of LLR demonstrates that laparoscopic liver resection may be feasible and safe in a developing-country setting. No operative mortality, blood transfusion requirement and palliative resections were recorded in these selected patients. Liver resection related morbidity was acceptable and controllable.

Since feasibility, safety, efficacy and usual minimally invasive benefits were demonstrated by multiple case series, laparoscopic liver resection (LLR) was adopted by a growing number of hepatobiliary surgeons all over the world.(3) However, to date, no randomized study comparing open to LLR is available. Limits to LLR larger diffusion may be explained by: the highly demanding technical aspect of these procedures and the oncological doubt on the quality of the excision.(11) The proportion of LLR according to the total volume of liver resection by center ranges from 20% to as much as 80%.(12) This proportion was 12.5% in this initial series, which reflects our selective and careful approach. Thus, LLR was considered preferentially in solitary lesions (12/13 patients), 5cm diameter or less (10/13 patients) and located in the peripheral segments of the liver (9/13 patients).(1) Moreover, a planned hybrid approach may represent an equivalent option in patients out of these 3 criteria (patient 9) and may hasten the move toward more complex LLR procedures (by preparing open parenchymal transection after laparoscopic liver mobilization and vascular controls).(13)

This series reported neither in-hospital nor 1-month postoperative mortality. Only 2 patients with synchronous colorecral liver metastases

Table 2 : Operative details and results of laparoscopic liver resection. *laparoscopic S2 wedge resection

N°	Approach	Resection type	Difficulty	Combined Resection	Conversion Cause	Blood loss (ml)	Duration (min)	Margin (mm)	Morbidity (Clavien-Dindo)	Hospital Stay (Days)
1	Pure	Left lobectomy	II	-	-	600	390	30	-	6
2	Pure	Left hepatectomy	III	-	-	300	300	20	-	9
3	Pure	Left lobectomy	II	-	-	300	270	25	Ascites (2)	3
4	Pure	Wedge (S8)	III	-	Localization	300	150	5	Ascites (2)	5
5	Pure	Wedge (S3)	I	Rectal	-	300	360	3	Pelvic sepsis (3b)	27
6	Pure	Wedge (S3)	I	Rectal	Localization	300	320	5	-	9
7	Pure	Left lobectomy	II	-	-	100	210	-	-	7
8	Pure	Wedge (S7)	III	-	-	800	360	15	-	5
9	Hybrid	Wedge (S2;S6-S7)	I *	Rectal	-	400	510	3	Pelvic sepsis (3b)	13
10	Pure	Right hepatectomy	III	-	-	900	710	-	-	7
11	Pure	Segmentectomy (S6)	II	-	-	700	180	15	-	5
12	Pure	Segmentectomy (S1)	II	-	-	50	150	2	-	6
13	Pure	Left lobectomy	II	-	-	100	270	-	-	4

(CRLM) expressed major complications (CD>3), which were not related to liver resection (pelvic sepsis secondary to the rectal laparoscopic resection in combined procedures). the postoperative morbidity associated to increased hospital stay in this 2 patients was expected however it is still lower than length stay and morbidity of two staged interventions,(14, 15) defending a strong rational of combined resection in synchronous CRLM in selected patients.(16)

In the 7/13 patients (54%) HCC group, liver resection was well tolerated since no hepatic failure occurred. Diuretics successfully managed the only two resulting postoperative ascites. Besides decreasing morbidity without impairing oncological outcome, laparoscopic approach in patients with HCC and cirrhosis is associated with less postoperative adherences ensuring an easier iterative liver resection or salvage liver transplantation in case of liver recurrence.(5, 6, 8, 17)

In this series, no conversion to open surgery was made for bleeding, since pneumoperitoneum helps to the hemostasis and laparoscopic magnification of the intra-operative vue permits a precise dissection.

The two other accepted indications of conversion to laparotomy are: the lack of progression during parenchymal transection and difficulty of lesion localization (as was the case for 2 patients in our series).(1, 3) conversion represents a prudent surgical practice rather than failure and laparoscopic intraoperative ultrasound liver examination may help prevent this unnecessary and avoidable situation (enabling an easy peroperative determination of the tumor and its vascular contacts).

Indications of LLR should obey to the same technical guidelines of open approach and proposed to eligible patients for minimally invasive surgery. Moreover, laparoscopic major hepatectomies are now safely achieved and can be performed in highly specialized centers by hepatobiliary surgeons used to minimally invasive techniques. In fact, this approach must not extend liver excision to unnecessary parenchymal resection especially in benign disease and CRLM (where parenchymal preservation is a matter of state) nor compromise width of tumor free margins in HCC (where anatomical resection is highly recommended when possible).

Although hepatocellular carcinoma represents the most reported indication for LLR, metastatic colorectal disease remains a matter of debate concerning it oncologic safety since it is often multinodular. However it may represent an extension of combined management of synchronous colorectal liver metastases if the surgical teams offer both colorectal and hepatic surgical skills.

It is admitted that initial experience should start by limited resection and/or left lobectomy for peripheral lesions (to endorse Louisville statement).(1) However there is no consensus about how to move toward more complex resections. Our experience supports the fact that the move toward hemihepatectomies can be relatively fast and safe as soon as strict and careful conversion criteria are adopted.

Intraoperative ultrasound liver examination is mandatory to improve our program's quality and extend our current indications. Far from being a routine procedure offering good cosmetic results, LLR may be a promising approach offering good rehabilitation, easy reintervention and quicker access to adjuvant therapy.

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