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Laparoscopic anatomical hepatic resection

Report of four left lobectomies for solid tumors

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Abstract. Four patients underwent a laparoscopic left hepatic resection for solid tumor, two for metastasis from colonic cancer, and two for focal nodular hyperplasia (final diagnosis). The procedure was performed according to the rules of conventional hepatic surgery and cancer surgery. No blood transfusion was necessary. No surgical complication occurred. In malignant disease, laparoscopy allows a good staging and the performance of a real no-touch technique; the specimen is removed in a plastic bag without contact to the abdominal wall. In symptomatic benign disease the esthetic benefit of the laparoscopic approach is real. In asymptomatic benign disease, laparoscopy could allow large biopsies in the case of uncertain diagnosis or dangerous resection. It allows safe resections in the case of small, well-located tumors. This approach requires sophisticated material and extensive experience in both laparoscopy and hepatobiliary surgery.

Key words: Laparoscopy — Hepatectomy — Lobectomy

The laparoscopic approach is now used in the surgical treatment of biliary lithiasis, gastroesophageal reflux, and duodenal ulcer [20]. It is under evaluation in other procedures such as splenectomy [4], appendectomy [16], groin hernia [17], and colectomy [7]. Laparoscopic liver surgery has developed more slowly. Several early reports concerned laparoscopic management of parasitic and nonparasitic cysts of the liver [14, 15] but hepatic laparoscopic resections, either anatomic or nonanatomic, remain anecdotal [1, 9, 12]. We report four cases of left lobectomy for solid tumors of the liver.

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Case reports

Case 1

A 45-year-old man underwent a laparoscopic left colectomy on January 1995 for an adenocarcinoma Dukes C not involving the serosa. He underwent postoperative adjuvant chemotherapy (5 FU + L). Nine months later an ultrasound control showed a 28-mm-diameter metastasis in the left lobe (segment II) which remained unique and stable 2 months later. He underwent a laparoscopy in December 1995. Visual and ultrasound examination of the peritoneal cavity and liver confirmed that the metastasis was unique. A left lobectomy was performed without clamping of the hepatic pedicle. The specimen was removed through a 10-cm median incision done to checkup the bed of hepatectomy. Neither bleeding nor biliary leakage was seen. The procedure lasted 5 h; no blood transfusion was done. The size of the specimen was 19 × 12 × 3.5 cm and its weight 239 g. Histologically, it was a metastasis of a colic adenocarcinoma. The margin was tumor free. He was discharged carefully on the 7th postoperative day after an uncomplicated course.

Case 2

A 24-year-old woman on oral contraceptives for 8 years was referred for a 3.5-cm-diameter tumor of segment II discovered incidentally. CT scan, Doppler US, and MRI suggested an adenoma. A biopsy of such a small tumor, especially in a thin and mobile left lobe, was considered dangerous and potentially not helpful since the differential diagnosis between adenoma, focal nodular hyperplasia (FNH), and well differentiated hepatocarcinoma (HCC) is difficult in small specimens. Besides, she had desired pregnancy and preferred to get rid of the nodule. She underwent a laparoscopic left lobectomy in March 1996 with clamping of the hepatic pedicle two times for 10 min, each separated by 20 min of declamping. The procedure lasted 4 h. The size of the specimen was 10 × 7 × 4 cm and the final histology was FNH. No blood transfusion was done. She was discharged on the 4th postoperative day after an uncomplicated course.

Case 3

A 65-year-old woman underwent a local transanal resection of a small (1.5 cm diameter) well-differentiated in situ adenocarcinoma in March 1994. In February 1996, the carcinoembryonic antigen was 130 ng/l (normal < 5). She was suffering from a 6-cm-diameter metastasis located on the left lobe. The rest of an extensive checkup was negative. Two months later, the metastasis was still unique. She underwent a left hepatic lobectomy in

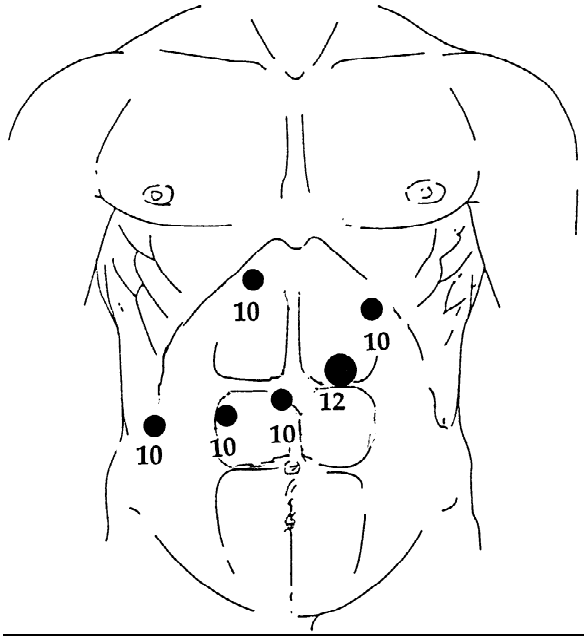

Fig. 1. Port sites.

April 1996 without clamping of the hepatic pedicle. The procedure lasted 4 h. No blood transfusion was done. The size of the specimen was 17 × 10 × 5 cm and the weight 352 g. The size of the tumor was 7 × 5 × 4 cm. Histologically, it was a metastasis of a well-differentiated colonic adenocarcinoma. Because of a pulmonary infection she was not discharged until the 10th postoperative day.

Case 4

A 30-year-old man underwent a Doppler-ultrasound examination of the liver because of a drug-related high elevation of transaminases. A highly vascularized tumor of 2.5-cm diameter was found in the segment III. CT scan and MRI were unable to conclude between adenoma, FNH, and HCC, all of these diagnoses being uncommon in a young man. A left lobectomy was performed in December 1996 without clamping the hepatic pedicle nor with blood transfusion. The specimen was removed through a 5-cm-long midline incision. The size of the specimen was 15 × 10 × 4 cm and the weight 280 g. The procedure lasted 3 h. The operative frozen section determination was HCC but the final histology was FNH. He was discharged on the 4th postoperative day after an uncomplicated course.

Operative technique

The patients were in supine position with legs apart. The surgeon stood between the legs with one assistant on each side. Two video monitors were positioned, one on either side of the anesthesiologist at the head of the patient. The pneumoperitoneum was created with a Veress needle in the left subcostal area. The maximum insufflation pressure was 12 mmHg. Five or six trocars were inserted as indicated in Fig. 1. After extensive abdominal examination to assess the liability of hepatectomy, the left lobe was completely mobilized by division of the left triangular ligament. The falciform ligament was also divided to allow better ultrasonographic exploration of the whole parenchyma. The ligamentum teres was either cut and pulled down to the right or simply lifted up and held using a thread through the abdominal wall. The porta hepatis was surrounded systematically by a piece of tape introduced through a segment of Silastic tube (external diameter 10 mm) inserted into the rightmost 10-mm port so that it was easy, rapid, and nontraumatic to clamp the pedicle if necessary. The bridge of parenchyma between segment IV and left lobe was fractured so that the umbilical fissure was perfectly exposed. The Glisson's capsule was incised with a diathermic hook along the left side of the falciform ligament. The liver was split anteroposteriorly following the plane of the falciform ligament using an ultrasonic dissector (CUSA 200, Valleylab., Lyon, France). The small vascular and biliary vessels were divided between metallic clips. The pedicles of segments III and II were divided between nonabsorbable sutures. In case 2 only these sutures were made, using the Pringle maneuver (twice for 10 min each). The left hepatic vein was divided between nonabsorbable sutures in cases 1 and 3. A vascular endo-GIA stapler (Merlin Medical, Autosuture, La Clé de Saint Pierre, France) was used in cases 2 and 4. The specimen was immediately placed in a plastic bag which was tightly closed and removed through a 10-cm median incision in the case 1, a preexisting MacBurney scar in case 2, part of a preexisting pubo-umbilical scar in case 3, and a 5-cm-long midline incision in case 4. Drainage was used in cases 1, 3, and 4. Fibrin glue (Tissucol, Immuno-France, Ilkirch, France) was spread on the bed of hepatectomy in case 2.

Discussion

Laparoscopic left lobectomy can be performed following the same rules as in open hepatic surgery [2]. Mobilization of the lobe, exploration of the parenchyma, Pringle maneuver, and selective control of segmental pedicles and left hepatic vein can be performed similarly. In our opinion, compared to crushing techniques for parenchymal division, the use of the ultrasonic dissection is a benefit: our laparoscopic experience confirmed the data published for open surgery showing that the division of parenchyma is less hemorrhagic [11, 13]. The control of large pedicles is easier and safer. Ultrasonic dissection allows complete clearance of parenchyma all around the pedicles for a length of several millimeters, allowing safe ligatures. For the approach to hepatic veins, the ultrasound dissection allows precise dissection without traction, minimizing the risk of tearing the fragile wall of hepatic veins and collaterals. Intraoperative ultrasound is a precious tool, as it replaces the manual palpation of parenchyma and it can help to see clearly the boundaries of the tumor and the exact location of the vessels, chiefly the hepatic vein. Left lobectomy is probably the easiest anatomical hepatectomy to perform as the left lobe is easy to mobilize and small enough to be removed. Its vascularization is standard and simple and the raw surface after hepatectomy is small.

In three out of our four cases neither intraoperative nor postoperative complication occurred. In case 3, the discharge was delayed because of a pulmonary infection. No blood transfusion was necessary. This does not mean that the procedure is easy. It requires practice both in laparoscopic surgery and in hepatobiliary surgery. Two dangers must be avoided: hemorrhage and venous gas embolism. In our experience the pneumoperitoneum and the use of an ultrasonic dissector have made the division of the hepatic parenchyma surprisingly unhemorrhagic. We have not had experience using water-jet dissection [19]. Intermittent clamping of the pedicle is a safe procedure for meticulous dissection of large intraparenchymal portal pedicles. In the four cases, we prepared the Pringle maneuver but we used it only in one case because of a slight hemorrhage during dissection of the portal pedicle of segment III (first clamping) and to allow a safe dissection of the portal pedicle of segment II (second clamping). In fact, with experience, systematic clamping is not necessary, but it is useful in case of hemorrhage. The risk of venous gas embolism [10] can be reduced by taking simple precautions: precisely locating the left hepatic vein using ultrasound, using the Endo-GIA vas-

cular stapler [3], creation of positive pressure pulmonary insufflation when approaching the vessel, and, probably, diminishing the pressure of the pneumoperitoneum. Wound suspension could be useful [12].

In malignant disease the laparoscopic approach could allow a better staging than the conventional approach by visual examination of the whole abdominopelvic cavity and ultrasound examination of the liver. Thus, if a contraindication for hepatectomy is found, the patient undergoes a simple laparoscopy instead of an unnecessary laparotomy. Several reports have drawn attention to the risk of parietal seeding [6, 18] especially after laparoscopic cholecystectomy with unknown carcinoma [5] or laparoscopic colectomy for cancer [8]. Laparoscopy allowed, in our cases, a real no-touch technique; the specimen was immediately isolated in a closed plastic bag and removed without direct contact to the abdominal wall. The operative site was profusely washed at the end of the procedure and the pneumoperitoneum was eliminated.

In symptomatic benign disease, the laparoscopic approach is really helpful, as it often concerns young patients, so the esthetic benefit is real.

In case of tumor discovered incidentally, the risk is of either being too conservative and misdiagnosing malignant tumor or of being too aggressive and resecting tumor which should not be resected, like in FNH. Histology is mandatory because the specificity of US, CT scan, or MRI for adenoma, FNH, and HCC is far from 100%. In case 2, it was a FNH whereas preoperative diagnosis was adenoma. Percutaneous biopsy has its own risks and is difficult to interpret because of the small size of the specimen. In case 4, because of the size of the tumor, the first diagnosis on operative frozen sections was HCC whereas the final diagnosis was FNH. The laparoscopic approach could be interesting in this field if it allows visualisation and ultrasound-guided larger biopsy of the tumor with *de visu* hemostasis. Perhaps this could lower the rate of unjustified laparotomies and hepatectomies, particularly in the case of asymptomatic FNH, which requires large or dangerous hepatectomies. That does not concern our four cases of left lobectomy. Our policy is to perform laparoscopic large biopsies when the risk of hepatectomy is higher than the own evolutive risk of the tumor and one of the major risk of a presumed benign tumor is to be malignant.

In our short experience, laparoscopic anatomic left hepatectomy is feasible and safe according to the rules for conventional approach and cancer surgery. It requires sophisticated material and surgeons specialized in both laparoscopy and hepatobiliary surgery. Further studies will be required to assess the future of the laparoscopic approach to hepatic resection.

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