

## LAPAROSCOPIC RIGHT POSTERIOR SECTIONIECTOMY

### *Setorectomia posterior direita laparoscópica no tratamento dos tumores hepáticos*

Sergio Renato Pais **COSTA**, Sergio Luiz Melo **ARAÚJO**, Olímpia Alves **TEIXEIRA**, Alexandre Chartuni **PEREIRA**

From Hospital Santa Lucia, Brasília, DF, Brazil **ABSTRACT - Background** - Resection of neoplasms arising in the posterior right sector is usually a technical challenge due to approach difficulties. Additionally, laparoscopic hepatectomy has become an interesting alternative with several advantages (low morbidity, short hospital stay, early return work activities and good cosmetic results). **Aim** - To report a series of patients who underwent laparoscopic right posterior sectionectomy performed by a single surgical team. **Methods** - Five patients were operated. Their ages ranged from 21 to 63 years (median 43 years). There were four women and one man. Etiology of the neoplasm was: adenoma (n=2), hepatocellular carcinoma (n=1) and metastasis (n=2). There was a single lesion in three cases (60 %). The mean lesion diameter was 3,3 cm (1,8-5). It was analyzed: operative time, intraoperative bleeding, morbidity, length of stay and time of return to usual activity. **Results** - The mean surgical time was 160 minutes (90-260). The mean intraoperative blood loss was 200 ml (0-500). None of the patients received transfusions. There was no mortality and no morbidity. The median hospital stay was three days (2-5). The median length of time taken to return to day-to-day activities was 12 days (7-20). The median follow-up period was 13 months (1-20). There was no tumor recurrence. **Conclusion** - Laparoscopic right posterior sectionectomy (bi-segmentectomy VI + VII) is a good option to treat hepatic tumors located in the posterior sector of the right lobe. It is a safe procedure that avoids large incisions with no mortality or morbidity in this series. This approach also bring good cosmetic result and early return to work.

**HEADINGS** - Laparoscopy, Hepatectomy, Liver neoplasms/surgery, Neoplastic metastases.

#### Correspondence

Sergio Renato Pais Costa,  
e-mail srenatopaiscosta@hotmail.com

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**RESUMO - Introdução** - A ressecção de neoplasias no setor posterior direito costuma ser um desafio técnico pela dificuldade de sua abordagem. Adicionalmente, as hepatectomias laparoscópicas tem se tornado alternativa interessante em virtude de muitas vantagens (baixa morbidade, curto tempo de internação, retorno precoce as atividades laborais e bons resultados cosméticos). **Objetivo** - Relatar experiência em doentes submetidos à setorectomia posterior direita laparoscópica por uma única equipe. **Métodos** - Cinco doentes foram operados entre novembro de 2008 a agosto de 2010. A idade variou de 21 a 63 anos com mediana de 43 anos. Foram quatro mulheres e um homem. A causa das neoplasias foi: adenoma (n=2), hepatocarcinoma (n=1) e metástases (n=2). A lesão foi solitária em três casos (60 %). A média do tamanho das lesões foi 3,3 cm (1,8-5). Foram analisados: tempo cirúrgico, sangramento operatório, morbimortalidade, tempo de internação e tempo de retorno à atividade habitual. **Resultados** - A média de tempo cirúrgico foi de 160 minutos (90-260). A de sangramento intra-operatório foi de 200 ml (0-500). Nenhum doente foi transfundido. Não houve mortalidade e a morbidade foi nula. A mediana de internação foi de três dias (2-5). A mediana de retorno às atividades cotidianas foi de 12 dias (7-20). A mediana de seguimento foi de 13 meses (1-20). Não houve recidiva de lesão. **Conclusão** - A setorectomia posterior direita laparoscópica representa boa opção tática para o tratamento dos tumores hepáticos situados no setor posterior do lobo direito. É opção segura que evita grandes incisões com morbimortalidade. Também apresenta bom resultado cosmético e retorno precoce ao trabalho.

Laparoscopic hepatectomy provides an excellent treatment alternative for tumors arising in the posterior sector of the right hepatic lobe. Along general lines, laparoscopic hepatectomy offers several advantages over an open approach. The main advantages are: less postoperative pain, early mobilization, minimal ileus, earlier resumption of oral intake and shorter hospital stay. Initially, minor hepatectomy to treat superficial lesions was performed with great assurance. With advances in laparoscopic instruments and parenchymal transection devices associated with improved experience of complex laparoscopic hepatobiliary resections; the use of laparoscopic hepatic resection has been growing, especially formal right hepatectomy or even mono and bi-segmentectomy of the right lobe. More recently, laparoscopic hepatectomy has been performed with dismal morbidity and low mortality in some referral centers<sup>1,2,3,4,5,6,10,11,12,13,14,15,17,18</sup>.

Difficult-to-access lesions in the right hepatic lobe may be safely resected using laparoscopic approach with low conversion rates and morbidity<sup>3,11</sup>. Right posterior sectionectomy is a good parenchyma-sparing procedure that may be used to treat both benign and malignant hepatic neoplasms. It is an alternative of interest in relation to formal right hemihepatectomy because it leads to greater preservation of the remaining liver without comprising oncological principles<sup>3,16</sup>. This is very important because there is a high risk of hepatic recurrence of metastasis, both of colorectal metastasis origin and of non-colorectal metastasis origin. Many patients who present colorectal metastasis may need hepatectomy again as the treatment choice in cases of recurrence. Sparing-preserving hepatectomy may aid in cases of new resection because there will be sufficient parenchymal liver for the second hepatectomy, thereby avoiding postoperative liver failure. Furthermore, since hepatocellular carcinoma frequently arises in cases of cirrhotic liver, a more conservative resection procedure is attractive since this also avoids postoperative liver failure. Nevertheless, open right posterior sectionectomy may be a safe procedure and it has been widely used by hepatobiliary surgeons around the world<sup>13</sup>; while laparoscopic right posterior sectionectomy may be more complex than the open approach<sup>14,15</sup>. A laparoscopic intra-hepatic approach, as described in Brazil by Machado, et al.<sup>14</sup> seems to be a very good option for accessing the posterior right pedicle and thereby safely performing laparoscopic right posterior sectionectomy. Few cases or series using this technique have been reported, Machado, et al.<sup>14,15</sup> have shown that laparoscopic right posterior sectionectomy is efficacious with good outcomes in cases of colorectal metastasis.

The aim of this study was to describe a series of laparoscopic right posterior sectionectomy performed by single surgical team to treat liver neoplasms.

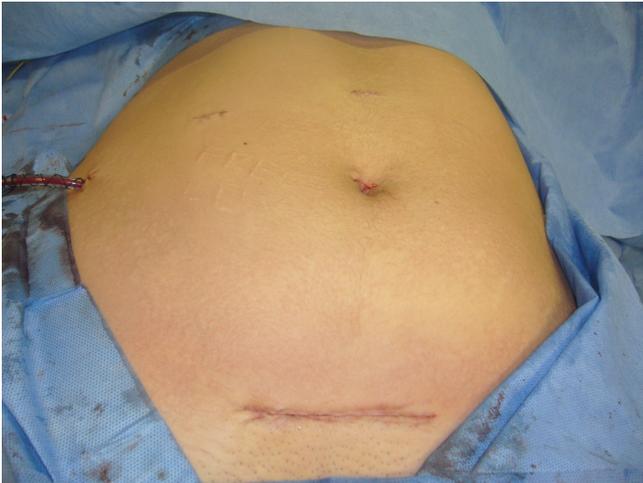
Between November 2008 and August 2010, five laparoscopic right posterior sectionectomy procedures were carried out at Santa Lucia Hospital, Brasilia, Brazil. All of the resections were done by single surgical team. Two of them were performed for benign hepatic lesions while three were for malignant lesions. The indications for laparoscopic resection of benign liver tumors were a preoperative diagnosis of hepatic adenoma. All of these patients were symptomatic. The laparoscopic approach was chosen with regard to the size and location of the lesions, and the surgeon's preference. Abdominal ultrasonography, computed tomography and magnetic resonance imaging were performed on all the patients. For malignant lesions PET-Scan was also carried out. Assays for the tumor markers CEA, AFP and Ca 19,9 were done in all cases.

The surgical technique for laparoscopic right posterior sectionectomy was based on technical principles described by Machado, et al.<sup>14,15</sup>. As a general rule, the procedures were performed with carbon dioxide pressured-controlled pneumoperitoneum, maintained at a positive pressure of 12 mm hg. A 30 degree laparoscope was used. Four to six port sites were used depending on the case, and in accordance with the surgeon's preference and the intraoperative findings (Figures 1, 2). In liver transection was used Ligasure (10 mm- Valleylab, Tyco, US). Small vascular or biliary ducts were sealed using it, while major structures were sealed using metal clips. Major portal pedicles and hepatic veins were divided using a linear stapler (Endogia – 35 or 45 mm – vascular type) as described by Gumbs, et al.<sup>7</sup>.



FIGURE 1 – Five port sites and Pfannenstiel incision for laparoscopic right posterior sectionectomy (hepatocellular carcinoma)

The technical principles were identical and standardized in all of the operations performed. Initially, a



**FIGURE 2** – Four port site and Pfannenstiel Incision for laparoscopic right posterior sectionectomy (hepatic adenoma)

posterior right pedicle was found close to the Ganz fissure after two peri-hilar hepatomies. This was performed using a laparoscopic approach that was named an intra-hepatic Glissonian access by Machado, et al.<sup>14,15</sup>. The pedicle was clamped to demarcate the ischemic zone of the posterior right sector and then after demarcation it was stapled using Endogia stapler. There was always, one ischemic zone, and therefore the hepatic parenchyma was sectioned. The surgical specimen was moved into a plastic bag or gloves, and then the endobag was closed (Figure 3). The closed surgical specimen was resected by means of a Pfannenstiel incision (Figures 1 and 2). Abdominal drainage was generally not performed. When necessary, suction drains were used (in one initial case).



**FIGURA 3** – Peça cirúrgica de setorectomia posterior direita laparoscópica

## RESULTS

The characteristics of the five patients are shown in Table 1. The preoperative radiological investigations

showed a solid liver tumor in all of the patients. One patient with non-colorectal metastasis underwent a preoperative tumor biopsy (percutaneously, guided by radiology). This biopsy confirmed the presence of adenocarcinoma (primary was kidney cancer). Three patients underwent intraoperative frozen-section biopsy, and this confirmed hepatic adenoma in two cases and hepatocellular carcinoma is confirmed in the third case. The diagnosis in the case of one patient with colorectal metastasis was only confirmed through a postoperative biopsy on the surgical specimen. In this series, tumor biopsy allowed us to obtain a sure diagnosis in all of the cases.

**TABLE 1** – Patient characteristics

	Gender	Age	Etiology	Number	Largest lesion diameter(cm)	Hepatic segment location(s)	ASA
1	female	21	adenoma	3	3	VI/VII	1
2	female	23	adenoma	1	5	VI/VII	1
3	male	63	HCC	1	3	VI/VII	2
4	female	43	NCRM	3	3	VI/VII	1
5	female	53	CRM	1	4	VI/VII	1

HCC – hepatocellular carcinoma, CRM – colorectal metastasis, NCRM – non-colorectal metastasis, ASA – American Society of Anesthesiologists

Among the benign tumors, typical features of hepatic adenoma were found preoperatively in both patients. Both of them presented symptoms such as pain and discomfort. One patient presented multiple adenomas (three lesions), and this patient reported having made abusive use of anabolic steroids. One patient presented typical radiological findings of hepatocellular carcinoma and a low level of serum alpha-fetoprotein. Histological examination confirmed the preoperative suspected diagnosis in all these patients.

The laparoscopic procedure was completed in all five patients. There was no conversion in this series. All of the procedures were performed without vascular clamping (Pringle maneuver). The details of the hepatectomy procedures are shown in Table 2. There was no mortality and no morbidity. None of the patients required blood transfusions. One patient (the first of this series) underwent surgical drainage of the liver bed by means of a suction drain. The drain was taken out on the second postoperative day.

**TABLE 2** – Surgical features

Feature	N
Vascular clamping	0 (5)
Mean intraoperative blood loss in milliliters (range)	200 (0-500)
Transfusions received	0 (5)
Mean duration of operation in minutes (range)	160 (90-260)
Mean weight of the surgical specimen in grams (range)	225 (150-350)

The mean duration of the operation was 160 minutes (range 90-160 minutes). Oral intake was begun on the first postoperative day 1. The median hospital stay was three days (range 2-5 days). All of the patients used low doses of common analgesics such as dipyrone during their postoperative course (one or two days). None of them used narcotic analgesia during their postoperative course. The median length of time taken to return to normal activities was 12 days (ranged: 7-20 days). One patient with hepatocellular carcinoma presented microscopic positive margins (segment VI) and subsequently underwent successful laparoscopic segmentectomy of segment V. This was carried out on the third postoperative day without interurrences. The histological examination showed free margins and this patient remains alive without recurrence (six month of follow-up). No adjuvant therapy was administered.

**TABELA 3 – Postoperative course**

	N (%)
Morbidity	0 (0%)
Mortality	0 (0%)
Median hospital stay in days (range)	3 (2-5)
Median time taken to return normal activities in days (range)	12 (7-20)

The mean length of follow-up in this series was 13 months (median 11 months; range 1-20 months). All the symptomatic patients achieved complete symptom relief. For the cancer patients there was no recurrence. All of them now present good quality of life.

## DISCUSSION

Laparoscopic hepatectomy is an evolution from the continuing evolution of minimally invasive surgery. The specific advances in expertise regarding laparoscopic procedures have created evolving interest in applying these techniques to laparoscopic hepatectomy<sup>11</sup>. The surgical skills required for it have evolved in parallel with adaptation of laparoscopic techniques to these procedures. Hilar dissection, biliary or vascular repair, mobilization of the liver, and transection of the parenchyma are more technically demanding and potentially more dangerous than other laparoscopic procedures that have previously been reported. Anatomical hemihepatectomy requires a clear understanding of general liver anatomy, experience in advanced hepatobiliary surgery, and additionally, the ability to dissect major vascular and biliary structures using laparoscopic approach<sup>1,2,3,4,5,6,11</sup>.

Although laparoscopic hepatectomy is a complex laparoscopic procedure, it presents great advantages such as lower levels of postoperative pain, fewer peritoneal adhesions, shorter hospital stay,

and an earlier return to daily activity<sup>1,2,3,4,5,6,7,8,9,10,11,12</sup>. Additionally, it has been found to provide lower blood loss, reduced morbidity, fewer operative complications overall, and specifically with regard to the malignant disease no significant difference either in tumor recurrence or in long-term survival<sup>9,10,11,12</sup>. Furthermore, the cosmetic advantages are excellent when laparoscopic hepatectomy is performed. It is particularly important when performed to treat benign disease<sup>1,2,3,4,5,6,7,8,9,10,11,12</sup>. Earlier resumption of oral intake is also a great advantage considering that considered that hepatectomy is a major surgical procedure. For these reasons, the laparoscopic approach should be taken into account, both for benign and for malignant liver disease management<sup>11,12</sup>.

Despite the initially skepticism about the use of laparoscopic hepatectomy to treat malignant neoplasms, it is nowadays frequently performed since this procedure is secure and efficacious. Some authors<sup>3,6,9,10,11,12</sup> have taken the view that it is as safe as conventional open hepatectomy. For left lesions, some authors<sup>1,9,11</sup> have considered laparoscopic hepatectomy to be the initial approach in referral centers performed by surgeons with high levels of expertise. Although, laparoscopic right liver resection was found to be technical demanding in the initial experience, some authors<sup>3,11,15</sup> have taken the view that the laparoscopic approach may be the preferential choice even for posterior right lesions (segments VI-VII). In the present series, despite the small sample, it was found to be safe procedure without any mortality or morbidity as also found by Machado, et al.<sup>14,15</sup> The laparoscopic intrahepatic Glissonian approach as proposed by Machado, et al.<sup>15</sup> is an interesting and safe alternative that spares the liver parenchyma, while preserving the oncological principles of the open technique. The anatomical repair used by Liu, et al.<sup>13</sup>, i.e. the Ganz fissure seems to be for accessing the right posterior pedicle by means of an intrahepatic route. Like in the open approach to the posterior pedicle<sup>13</sup>, the laparoscopic approach spares the liver and thus minimizes the intraoperative bleeding. Additionally, it leads to well-defined ischemic zones for segments VI-VII<sup>15</sup>.

Furthermore, one great advantage of laparoscopic hepatectomy for resecting posterior right lesions is that it avoids the large open incision that is generally necessary for accessing posterior pedicles<sup>3</sup>. However right side hepatic resections not only are technically more difficult to perform but also present higher conversion rates than left resections do<sup>11</sup>. Laparoscopic hepatectomy for right-side lesions may be considered feasible and safe as Cho, et al.<sup>3</sup> have shown in a recent study. In a series of 78 patients, Zhang, et al.<sup>18</sup> observed that laparoscopic liver resection was totally successful, with no conversion to open procedures, and only four patients received transfusions. In the present series, there were no perioperative complications and

no bleeding or biliary leakage either. Machado, et al.<sup>15</sup> observed one case of bile leakage; thereby this complication is as possible as in open hepatectomy. In the present series there was no morbidity. Although the conversion rate to open surgery has ranged from 0 to 15 %, it depends on the resection type (major or minor hepatectomy, right or left side lesion), experience of the team and volume of the lesion. In the present series, the outcomes observed were similar to those of Zangh, et al.<sup>18</sup> and Machado, et al.<sup>14,15</sup> in which there was no conversion to open surgery. On the other hand, the present series observed one case of microscopically positive margins after laparoscopic right posterior sectionectomy to treat hepatocellular carcinoma. Nevertheless, this patient successfully underwent subsequent laparoscopic repeated hepatectomy with free margins, which seems not have comprised the short-term prognosis.

Doubts have been raised about long-term outcomes from liver-sparing resection to treat cancer by means laparoscopic approach because very preliminary results. Lack of palpatory sensitivity is a critical point in all laparoscopic procedures. The hepatocellular carcinoma resected in the present series was mainly of fibrolamellar type, and it was difficult to determine the real status of the margin because of the intense desmoplastic reaction that is sometimes observed in frozen sections produced in this cases. Machado, et al.<sup>14,15</sup> did not observe comprised margins, although the series was small and almost all cases were colorectal metastasis. Like in other series, there was no mortality in the present series which leads to think that laparoscopic hepatectomy is generally a safe procedure<sup>1,2,3,4,5,6,7,8,9,10,11,12,14,15,17,18</sup>.

To date, with regard to malignant disease, actual studies have suggested that there are no differences between laparoscopic hepatectomy and open hepatectomy in relation to port-site metastasis, free margins, local-systemic recurrence or even survival rates<sup>3,6,9,10,11,12</sup>. However, there have been few match-controlled studies with no ideal level of evidence. Historical series have shown no difference between laparoscopic hepatectomy and open hepatectomy for treating malignant disease, but this finding should be considered with caution and new studies to answer these questions must be awaited.

## CONCLUSION

Laparoscopic right posterior sectionectomy (bisegmentectomy VI + VII) is a good tactical option for treating hepatic tumors located in the posterior sector of the right lobe. It is a safe option that avoids large incisions with no mortality or morbidity in this small series. This approach also presents good cosmetic result and early return to work.

1. Ardito F, Tayar C, Laurent A, Karoui M, Loriau J, Cherqui D. Laparoscopic Liver Resection for Benign Disease. *Arch Surg* 2007; 142 (12): 1188-1193.
2. Cherqui D, Husson E, Hammoud R. Laparoscopic liver resections: A feasibility study in 30 patients. *Ann Surg* 2000; 232 (6): 753-62.
3. Cho JY, Han HS, Yoon YS, Shin SH. Outcomes of Laparoscopic Liver Resection for Lesions located in the Right Side of the Liver. *Arch Surg* 2009; 144 (1): 25-9.
4. Dulucq JL, Wintringer P, Stabilini C, Berticelli J, Mahajna A. Laparoscopic Liver resections: A single center experience. *Surg Endosc* 2005; 19: 886-91.
5. Gagner M, rogula T, Selzer D. Laparoscopic liver resection: benefits and controversies. *Surg Clin North Am* 2004; 84: 451-62.
6. Gigot JF, Gilneur D, Azagra JS, Goergen M, Ceuterik M, Morino M, Etienne J, Marescaux J, Mutter D, van Krunckelsen L, Descottes B, Valleix D, Lachachi F, Bertrand C, Mansvelt B, Hubens G, Saey J, Shockmel R, under the auspices of the Hepatobiliary and Pancreatic Section of the Royal Belgian Society of Surgery and the Belgian Group for Endoscopic Surgery. Laparoscopic liver resection for malignant liver tumours: preliminary results of a multicenter European study. *Ann Surg* 2002; 236(1): 90-7.
7. Gumbs AA, Gayet B, Gagner M. Laparoscopic liver resection: When to use the laparoscopic stapler device. *HPB* 2008; 10: 296-303.
8. Herman H, Pugliese V, Machado MAC, Montagnini AL, Salem MZ, Bachella T, D'Albuquerque LAC, Saad WA, Machado MCC, Pinotti HW. Hepatic Adenoma and Focal Nodular Hyperplasia: Differential Diagnosis and Treatment. *World J Surg* 2000; 24: 372-6.
9. Herman H, Coelho FF, Lupinacci RM, Perini MV, Machado MAC, D'Albuquerque LAC, Ceconello I. Ressecções Hepáticas por Videolaparoscopia. *ABCD Arq Bras Cir Dig* 2009; 22(4): 226-32.
10. Kofron AJ, Geller D, Gamblin TC. Laparoscopic liver surgery: shifting the management of liver tumors. *Hepatology* 2006; 44: 1694-700.
11. Kofron AJ, Aufferberg BS, Kung R, Abecassis M. Evaluation of 300 Minimally Invasive Liver Resections at a Single Institution. *Ann Surg* 2007; 246( 3): 385-94.
12. Lee KF, Cheung YS, Chong CN, Tsang YYY, Ng WWC, Ling E, Wong J, Lai PBS. Laparoscopic versus open hepatectomy for liver tumours: a case control study. *Hong Kong Med J* 2007; 13(6): 442-8.
13. Liao KH, Blumgart LH, DeMatteo RP. Segment-oriented approach to liver resection. *Surg Clin N Am* 2004; 84(2): 543-61.
14. Machado MAC, Makdissi FF, Almeida FAR, Luiz-Neto M, Martins ACA, Machado MCC. Hepatectomia Laparoscopica no Tratamento das Metástases Hepáticas. *Arq Gastroenterol* 2008; 45(4): 330-2.
15. Machado MAC, Makdissi FF, Galvão FH, Machado MCC. Intrahepatic Glissonian approach for laparoscopic right segmental liver resections. *Am J Surg* 2008; 196: e38-42.
16. Reynaud BH, Coucorovas GO, Giuly JA. Basis to improve several hepatectomy techniques involving the surgical anatomy of incisura dextra of Gans. *Surg Gyn Obs* 1991; 172: 490-2.
17. Pilgrim CHC, To H, Usatoff V, Evans PM. Laparoscopic hepatectomy is a safe procedure for cancer patients. *HPB* 2009; 11: 247-51.
18. Zhang L, Chen YJ, Shang CZ, Zhang HW, Huang ZJ. Total laparoscopic liver resection in 78 patients. *World J Gastroenterol* 2009; 15(45): 5727-31.