



## Liver resection as the definitive treatment for unilateral non-oriental primary intrahepatic lithiasis

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### Abstract

**Background:** The current study sought to evaluate the results of liver resection as the treatment for unilateral non-oriental primary intrahepatic lithiasis (PHIL).

**Methods:** Twenty-seven symptomatic patients (mean age 42 years) were submitted to liver resection; the indications were parenchymal fibrosis/atrophy in 22 and biliary stenosis in 5. Resection was associated with a Roux-en-Y hepaticojejunostomy in patients with a significant degree of dilation of the extrahepatic biliary duct.

**Results:** There was no operative mortality and the morbidity rate was 7.4% (2 patients with biliary fistula). After a median follow-up of 41.2 months, the overall rate of good results was 92.6%. All patients submitted to liver resection alone presented good late results, while 80% of those with associated hepaticojejunostomy did not have complications ( $P = .12$ ). Late complications were observed in 2 patients (7.4%): 1 with a liver abscess and 1 with cholangitis and recurrent stones. There was no mortality during long-term follow-up.

**Conclusions:** Liver resection showed low incidence of complications and good long-term results. None of the patients with unilateral disease without associated extrahepatic bile duct dilation presented complications and they were considered cured. We believe that resection indications should be expanded and the procedure should be indicated as routine in patients with unilateral PHIL even in the absence of parenchymal fibrosis/atrophy or biliary stenosis. © 2006 Excerpta Medica Inc. All rights reserved.

*Keywords:* Intrahepatic lithiasis; Hepatic resection

Primary intrahepatic lithiasis (PIHL) or hepatolithiasis is a very prevalent disease in Southeast Asia but it is rare in the Western world; however, it has been increasingly reported in some Western countries, such as Brazil [1–3]. The etiology is unclear but the association of biliary stasis and infection are determinant factors for stone formation. With the routinary use of imaging methods, diagnosis of liver stones has become more frequent, being that cholangiographic evaluation is the most accurate diagnostic method. The treatment is complex, and the goal is to promote complete stone clearance, decompression of the biliary tree, and control of bile infection; hence, it has to be individualized

according to the different presentations of the disease. Most groups propose surgical treatment with bilioenteric anastomosis and/or liver resection as the first approach [4–6] and nonsurgical procedures such as percutaneous cholangioscopic lithotripsy or endoscopic therapy [7–10] to treat stone recurrences rather than as the initial treatment. Stone recurrence is a major problem in these patients and may result in recurrent cholangitis in up to 40% of cases [11]. Morbidity and mortality rates for liver resection decreased significantly during the last decade due to an exponential increase of expertise and thus can be considered as a potentially curative treatment for hepatolithiasis. This is especially true in patients with unilateral irreversible disease as parenchymal atrophy or biliary stenosis, since stones and biliary strictures can be simultaneously removed, reducing the risk of recurrency [12–17].

We report our results in the largest Western series of

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patients submitted to liver resection as the treatment of unilateral non-oriental PHIL.

## Patients and Methods

Eighty-four native Brazilian patients with symptomatic PIHL were treated in our institution between 1992 and 2002. Twenty-seven (32.1%) underwent liver resection for unilobar disease. Data regarding gender, age, symptoms, intrahepatic stone location, history of previous biliary surgery, liver function tests, intraoperative findings, and post-operative outcome are presented.

Liver resection was indicated in the presence of an irreversible lesion as unilobar or segmental liver fibrosis/atrophy or intrahepatic biliary stenosis. A complementary Roux-en-Y hepaticojejunostomy was performed in patients who presented common bile duct stones with a bile duct dilation of more than 2 cm in diameter.

There were 12 men (44.4%) and 15 women (55.6%) with a mean age of 42 years (range 24 to 67). History of jaundice was present in 20 patients (74%) and cholangitis in 17 (62.9%); 13 patients (48.1%) had undergone previous biliary surgery, most without a previous diagnosis of PIHL. Eight patients had received previous cholecystectomy, 3 cholecystectomy plus hepaticojejunostomy, and 2 cholecystectomy plus T-tube placement.

Physical examination did not show any significant findings and no patient presented stigmata of liver failure.

Preoperative diagnosis was based on ultrasound, helicoidal 3-phase tomography, and/or magnetic resonance cholangiography (Fig 1). Intraoperative cholangiography for the complete evaluation of the biliary tree was performed in all cases.

Indications for liver resection in this series were: parenchymal atrophy in 17 patients, intrahepatic biliary stenosis in 5, and unilobar liver fibrosis in 5. Two patients were

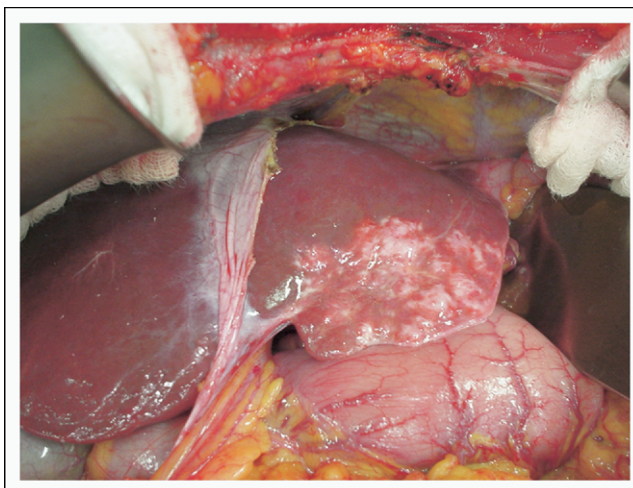


Fig. 2. Intraoperative view disclosing left lobe bile ducts dilation and fibrosis.

submitted to liver resection in septic conditions: 1 due to cholangitis and the other because of liver abscess.

Median follow-up was 41.2 months, ranging from 12 to 90 months. Long-term results were considered good when there was no recurrence of stones or symptoms, or complications of the disease such as cholangitis episodes or liver abscess during the follow-up period.

Fischer's exact test was used to evaluate whether the type of surgery performed (liver resection alone or liver resection plus hepaticojejunostomy) had any impact on the results. Statistical significance was set at .05.

## Results

Among 27 patients with unilateral disease, 22 (81.4%) had stones located in the left lobe and 5 in the right lobe. Seven patients (25.9%) had intrahepatic and common bile duct stones. Bilirubin levels were increased in 21.8% of patients, and alkaline phosphatase and gamma-glutamyl transpeptidase in 65.6% and 43.7%, respectively. The other liver function tests were within normal limits.

Four patients underwent right hepatectomy (14.8%), 6 left hepatectomy (22.2%), 16 bi-segmentectomy II–III (59.2%), and 1 patient underwent a segment V resection (Figs 2 and 3). An associated Roux-en-Y hepaticojejunostomy was performed in 7 patients (25.9%) with significant common bile duct dilation and stones. Another 3 patients had undergone previous hepaticojejunostomy (Table 1).

There was no operative mortality. Two patients who underwent liver resection (right lobectomy and bisegmentectomy II, III) in septic conditions presented uneventful outcomes. Two patients (7.4%) presented postoperative biliary fistula and were conservatively managed with an uneventful outcome; no other early complications were observed.



Fig. 1. Computed tomography scan showing left lobe of the liver atrophy with dilated bile ducts.

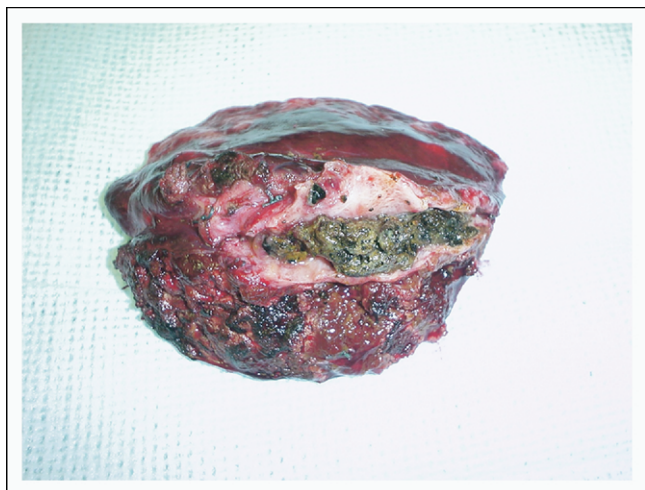


Fig. 3. Resected liver segments II and III with bile duct dilation and fibrosis filled with pigment stones.

All patients submitted only to liver resection presented good late results (100%), while among those with associated hepaticojejunostomy, 2 (20%) presented late complications: 1 had liver abscess percutaneously drained with good outcome and the other, who presented with cholangitis and stone recurrence, received antibiotic therapy and percutaneous stone removal and remains well. Stone recurrence was observed in 1 patient (3.7%). There was no mortality during long-term follow-up.

The overall rate of good long-term results was 92.6%. Patients submitted to liver resection only had better long-term results when compared to those with associated hepaticojejunostomy (100% vs. 80%), but this difference was not statistically significant ( $P = .12$ ) (Table 2).

**Comments**

PIHL is a rare disease in the western world but the high number of cases in our country called our attention for it.

Table 1  
Primary intrahepatic lithiasis: location of stones, type of surgery performed, and long-term results

Stone location	Type of surgery	Late complications	Good long-term results
Right lobe, n = 5 (15.6%)	Right hepatectomy (4)	0	100%
	Segmentectomy V (1)	0	
Left lobe, n = 22 (68.7%)	Left hepatectomy (3)	0	100%
	Bisegmentectomy II/III (9)	0	
	Left hepatectomy + HJ (3)	0	80%
	Bisegmentectomy II/III + HJ (7)	2 (6.2%)	

HJ = hepaticojejunostomy.

Table 2  
Surgical procedure and long-term results

Surgical procedure	n (%)	Good results (%)
Liver resection	17 (53.1)	17 (100)
Liver resection plus hepaticojejunostomy	10 (46.9)	8 (80)
Total	27 (100)	25 (92.6)

$P = .1282$ .

We have previously reported a relative incidence of 2.1% of PIHL between all cases of biliary stone disease treated at our institution [2] and patients' and stone characteristics were similar to those with oriental PIHL, suggesting a similar etiology. A treatment protocol, according to the presentation of the disease [2,3] was applied and, 27 of the 84 patients with symptomatic PIHL (32.1%) underwent liver resection for the treatment of unilateral disease.

The management of hepatolithiasis requires the complete removal of intrahepatic and extrahepatic stones, and strictured ducts, when present, as well as the adequate drainage of the affected segments of the biliary tree. Hepatic resection is the only treatment that allows the complete removal of intrahepatic stones and affected bile ducts, reducing the risk of recurrence [4,5,12–20]. The stone recurrence rate following liver resection is about 9%, which is significantly lower when compared to nonsurgical approaches or hepaticojejunostomy alone, which are generally associated with a long-term recurrence rate of up to 54% [17,20]. In the presence of biliary strictures, recent successful reports with percutaneous management [17,21,22] has encouraged authors to indicate percutaneous approach instead of the surgical treatment; however, despite temporary relief of the stenosis, a high rate of recurrences has been observed in almost all patients with severe biliary stenosis [7,20]. The residual/recurrent stone rate was 3.7% in our study and 10% in that of Chen et al [20], a low rate when compared to residual stone rates of 20% to 40% reported in most studies without hepatic resection [7,16].

In this series, as in the majority of the reports, liver resection was indicated only in patients with irreversible disease such as biliary strictures or severe parenchymal fibrosis or atrophy and not for the simple presence of stones localized in 1 lobe of the liver [4,13–15,23].

A bilioenteric anastomosis was indicated when the common bile duct presented stones and a dilation of 2 cm or more. Hepaticojejunostomy was the procedure of choice, as in the majority of groups that treat the disease. Associated procedures such as cutaneous hepaticojejunostomy or latero-lateral jejunal-duodenostomy were not employed because stone recurrences were not expected in this group of resected patients.

There was no operative mortality even considering the 2 patients operated in septic conditions due to suppurative cholangitis or liver abscess. Overall operative morbidity rate was 7.4% and the most common complication was

biliary leakage; all were successfully managed using conservative approaches and no reoperations were required.

Good late results were achieved in 92.6% of the patients and are comparable to other reports from the Far East, with rates between 80% to 90% in patients with unilateral intrahepatic stones [4,5,12–16]. Our data show that good late results were achieved in all patients with unilateral stones who did not present extrahepatic biliary disease, which can be explained by the fact that in patients with unilateral stones, all of the compromised liver parenchyma can be removed, leading to cure. However, if there was a significant dilation of the extrahepatic biliary tree due to the presence of stones or sphincter stenosis and a biliary drainage procedure was required, the rate of good late results decreased to 80% (Table 2).

Two patients (7.4%) with liver resection associated with hepaticojejunostomy presented complications: 1 had a liver abscess and the other had cholangitis and recurrent stones; both were successfully treated with a percutaneous approach. The other 25 patients (92.6%) had no complications during the period of observation.

The association between PIHL and cholangiocarcinoma has been reported in the literature with incidences ranging from 2.3% to 10% [20,24]. In our experience, among 53 patients with hepatolithiasis surgically treated but not submitted to liver resection, 3.7% presented cholangiocarcinoma during their evolution [2,3] while none of the resected patients of this series presented malignancy. This finding may suggest that the chronically inflamed hepatic tissue plays some role in the development of cancer. Removal of the inflamed tissue could be considered as another advantage of hepatic resection for the treatment of PIHL [23].

This study showed that hepatic resection is effective as well as safe for the treatment of intrahepatic stones when indicated for the treatment of unilateral irreversible lesions as biliary stenosis or parenchymal fibrosis/atrophy. In patients with a hepaticojejunostomy, results were worse than in those without extrahepatic dilations, probably due to an associated extrahepatic biliary disease (persistence of a possible cause for stone formation and/or inadequate biliary or stone drainage).

The reported good late results for the treatment of PIHL are 58.3%, 77%, 84%, and 65% [5,10,24,25]. Our previous data showed a 73.4% rate of good late results for patients submitted to biliary drainage procedures and/or liver resections [2,3]. Hepatic resection for the treatment of hepatolithiasis has been reported to be associated with a low incidence of long-term stone recurrence or recurrent cholangitis [12–17]. The global rate of 7.4% of late complications in our series is relatively low when compared with recurrent/residual disease rates ranging between 20% and 40% reported in most studies after percutaneous cholangioscopic lithotripsy, or endoscopic or other surgical approaches such as bilioenteric anastomosis without hepatic resection [6–10,17,18].

In this study, to our knowledge the largest western PIHL

series, the indications for resection were irreversible parenchyma or biliary lesions. However, based on the better results of liver resection when compared with other treatment modalities for PIHL [26] and considering the low mortality rates for the resection of other benign liver diseases [27], resection has become the definitive treatment for unilateral hepatolithiasis. We believe that the indications for resection in patients with PIHL should be extended to encompass all symptomatic patients with unilateral disease (left or right) even in the absence of associated biliary stenosis or parenchymal atrophy.

## References

- [1] Bove P, Ramos de Oliveira M, Speranzini M. Intrahepatic lithiasis. *Gastroenterology* 1963;44:317–22.
- [2] Herman P, Machado MCC. Primary intrahepatic lithiasis. *Prob Gen Surg* 2001;18:51–5.
- [3] Herman P, Bacchella T, Pugliese V, et al. Non-oriental primary intrahepatic lithiasis. Experience with 48 cases. *World J Surg* 2005; 29:858–62.
- [4] Fan ST, Choi TK, Lo CM, et al. Treatment of hepatolithiasis: improvement by a systematic approach. *Surgery* 1991;109:474–80.
- [5] Choi TK, Wong J. Current management of intrahepatic stones. *World J Surg* 1990;14:487–91.
- [6] Chen HH, Zhang WH, Wang SS, et al. Twenty-two year experience with the diagnosis and treatment of intrahepatic calculi. *Surg Gynecol Obstet* 1984;159:519–24.
- [7] Lee SK, Seo DW, Myung SJ, et al. Percutaneous transhepatic cholangioscopic treatment for hepatolithiasis: An evaluation of long-term results and risk factors for recurrence. *Gastrointest Endosc* 2001;53: 318–23.
- [8] Jeng KS, Sheen IS, Yang FS. Percutaneous transhepatic cholangioscopy in the treatment of complicated intrahepatic biliary strictures and hepatolithiasis with internal metallic stent. *Surg Laparosc Endosc Percutan Tech* 2000;10:278–83.
- [9] Seo DW, Kim MH, Lee SK, et al. Usefulness of cholangioscopy in patients with focal stricture of the intrahepatic duct related to intrahepatic stones. *Gastrointest Endosc* 1999;49:204–9.
- [10] Tanaka M, Ikeda S, Ogawa Y, et al. Divergent effects of endoscopic sphincterotomy on the long term outcome of hepatolithiasis. *Gastrointest Endosc* 1996;43:33–7.
- [11] Tsunoda T, Tsuchiya R, Harada N, et al. Long term results of surgical treatment for intrahepatic stones. *Jpn J Surg* 1985;15:455–62.
- [12] Sato M, Watanabe Y, Horiuchi S, et al. Long-term results of hepatic resection for hepatolithiasis. *HPB Surg* 1995;9:37–41.
- [13] Chijiwa K, Kameoka N, Komura M, et al. Hepatic resection for hepatolithiasis and long-term results. *J Am Coll Surg* 1995;180:43–8.
- [14] Fan ST, Lai EC, Wong J. Hepatic resection for hepatolithiasis. *Arch Surg* 1993;128:1070–4.
- [15] Choi TK, Wong J. Partial hepatectomy for intrahepatic stones. *World J Surg* 1986;10:281–6.
- [16] Chen MF, Jan YY, Wang CS, et al. Role of hepatic resection in surgery for bilateral intrahepatic stones. *Br J Surg* 1997;84:1229–32.
- [17] Uchiyama K, Onishi H. Indications and procedure for treatment of hepatolithiasis. *Arch Surg* 2002;137:149–53.
- [18] Otani K, Shimizu S, Chijiwa K, et al. Comparison of treatments for hepatolithiasis: Hepatic resection versus cholangioscopic lithotomy. *J Am Coll Surg* 1999;189:177–82.
- [19] Sun WB, Han BL, Cai JX. The surgical treatment of isolated left-sided hepatolithiasis: a 22-year experience. *Surgery* 2000;127:493–7.

- [20] Kim YT, Byun JS, Kim J, et al. Factors predicting concurrent cholangiocarcinomas associated with hepatolithiasis. *Hepatogastroenterology* 2003;50:8–12.
- [21] Chen DW, Poon RTP, Liu CL, et al. Immediate and long term out-comes of hepatectomy for hepatolithiasis. *Surgery* 2004;135:386–93.
- [22] Jeng KS, Yang FS, Ohta I, et al. Dilatation of intrahepatic biliary strictures in patients with hepatolithiasis. *World J Surg* 1990;14:587–92.
- [23] Sheen-Chen SM, Cheng YF, Chou FF, et al. Ductal dilatation and stenting make routine hepatectomy unnecessary for left hepatolithiasis with intrahepatic biliary stricture. *Surgery* 1995;117:32–6.
- [24] Sheen-Chen SM, Chou FF, Jeng HL. Intrahepatic cholangiocarcinoma in hepatolithiasis: A frequently overlooked disease. *J Surg Oncol* 1991;47:131–5.
- [25] Wong J. Recurrent pyogenic cholangitis. In: Schwartz SI, Ellis H, editors, *Maingot's Abdominal Operations*. New York: Appleton-Century-Crofts; 1984:1997–2014.
- [26] Di Carlo I, Sauvanet A, Belghiti J. Intrahepatic lithiasis: a western experience. *Surg Today* 2000;30:319–22.
- [27] Iwatsuki S, Todo S, Starzl TE. Excisional therapy for benign hepatic lesions. *Surg Gynecol Obstet* 1990;171:240–6.