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Giant haemangioma of the liver: is enucleation better than resection?

RAJNEESH KUMAR SINGH, SORABH KAPOOR, PEUSH SAHNI, TUSHAR K CHATTOPADHYAY

Department of Gastrointestinal Surgery and Liver Transplantation, All India Institute of Medical Sciences, New Delhi, India

ABSTRACT

INTRODUCTION Haemangioma is the most common liver tumour. Treatment is indicated for symptomatic tumours, rapid increase in size, rupture or doubt in diagnosis. There is continuing debate regarding the ideal method of surgical treatment for liver haemangiomas, with some surgeons favouring enucleation over liver resection.

PATIENTS AND METHODS Retrospective analysis of prospectively compiled database of patients who were surgically treated for liver haemangioma.

RESULTS Between 1987 and 2003, we operated on 21 patients with liver haemangioma. Pre-operative diagnosis on imaging was made in 16 patients (13 symptomatic, 3 had progressive increase in size). In five patients, the indication of surgery was uncertain diagnosis. Enucleation was performed in 9 patients and liver resection in 12. The size of the haemangioma was similar in the enucleation and resection groups (8.9 cm versus 10 cm; $P = 0.85$). The mean intra-operatiive blood loss was significantly less in the enucleation group (400 ml versus 1330 ml; P = 0.004). The mean operative time was significantly less in the enucleation group as compared to the resection group (170 min versus 230 min; $P = 0.035$). Five patients had major postoperative morbidity in the resection group as compared to none in the enucleation group ($P = 0.045$). The duration of hospital stay was significantly longer in the resection group.(9.9 days versus 5.6 days; $P = 0.005$).

CONCLUSIONS Enucleation of liver haemangiomas is safer, quicker and associated with less morbidity than liver resection. Except for some situations, such as uncertain diagnosis or total replacement of a lobe, we recommend enucleation as the surgical procedures of choice for the treatment of hepatic haemangiomas.

KEYWORDS

Liver neoplasms – Haemangioma – Hepatectomy

CORRESPONDENCE TO

Sorabh Kapoor, Department of Surgical Gastroenterology, Bhopal Memorial Hospital and Research Centre, Raisen Bypass Road, Karond, Bhopal, MP, India – 462038

T: +91 7552742212 ext. 1004, 1103; M: +91 9893294674; F: +91 7552748309; E: sorabhkapoor@hotmail.com

Haemangioma is the commonest benign liver tumour with an incidence of 0.4–7.3% in autopsy series.[1] With the increasing use of imaging modalities, asymptomatic giant haemangiomas (> 4 cm in size) are detected more frequently. These lesions can, at times, present a diagnostic dilemma.[2] There is considerable controversy regarding the ideal treatment of giant haemangiomas of the liver. Some authors, on the basis of long-term follow-up of such lesions, propose that most of these lesions do not require any treatment.[3,4] Others have treated these lesions surgically, citing symptoms of the patient, increase in size and an occasional case of rupture, or diagnostic uncertainty.[5]

The surgical procedure is the choice of the individual surgeon – the commonest being enucleation and resection.[5,6] Massive blood loss can occur during surgery and may result in an operative mortality. Though liver resections can be safely accomplished in specialised units, occasional postoperative complications (bile leak) do occur. Enucleation may represent a safer surgical option with fewer complications for the treatment of haemangiomas, especially in centres with limited experience in liver resections.

We reviewed our experience of the surgical treatment of giant haemangiomas of the liver with regard to presentation, indications and outcome. We also compared our results with those published in the literature.

Patients and Methods

The details of all patients undergoing surgical treatment of liver haemangiomas at the Department of Gastrointestinal

Surgery at the All India Institute of Medical Sciences, New Delhi were entered prospectively into a database. Between January 1987 and December 2003, we operated on 21 patients with giant haemangioma of the liver. There were 8 men and 13 women with a mean age of 42.5 years (range, 28–60 years). A detailed history was taken with emphasis on the patient's symptoms. They underwent a thorough clinical examination. Routine haematological parameters, renal and liver function parameters and, when needed, oesophagogastroscopy were done.

Eighteen patients were symptomatic and 9 had a palpable abdominal lump. All 18 symptomatic patients had pain in the right hypochondrium and heaviness in the upper abdomen. Dyspepsia and abdominal compartment syndrome was present in one patient each. The mean duration of symptoms was 27.8 months (range, 1–180 months). In one woman, who had been asymptomatic earlier and was being followed up for several years, a large 25-cm size haemangioma presented with an abdominal compartment syndrome. Nine patients had associated co-morbid conditions, including hypertension in three patients and coronary artery disease, obscure gastrointestinal bleeding, epilepsy, depression, gallstone and renal calculus in one each.

The initial diagnostic investigation was an ultrasound evaluation of the abdomen which was also used to exclude any alternative diagnosis. A dual-phase computerised tomography (CT) scan was done in all patients. Peripheral nodular filling in the arterial phase with complete opacification in the portal phase was considered diagnostic of an haemangioma. In case of a doubt, a magnetic resonance (MR) scan was done (n = 4). Two patients underwent a Tc^{99m}-labelled red blood cell scan; a SPECT (single photon emission computed tomography) scan was done in one patient. Angiography with the intention of embolisation was done in 8 patients.

In each patient, the indication for surgery was discussed and written informed consent taken. The choice of surgical procedure was that of the individual surgeon. The type of liver resection performed was based on the size and location of the lesion. The control of arterial and venous in-flow and venous out-flow was obtained before parenchymal transection. Non-anatomical resection was done in four cases to preserve normal liver parenchyma. Enucleation was done on the same principles, with prior identification and ligation of the feeding artery, if possible. In cases where the haemangioma was obscuring anatomy at the porta-hepatis, in-flow control was obtained with a Pringle manoeuvre.

Postoperative management included intravenous fluid, blood and component support when needed and monitoring of haemodynamic parameters and signs of liver failure.

Statistical analysis was done using SPSS (v.7.5) software. The Mann-Whitney test was applied to continuous variables and Chi-square and Fisher exact test were applied to the categorical variables. A P value < 0.05 was considered statistically significant.

Results

Ultrasound examination alone gave the diagnosis in 12 patients (57.1%). CT scan confirmed the diagnosis in 14 patients (66.6%) while MR scan and Tc^{99m}-labelled red blood cell scan were diagnostic in one patient each. Hence, the pre-operative diagnosis was confirmed in 16 patients (76.1%).

In the confirmed cases of haemangioma (n = 16), the indication for surgery was presence of symptoms (n = 13) and increase in size on follow-up (n = 3). In the other 5 patients, the indication for surgery was an uncertain diagnosis. None of the patients had consumptive coagulopathy based on the routine haematological parameters. Detailed coagulation parameters were not assessed in the absence of specific symptoms.

Selective angiography was attempted in 8 patients and was successful in 5 patients in whom embolisation of the feeding vessel could be done with polyvinyl alcohol or steel coils. The response was transient in two patients in whom the symptoms returned after 4 months and 8 months, respectively; a repeat CT scan showed no regression in size. In three other patients there was no response of the symptoms or reduction in size.

The mean size of the haemangiomas was 9.5 cm (range, 4–25 cm). All the patients had a single giant haemangioma except 2 patients who had two haemangiomas each and 1 patient who had three. The surgical procedures carried out were enucleation (n = 9) and liver resection (n = 12; anatomical [8] and non-anatomical [4]). The anatomical liver resections carried out were extended right hepatectomy (n = 2), right hepatectomy (n = 1), left hepatic lobectomy (n = 3) and bi-segmentectomy (n = 2). The mean blood loss was 930.9 ml (range, 200–5000 ml) and the mean operation time was 204.2 min (range, 90–360 min).

Although the mean size of the haemangiomas was similar (enucleation group 8.9 cm [range, 5–15 cm]; liver resection group 10 cm [range, 4–25 cm]), the operative blood loss and operation time were significantly less after enucleation as compared to liver resection (Table 1).

No patient had a major morbidity after enucleation as compared to 5 patients (41.6%) after liver resection. Two patients had postoperative bile leaks and one patient each had fever, persistent vomiting and ascites. All the complications were managed conservatively. There was no mortality and the mean hospital stay was 8.1 days (range, 4–20 days). Because of the postoperative morbidity, the hospital stay was significantly prolonged after liver resection as compared to enucleation (9.9 days versus 5.6 days; Table 1).

Table 1 Surgical procedures and results

Parameter	Enucleation (n = 9)	Liver resection (n = 12)	P-value
Size of haemangioma, mean (range) cm	8.9 (5–15)	10 (4–25)	0.858
Blood loss, mean (range) ml	400 (200–600)	1329.1 (300–5000)	0.004
Operative time, mean (range) min	170 (120–240)	230 (90–360)	0.035
Major morbidity (%)	Nil	41.6	0.045
Hospital stay, mean (range) days	5.6 (4–8)	9.9 (4–20)	0.005

Discussion

We operated on 21 patients with giant hepatic haemangiomas (over 17 years) for symptoms or increase in size (n = 16) and diagnostic uncertainty (n = 5). Though the size of the haemangiomas was similar in the two treatment arms, enucleation (n = 9) could be done with a less blood loss, lower operative time, no morbidity and shorter hospital stay compared to liver resection (n = 12).

Conventional grey-scale ultrasound is the commonest and most easily available diagnostic investigation for hepatic haemangioma. In our experience, it gave the diagnosis in 57.1% of the patients, which is similar to other series (58–69%).[7,8] However, it is an observer-dependent investigation and may miss details needed for guiding the surgeon. A good-quality, contrast-enhanced, dual-phase CT scan confirmed the diagnosis in 66.6% of our patients and provided surgical details of the vascular relationships, an experience reported by others (73–82%).[7–9] With the availability of MR scan, we have recently started using it more often in cases of a diagnostic dilemma after ultrasound and CT scans. A hyperintense lesion in the T2-weighted images is characteristic of a haemangioma. Recent literature indicates that, with the use of a good-quality MR scan and, if needed, a Tc^{99m}-labelled red blood cell scan, the incidence of diagnostic uncertainty is very low. Ozden *et al.*[9] reported that the diagnostic accuracy using these two investigations is in the range of 90–95%. In the latter part of their study, no patient had undergone surgery for diagnostic uncertainty.[9] A contrasting opinion comes from a large surgical series from the Memorial Sloan Kettering Cancer Center (n = 52) where diagnostic uncertainty was the indication for surgery in 29% of their patients.[7]

Although most patients with haemangiomas of the liver may be safely followed up, some patients need surgery for symptoms (pain, *etc.*), large or increasing size, uncertain diagnosis and complications (consumptive coagulopathy, rupture, *etc.*). Yoon *et al.*[7] reported that the commonest indication for surgery was the presence of symptoms (60%); others were an uncertain diagnosis (29%) and large or increasing size (11%). In another series from the US,[10] the indications of surgery were pain or increase in size (68%), uncertain diagnosis (25%) and rupture (7%). In our patients, the indications were pain (61.9%), increasing size (14.3%) and uncertain diagnosis (23.8%). We had one patient with a complicated haemangioma who presented with abdominal compartment syndrome. We did not encounter any patients with rupture or consumptive coagulopathy.

Although there is a wide range in the size of resected haemangiomas, in the recent literature this varies from 6.5 cm to 11 cm (comparable to 9.5 cm in the current series).[7,10–12] The choice of surgical procedure (enucleation or liver resection) depends on the individual surgeon. Enucleation can be performed for any size of tumour and has the advantage of not removing any liver parenchyma. Similar to our experience, others have found it to result in less blood loss (400–922 ml) and require less operating time (204 min) compared to liver resection (blood loss 1000–2080 ml; operation time 258–262 min).[10,12–14]

Zimmermann and Baer[15] described the well-formed tumour–liver interface and its surgical application. Since there are no bile ducts traversing the plane between the liver and the haemangioma, enucleation does not result in postoperative bile leak, which is an infrequent, but troublesome, complication of liver resection. Brouwers *et al.*[12] reported 24 patients treated by liver resections. Five patients (21%) had early postoperative complications (of whom 2 had bile leaks). Gedaly *et al.*,[10] on multivariate analysis of their results of surgery for hepatic haemangiomas (n = 28), found that enucleation (versus liver resection) was associated with fewer intra-abdominal complications. They also found that intra- and postoperative complications resulted in prolonged hospital stay in patients undergoing liver resection (as in the present series). Similar findings have been reported recently by Hamaloglu *et al.*[16] and Lerner *et al.*[17]

In recent years, few reports of the successful use of angio-embolisation have been published.[18,19] It may be suc-

cessful in selected patients, but this form of therapy has not been used widely. While embolisation may be useful in symptomatic patients who are considered high surgical risks, we did not find a consistent benefit in the patients in whom it was used.

Conclusions

Enucleation can be accomplished more safely than liver resection. This assumes importance because of the benign nature and high incidence of hepatic haemangiomas, where the risks of surgery, as for malignancy, may not be as acceptable. While there may be an occasional place for a liver resection (*e.g.* uncertain diagnosis, total replacement of a lobe), in most cases we recommend enucleation as the surgical procedure of choice for the treatment of hepatic haemangioma.

References

1. Ishak KG, Rabin L. Benign tumours of the liver. *Med Clin North Am* 1975; **59**: 995–1013.
2. Adam YG, Huvos AG, Fortner JG. Giant hemangioma of the liver. *Ann Surg* 1970; **172**: 239–45.
3. Terkivatan T, Vrijland WW, Den Hoed PT, De Man RA, Hussain SM, Tilanus HW *et al*. Size of lesion is not a criterion for resection during management of giant liver haemangioma. *Br J Surg* 2002; **89**: 1240–4.
4. Terkivatan T, de Wilt JH, de Man RA, van Rijn RR, Zondervan PE, Tilanus HW *et al*. Indications and long-term outcome of treatment for benign hepatic tumors: a critical appraisal. *Arch Surg* 2001; **136**: 1033–8.
5. Tsai HP, Jeng LB, Lee WC, Chen MF. Clinical experience of hepatic hemangioma undergoing hepatic resection. *Dig Dis Sci* 2003; **48**: 916–20.
6. Kammula US, Buell JF, Labow DM, Rosen S, Millis JM, Posner MC. Surgical management of benign tumors of the liver. *Int J Gastrointest Cancer* 2001; **30**: 141–6.
7. Yoon SS, Charny CK, Fong Y, Jarnagin WR, Schwartz LH, Blumgart LH *et al*. Diagnosis, management, and outcomes of 115 patients with hepatic hemangioma. *J Am Coll Surg* 2003; **197**: 392–402.
8. Vishnevsky VA, Mohan VS, Pomelov VS, Todua FI, Guseinov EK. Surgical treatment of giant cavernous hemangioma liver. *HPB Surg* 1991; **4**: 69–78.
9. Ozden I, Emre A, Alper A, Tunaci M, Acarli K, Bilge O *et al*. Long-term results of surgery for liver hemangiomas. *Arch Surg* 2000; **135**: 978–81.
10. Gedaly R, Pomposelli JJ, Pomfret EA, Lewis WD, Jenkins RL. Cavernous hemangioma of the liver: anatomic resection vs. enucleation. *Arch Surg* 1999; **134**: 407–11.
11. Popescu I, Ciurea S, Brasoveanu V, Hrehoret D, Boeti P, Georgescu S *et al*. Liver hemangioma revisited: Current surgical indications, technical aspects, results. *Hepatogastroenterology* 2001; **48**: 770–6.
12. Brouwers MA, Peeters PM, de Jong KP, Haagsma EB, Klompmaker IJ, Bijleveld CM *et al*. Surgical treatment of giant haemangioma of the liver. *Br J Surg* 1997; **84**: 314–6.
13. Duron JJ, Keilani K, Jost JL, Barrat C. Giant cavernous hepatic hemangiomas in adults: enucleation under selective blood inflow control. *Am Surg* 1995; **61**: 1019–22.
14. Demiryurek H, Alabaz O, Agdemir D, Sungur I, Erkocak EU, Akinoglu A *et al*. Symptomatic giant cavernous haemangioma of the liver: Is enucleation a safe method? A single institution report. *HPB Surg* 1997; **10**: 299–304.
15. Zimmermann A, Baer HU. Fibrous tumor-liver interface in large hepatic neoplasms: its significance for tumor resection and enucleation. *Liver Transpl Surg* 1996; **2**: 192–9.
16. Hamaloglu E, Altun H, Ozdemir A, Ozenc A. Giant liver hemangioma: therapy by enucleation or liver resection. *World J Surg* 2005; **29**: 890–3.
17. Lerner SM, Hiatt JR, Salamandra J, Chen PW, Farmer DG, Ghobrial RM *et al*. Giant cavernous liver hemangiomas: effect of operative approach on outcome. *Arch Surg* 2004; **139**: 818–21.
18. Srivastava DN, Gandhi D, Seith A, Pande GK, Sahni P. Transcatheter arterial embolization in the treatment of symptomatic cavernous hemangiomas of the liver: a prospective study. *Abdom Imaging* 2001; **26**: 510–4.
19. Giavroglou C, Economou H, Ioannidis I. Arterial embolization of giant hepatic hemangiomas. *Cardiovasc Intervent Radiol* 2003; **26**: 92–6.