Original Article
African Journal of Paediatric Surgery
Vol. 4 (1); Jan - Jun 2007

Outcome of Liver Resection for Liver Tumours in Children: An Institutional Review from a Developing Country

[1]Krishna K. G., [2]Chitra S., [3]Seeniraj K.
[1]Birmingham Children's Hospital, UK; [2]Department of Pathology, Institute of Child Health, Chennai, India; [3]Department of Paediatric Surgery, Institute of Child Health, Chennai, India

Abstract

Background: Availability of gadgets like Harmonic Scalpel allows liver resection to be performed with ease and minimal blood loss. The scenario is different in a developing country which lacks these modern gadgets. We present a review of our results of liver resection from a referral institute in a developing country.

Patients and Methods: We reviewed children with liver resection done at our Institute from July 1999 - July 2006. Children with liver trauma and non operated tumour cases were excluded.

Results: Twenty one resections were carried out in 7 years, achieving a 68.4% disease free survival rate. The most common presenting complaint was abdominal mass (19 / 21-90%). The majority (85%, 18/21) were found to be malignant on histopathological examination. Anatomical resections were performed in 16 (85%) children; 4 developed tumour recurrence, 3 with recurrence did not respond to second line chemotherapy and died while waiting for reoperation. One with recurrent liver tumour refused further treatment. Two (10%) were lost to follow up.

Conclusion: Liver resections can be safely performed in the absence of the modern gadgets, although presence of such gadgets would facilitate resection in terms of operating time and blood loss.

Keywords: Liver resection, paediatric liver tumours, outcome

Introduction

Liver tumours account for 1% of all childhood malignancies[1]. Surgical resection continues to form an important part of management of liver tumours. Advances in surgical technique have brought improvement in the outcome of hepatic resection.

In our tertiary care referral centre 5 to 6 new cases of liver tumours are registered annually, although the facilities for management of children with liver tumours like chemotherapy exist, modern gadgets such as Harmonic Scalpel are not available. Given these limitations, we wanted to analyse the outcome of resection for liver tumours in our Institute, in the perspective of a centre from a developing country. The pattern of presentation and histopathological profile of liver tumours, and the outcome of liver resection were analysed.

Correspondence: Mr G Krishna Kumar, Registrar, Department of Paediatric Surgery, Birmingham Children's Hospital, UK. Email - sasisang@rediffmail.com

Patients and Methods

All children who underwent liver resection from July 1999 July 2006 at the Institute of Child Health, Chennai, India were studied. Exclusion criteria were children with liver tumours not operated, or trauma related liver resection. Informed consent for inclusion in the study was obtained from the parents of the children.

Surgical procedure involved exposure and mobilization of the liver by cutting the ligaments and taking vascular control. Finger fracture method was used for parenchymal resection; ligation of the large vessels and ducts was done at the end of the procedure.

All children were followed up on a periodic basis: monthly for one year, 3 monthly for two years, 6 monthly for three years, and annually thereafter. Children underwent a complete clinical examination during the follow up visit. In addition, relevant investigations including chest X-ray, ultrasonography of abdomen, complete blood counts, liver function tests and tumour markers were carried out during the

Copyright © 2007 African Journal of Paediatric Surgery

follow up, to detect loco-regional recurrence of tumours. The children were discussed in a weekly tumour board, which comprised a team of specialists including a medical oncologist, radiotherapist, pathologist and 3 consultant paediatric surgeons.

Results

Table 1: Age, Gender and Histopathological Profile

Age in years	Male	Female	Total
<1	2 HPB	3 HPB, 1 HE	6 (28.5%)
1-2	3 HPB	4 HPB	7 (33.5%)
2-3	1 HPB, 1 HE	1 HPB	3 (14.3%)
4-5	1 Ad Ca	1 Adenoma	2 (9.5%)
6-7	1 Ma Me Ha	1 Ad Ca	2 (9.5%)
8-9	1 Hepatoma	-	1 (4.9%)
Total	10	11	21

HPB - hepatoblastoma, HE - hemangioendothelioma
Ad Ca - Adrenal Carcinoma with metastases
Ma Me Ha - Malignant mesenchymal hamartoma

Table 2: Clinical Features

Presentation	Number of Cases
Abdominal Mass/distension	19 (90%)
Anorexia	5 (23%)
Fever	5 (23%)
Failure to thrive	4 (20%)
Weight loss	2 (10%)
Pain abdomen	2 (10%)
Pseudo precocious puberty	2 (10%)

Table 3: Alpha Foeto Protein Profile

Levels ng/mL	Cases
>30,000	6 HPB
10,000 - 30,000	5 HPB
1,000 - 10,000	3 HPB
<1,000	1 HE, 1 Hepatoma
Normal	1 Adenoma, 1 HE, 1 MMH, 2 Ad Ca

HPB - hepatoblastoma, HE - hemangioendothelioma
Ad Ca - Adrenal Carcinoma with metastases
MMH - Malignant Mesenchymal Hamartoma

A total of 21 children were enrolled in the study over a period of 7 years. Ten (48%) were boys and 11(52%) were girls (M:F=1:1.1).

The youngest child was 3 weeks of age and the oldest was aged 8 years (median=18 months). Their age distribution is shown in table 1. Seven (33%) patients were within the age group of 1-2 years, 6 (29%) were less than one year (2 of whom were neonates). Overall, 80% of the children were below 3 years of age as opposed to 20% in those older more than 4 years of age.

All the patients had a palpable mass or hepatomeagaly. The next most common presenting complaint was abdominal mass / distension of abdomen in 19/ 21 (90%), followed by anaemia in 13 (60%). The clinical features are listed in table 2. Two (9.5%) patients presented with pseudo-precocious puberty, one had adrenal tumour with secondaries to the liver, and the other had a beta human choriomic gonadotropin (HCG) producing Hepatoblastoma. None of the children had jaundice, although altered liver enzymes were present in more than a half of the patients.

Sixteen (76%) patients showed abnormality in the marker profile (Table 3). Alpha foeto protein was grossly elevated (above 30,000 ng/mL) in 6 (29%). Beta Human Chorionic Gonadotropin was elevated in 2.

The majority (18/21, 86%) were malignant on histopathological examination while 3 (14%) were benign liver tumours. Among the malignant tumours, hepatoblastomas accounted for 67% (14/21). Others were adrenal carcinoma (with secondaries to the liver) 2, and 1 each of malignant mesenchymal hamartoma and hepatoma. Of the benign tumours, there were 2 haemangioendotheioma and 1 hepatic adenoma.

The commonly employed incision was bilateral rectus cutting incision in 12 (57%). Other incisions used were chevron in 7 /21 (33%) and midline in 2 (9.5%). Anatomical resections included a right hepatectomy in 9 (43%) patients, and left hepatectomy in 7 (33%). Non-anatomical resections were undertaken in 4 (19%) and 1 (5%) underwent

Copyright © 2007 African Journal of Paediatric Surgery

segmentectomy. Re-resections were performed in 3 patients who under-went non anatomical resection because of residual disease. In 2 patients concomitant adrenalectomy and liver resection was performed for adrenal carcinoma with liver metastases. Majority (9/16) of the anatomical resections were right hepatectomies. In 5 patients, Pringle's manoeuvre was performed to reduce blood loss. Packed red blood cells were transfused in 18 /21 (86%), an average of 1 unit of packed cells per child (range 100 ml 5 units).

Immediate complications within the first post-operative period were noted in 8 (38%) patients. Bile leak occurred in 3, 2 of which subsided without any intervention. One child who had persistent bile leak required intervention. Significant post-operative haemorrhage was observed in 5 patients, 3 of whom needed blood transfusions only but the remaining 2 required additional packing to reduce bleeding. These 2 patients later died due to sepsis and multiorgan failure after a prolonged stay in the intensive care unit. Late complications occurring beyond the first post-operative week were recorded in 6 (29%) patients. One developed incisional hernia, and the other manifested bilio-entero cutaneous fistula, requiring intervention. The remaining 4 patients developed recurrences within 6 months of follow up. Three of these 4 patients did not respond to second line chemotherapy and died while waiting for reoperation. The remaining patient refused further treatment.

All had chemotherapy, except 6 patients who had unfavourable histology report and these included 2 each of hemangioendotheliomas and adrenal tumours with secondaries to the liver, and 1 each of hepatic adenoma and hepatocellular carcinoma. The chemotherapeutic regime consisted of Vincristine, 5-FluoroUracil and Cisplatin. Chemotherapy was started 10 days after surgery and a total of 6 cycles was given. Among the 15 children who received chemotherapy, only 2 were subjected to neo adjuvant chemotherapy in view of doubtful resectability, based on imaging studies.

Five (24%) patients died during the treatment. Two (10%) patients were lost to follow up, but the rest were followed up for varying lengths of time. The disease-free rate among survivors was 94% (15/16) at the conclusion of study. Four patients had been followed up for 1 year; 2 each had completed 2 year and 3 year follow up, and 5 had completed 5 year follow up.

Discussion

Hepatic resection is the main treatment modality for hepatic tumours in childhood. Advances in diagnostic technique, preoperative preparation, surgical technique and postoperative management have increased the success rate[1,2].

The incidence of malignant liver tumours in this study agrees with a cancer registry program in the Bethesda cancer institute[1], and the annual resection rate is similar to the report by Young et al[2]. The median age at diagnosis for hepatoblastoma was 18 months which is consistent with the reports of Exelby et al[3]. According to Tomlinson[4], 5% of hepatoblastomas were seen in children older than 4 years of age, but we did not see hepatoblastoma in children older than 4 years. Weinberg et al[5] reported a male predominance of 1.4: 1 to 2:1 in childhood hepatoblastoma. This contrasts with the near equal gender ration in this study.

In the series reported by Exelby et al[3], the most frequent clinical presentation of hepatic tumours was the presence of an abdominal mass accounting for 68% of cases. This compares with the 90% cases with abdominal mass in the present report. Abdominal pain and weight loss were uncommon features in our series. Although consistent with our findings, the series of Exelby[3] reported a higher percentage of weight loss. Alpha foeto protein is usually markedly elevated in hepatoblastomas and in many cases of hepatocellular carcinoma[6]. This also was our experience in the cases of hepatoblastoma.

Malignant tumours accounted for over three quarters of all liver tumours in this study. This pattern is observed in other report[7]. Histopathological profile of our series revealed hepatoblastoma as the commonest variety of tumour. This compares with the

Copyright © 2007 African Journal of Paediatric Surgery

report by Finegold et al[7].

We used the triple drug regime for the treatment of hepatoblastoma, after surgical resection. This regime according to the Paediatric Oncology group[8] (POG) is expected to produce a 67% 4yearr survival rate. Recent trials have reported the use of other regimes, including Cisplatin & Doxorubicin, Ifosfamide, Cisplatin & Doxorubicin with better overall

Résultat de la résection du foie pour des tumeurs du foie chez les enfants: un compte rendu institutionnel d'un pays en voie de développement

Résumé

Arrière-plan: La disponibilité de gadgets comme le scalpel harmonique facilite la résection du foie en réduisant la quantité de sang perdu. Le scénario est différent dans un pays en voie de développement qui manque de ces gadgets modernes. Nous présentons un compte rendu des résultats de notre résection du foie dans un institut spécialisé dans un pays en voie de développement. ***Malades et méthodes:*** Nous avons examiné des enfants ayant subi la résection du foie à notre institut de juillet 1999 à juillet 2006. Nous avons exclu les enfants atteints du traumatisme du foie et de tumeurs non opérées. ***Résultats:*** Vingt et une résections ont été effectuées en 7 ans, ce qui donne un taux de 68,4% de survie sans maladie. La plainte la plus fréquente était une masse abdominale (19 / 21 - 90%). Suite à un examen histopathologique, la majorité (85%, 18/21) des tumeurs se sont avérées être malignes. Seize (85%) enfants ont subi une résection anatomique ; chez 4 enfants, on a constaté la réapparition de la tumeur, 3 enfants souffrant d'une réapparition tumorale n'ont pas réagi positivement à la chimiothérapie et ils sont morts en attendant une autre opération. Un enfant atteint d'une tumeur du foie périodique a refusé un traitement supplémentaire. Deux enfants (10%) ont été perdus au suivi. ***Conclusion:*** Les résections du foie peuvent être effectuées sans risque en l'absence de gadgets modernes, bien que la présence de tels gadgets facilite la résection quant à la durée de l'opération et à la quantité de sang perdu. ***Mots-clés:*** Résection du foie, tumeurs pédiatriques du foie, résultat.

References

1. Bulterys M, Goodman M, Smith M, Buckley J. Hepatic tumors. In: Ries L, Smith M, Gurney J et al, eds.Cancer incidence and survival among children and adolescents. US SEER program 1975-95. Bethesda National cancer Institute, SEER program, NIH, 1999.
2. Young JL, JrRies LG, Silverberg E, et al: Cancer incidence, survival and mortality for children younger than age 15 years. Cancer 1986; 58:598.
3. Exelby PR, Filler RM, Grosfeld JL. Liver tumours in children in particular reference to hepatoblastoma and hepato-cellular ca: American Academy of Paediatrics Surgical section Survey 1974. J Pediatr Surg 1975; 10:329-337.
4. Tomlinson GE, Finegold MJ. Tumours of the Liver. In: PA Pizzo, DG Pablock,eds. Principles and Practice of Paediatric Oncology.Lippincott Williams and Wilkins, Philadelphia, 4th edition, 2002: 847-859.
5. Weinberg A, Finegold M.Primary hepatic tumours of childhood. Hum Pathol 1983; 14:512-537.
6. Frederick J Rescorla. Malignant tumours: hepatoblastoma and hepatocellular ca. In: ER Howard, MD Stringer, PM Colombani, eds. Surgery of the liver, Bile ducts and Pancreas in children. Arnold, New Delhi, 2002, 261-278.
7. Weinberg A, Finegold M.Primary hepatic tumours of childhood. Hum Pathol 1983; 14:512-537.
8. Douglas EC, Reynolds M, Finegold M, Cantor AB, Glicksman A.: hepatoblastoma: a paediatric oncology group study.J Clin Oncol 1993; 11:96-9.
9. Beckwith J. Macroglossia, Omphalocoele, adrenal cytomegaly, gigantism and hyperplastic visceromegaly. Birth Defects1969; 5:188-196.
10. Ekinci S, Karnak I, Tanyel FC, et al. Hepatic lobectomies in

Copyright © 2007 African Journal of Paediatric Surgery