

# Palliation of malignant hilar obstruction at a single centre – review of operative and non-operative techniques

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## Summary

**Introduction.** Jaundice secondary to a malignant hilar obstruction can be relieved by operative bypass or percutaneous stenting. Comparative trials involving these techniques are scarce. We reviewed our experience with these competing techniques in the palliation of malignant hilar obstruction.

**Patients and methods.** All patients with malignant hilar obstruction managed at our institution during the period 1992 - 2002 were identified for review.

**Results.** A total of 36 deeply jaundiced patients with hilar obstruction were identified. Twenty-two patients underwent exploration with the intention of performing an operative bypass and 14 patients underwent percutaneous transhepatic cholangiography (PTC) with intention to stent. Procedure-related mortality was similar in both groups. Morbidity was much higher in the operative group. Effective symptom relief was achieved with both techniques. In the PTC group recurrent biliary obstruction in 2 patients necessitated salvage non-operative procedures. Although survival rates were slightly longer in the operative group, this was not significant. There were no long-term survivors.

**Conclusion.** Operative bypass provides better sustained relief of jaundice than PTC. However long-term survival in both groups is poor and operative bypass is best reserved for younger patients with no technical contraindications. Despite early and late procedural failures PTC is the method of choice for patients with advanced-stage disease and those with significant co-morbidities.

Only a small subset of patients with malignant hilar obstruction may be candidates for resectional surgery and for the majority palliation of jaundice is the therapeutic objective.<sup>1-6</sup> The gold standard in palliation is a widely patent biliary enteric anastomosis, above the level of obstruction. For patients with a proximal obstruction, this involves the fashioning of an intrahepatic biliary-enteric anastomosis.<sup>7-19</sup> However, in patients with advanced malignancy and jaundice major abdominal surgery carries risk.<sup>20-23</sup> The endoscopic or percutaneous deployment of stents across the obstruction has increasingly been used as an alternative to operative bypass.<sup>24-27</sup> The first stents were plastic and narrow-gauge and recurrent occlusion necessitated further procedures, thus impacting negatively on the quality of palliation.<sup>23</sup> Modern self-expanding metal wall stents provide more durable relief of jaundice.<sup>4,23,24,26</sup> We reviewed our experience with the management of malignant hilar obstruction over the period 1992 - 2002 in an attempt to clarify the roles of operative and non-operative bypass. This period encompassed the era of operative bypass and the advent of the percutaneous metal wallstent insertion at our institution.

## Patients and methods

We reviewed all patients who had presented to us with malignant hilar obstruction between 1992 and 2002 and who were treated with either a biliary enteric bypass or a wallstent. Notes were retrieved from the hospital records and proformas were filled out documenting routine demographic details, modality of treatment complications and survival.

## Operative bypass

We used the technique initially described by Soupault and Couinaud<sup>7</sup> in 1957 which involves the anastomosis of a jejunal loop to the segment III duct on the left side of the liver.

The operation relies on the anatomical understanding that the obliterated umbilical vein which runs in the ligamentum teres joins the segment III branch of the portal vein. The accompanying bile duct lies above and behind this corresponding portal venous radical. Downward traction to the right on the divided ligamentum teres allows for finger and diathermy fracture of the parenchyma between segments III and IV (Fig. 1). This creates a wedge-shaped space leading down to the segment III duct (Fig. 2). The bile duct is located by needle aspiration and is exposed for 2 cm. It is opened longitudinally for at least 1 cm and a Roux-en-Y loop is anastomosed end-to-side or side-to-side depending on the best fit in the confined space using a fine interrupted absorbable suture material (Fig. 3). A transanastomotic stent is left in place depending on the operator's discretion. This allows for postoperative cholangiography and is removed 2 weeks after the operation.

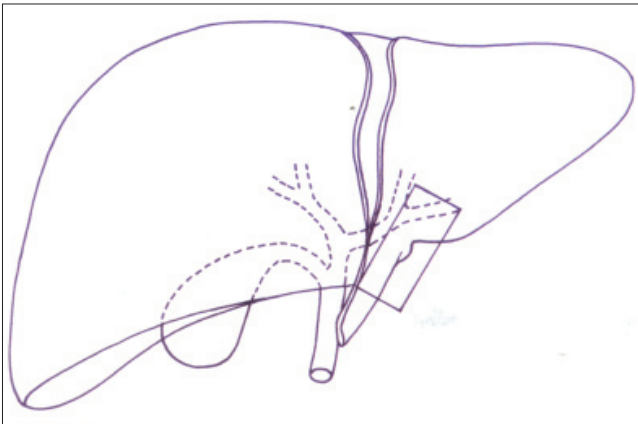


Fig. 1. Schematic depiction of the site of liver division to allow identification of the segment III duct.

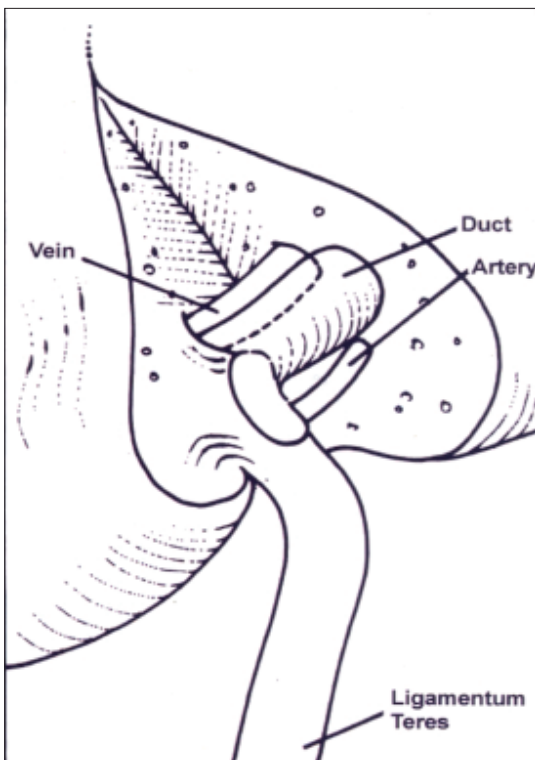


Fig. 2. Schematic depiction of how division of the liver substance exposes the sectoral triad for duct identification and cholangio-enteric anastomosis.

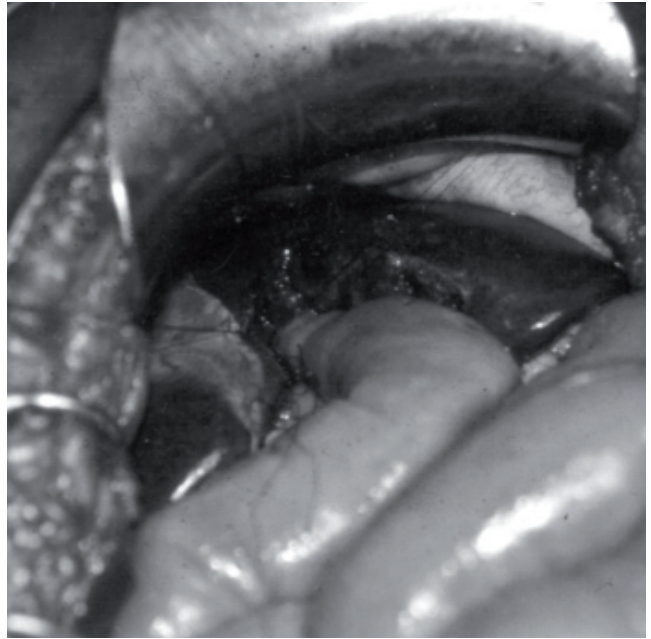


Fig. 3. Anastomosis completed with the loop in the liver defect.

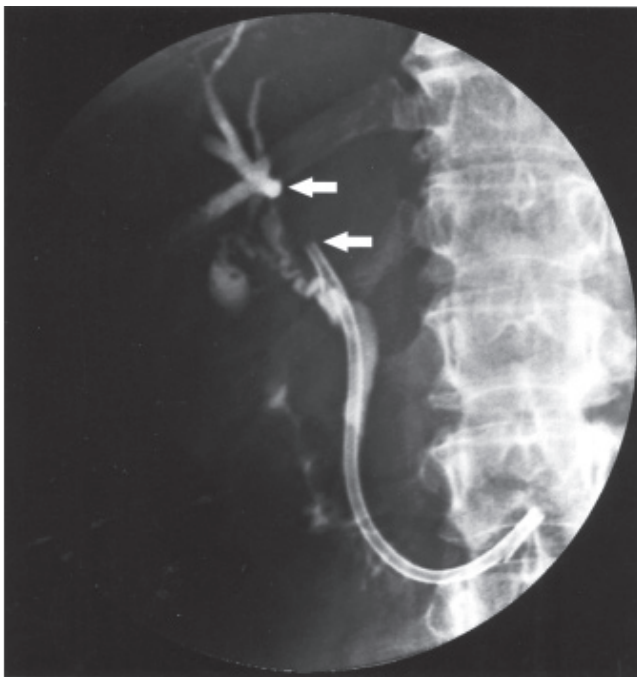
### Percutaneous transhepatic cholangiography (PTC)

With the patient cleaned and draped, a puncture site is fluoroscopically selected below the costophrenic angle in the mid-axillary line. A 22-gauge Chiba needle is advanced towards a marker placed on the xiphisternum, and contrast is injected as the cannula is withdrawn. Once ductal entry is confirmed the biliary tree is opacified and a definite point of entry identified. The system is re-cannulated and a guidewire is passed into the system and manipulated across the stricture into the duodenum. The tract is dilated prior to the self-expanding metal stent being delivered, with the distal end in the duodenum and the proximal end sitting in a peripheral biliary radicle. Once the position is confirmed, the stent is deployed.

### Results

A total of 36 deeply jaundiced patients with hilar obstruction were treated at our institution during the period under review. Their age range was 46 - 89 years and the average serum bilirubin level was 251  $\mu\text{mol/l}$  (range 105 - 407  $\mu\text{mol/l}$ ). During the period 1992 - 1998, 22 patients underwent exploration with the intention of performing a segment III duct cholangioenteric anastomosis. Since 1998 no patient has undergone an operative segment III bypass. One patient had undergone a prior attempt at endoscopic stenting. Two patients (9%) died peri-operatively. One patient with liver cirrhosis died from coagulopathic bleeding and 1 from a myocardial infarction. Three patients (14%) developed biliary fistula, 1 of which persisted until the patient's death. Twenty patients were discharged home. The bilirubin level fell significantly from 243  $\mu\text{mol/l}$  ( $\pm 114$ ) to 95 ( $\pm 47$ )  $\mu\text{mol/l}$  2 weeks after surgery ( $p < 0.0003$ ) in all patients. Pruritus was relieved in all patients. Eight patients (36%) remained jaundice free until death at 1, 3, 6, 6, 8, 9, 9 and 11 months following surgery. Twelve patients were still alive after a year. Ten (83%) of these were anicteric after a year. Only 4 returned for review after 1 year. All of this group have subsequently died. The longest survivor lived for 28 months.

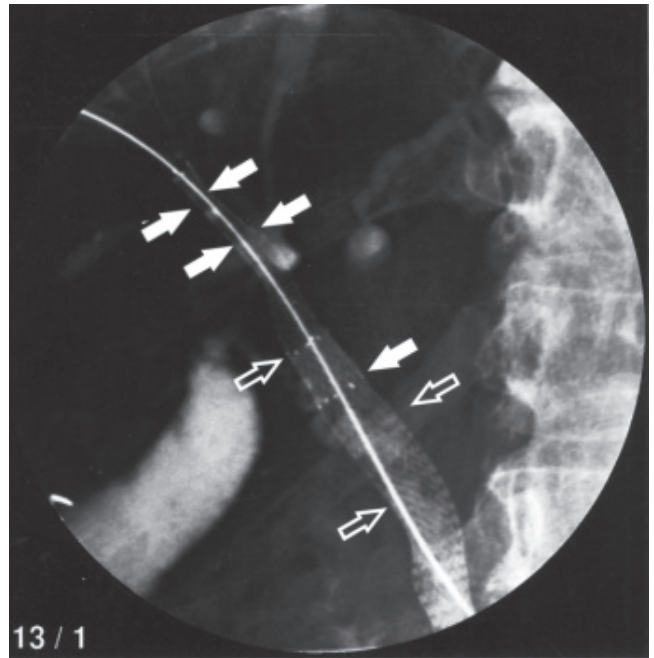
Between 1995 and 2002 14 patients (age range 53 - 78 years) underwent PTC with the intention to stent. Their diagnosis included cholangiocarcinoma ( $N = 10$ ), hepatoma ( $N = 1$ ), and gallbladder carcinoma ( $N = 3$ ). Non-therapeutic exploration ( $N = 2$ ), unsuccessful cholecystjejunostomy ( $N = 1$ ) and failed endoscopic stent placement ( $N = 1$ ) were performed before referral. Three were in established renal failure at presentation. PTC was successful at a single sitting in 9 patients, and at multiple sittings in 3. In 2 PTC was unsuccessful. These patients were left with external biliary fistulas (14%). In all patients who had undergone successful PTC, serum bilirubin levels dropped significantly by 1 week ( $84 \mu\text{mmol}$ ,  $p < 0.003$ ). All these patients experienced relief of pruritus. Renal failure resolved in the 3 patients who had presented with this established complication. Two patients (14%) died during the index hospital admission. Recurrent biliary obstruction in 2 patients (14%) necessitated salvage endoscopic retrograde cholangiopancreatography (ERCP) and PTC respectively. Three were transferred back to their referral hospital. Four patients survived more than a year. The remaining patients died as outpatients, with a median survival of 7 months. Figs 4 and 5 show the PTC of a patient demonstrating short hilar stricture with a failed endoscopic stent *in situ*. An overlapping stent was deployed percutaneously to alleviate the obstruction.



**Fig. 4.** Migrated biliary stent and the extent of the hilar stricture (arrowed).

## Discussion

The literature reporting on the operative palliation of malignant hilar obstruction is summarised in Table I and that reporting on the non-operative palliation is summarised in Table II. There are several consistent features in these series. As in our study, the numbers are generally small, the long-term survivors are few, and there is a paucity of quality-of-life data. Histological data are similarly vague as it is often difficult to obtain decent histological specimens in the setting of biliary malignancy. Most series include a number of diverse pathologies such as Klatskin tumours, gallbladder carcinomas and external compression from malignant hilar lymph nodes.



**Fig. 5.** Radio-opaque marked delivery device with the partially deployed proximal stent arrowed (white closed arrows). The stent overlap is between the superior open arrow and the inferior closed arrow. The distal stent (white open arrows) has already been deployed in the duodenum (not shown).

Our results with operative bypass are in keeping with the literature and confirm that the operation is technically feasible and successful in providing symptom relief until death, although it is associated with a not inconsiderable mortality and morbidity.<sup>9,11,15,28,29</sup> Survival is limited to less than a year in all series including our own.

In our non-operative group significant numbers presented with established renal failure ( $N = 3$ ) and prior intervention ( $N = 4$ ). We feel that this has contributed to our relatively high morbidity and mortality and technical failure rate with this procedure. We would expect a much higher primary success rate in patients who did not have an established complication of obstructive jaundice and who had not undergone unsuccessful invasive interventions before referral.

Decision-making in this group of patients is difficult. They have advanced malignancy, limited life expectancy and are at risk of developing several life-threatening complications. It is essential that the treatment modality has negligible morbidity and mortality and provides sustained relief of jaundice until death. Choosing the most appropriate palliative approach for an individual patient must take into account the patient's expected remaining life expectancy and systemic fitness.<sup>3,5,6,22,25-27,30</sup> The objection to non-operative palliation advanced by Myburgh<sup>18</sup> was that it was not as durable a procedure as operative bypass. He felt that the operation spared the patient any further interventions during what short time was left. Plastic stents are prone to early occlusion,<sup>31</sup> and series using self-expanding metal stents report long-term occlusion rates ranging from 23% to 27%.<sup>32-34</sup> His concerns are real, as confirmed by our re-intervention rate of 14%. However, radiological or endoscopic re-intervention does not necessarily equate to less than satisfactory palliation. In Lai *et al.*'s comparative historical series,<sup>35</sup> although the non-operative group required more frequent readmissions to deal with stent occlusion, there was no demonstrable difference

TABLE I. SERIES OF INTRAHEPATIC-CHOLANGIOENTERIC ANASTOMOSIS FOR HILAR OBSTRUCTION

Series	Date	Period (years)	No. of patients	Pre-operative bilirubin average ( $\mu\text{mol/l}$ )	Operative mortality	Morbidity (%)	Jaundice relief (%)	Hospital average stay (days)	Late failure rate (%)	Median survival (months)
Traynor <i>et al.</i> <sup>17</sup>	1987	25	48	331	6	17	73	NS	NS	9.2
Jagannath <i>et al.</i> <sup>10</sup>	1992	NS	17	323	6	30	76	NS	NS	NS
Lai <i>et al.</i> <sup>35</sup>	1992	6	34	220	18	50	NS	35	1.4/ month	3
Myburg <sup>18</sup>	1995	NS	65	NS	2	NS	NS	NS	1	6
Guthrie <i>et al.</i> <sup>9</sup>	1994	8	26	350	11	23	78	5 - 44	25	7.5
Jarnagin <i>et al.</i> <sup>11</sup>	1998	5	55	NS	11	45	100	14	18	3
Vellar <i>et al.</i> <sup>19</sup>	1998	NS	10	NS	10	NS	66	NS	NS	NS
Suzuki <i>et al.</i> <sup>15</sup>	2001	NS	15	NS	0	13	77	NS	44	9
Clarke (this study)	2004	10	18	243	9	14	100	14	20	7
<b>Average</b>		<b>10</b>		<b>293</b>	<b>9</b>	<b>27</b>	<b>81</b>	<b>21</b>	<b>22</b>	<b>7</b>

NS = not stated.

TABLE II. SERIES OF STENTS FOR HILAR OBSTRUCTION

Series	Date	Period (years)	Approach stent type	No. of patients	Pre-operative bilirubin average	Jaundice relief	Technical failure (%)	Re-intervention rate (%)	Early mortality (%)	Morbidity (%)	Hospital stay (days)	Median survival (months)
Wagner <i>et al.</i> <sup>34</sup>	1992	2	PTC/PS	9	152	Value NS	12	22	0	NS	NS	NS
Wagner <i>et al.</i> <sup>34</sup>	1992	2	PTC/MWS	11	204	Value NS	0	18	0	NS	NS	NS
Lai <i>et al.</i> <sup>35</sup>	1992	6	ENDO & PTC/PS	16	273	Value NS	0	3.5/ month	38	50	34	1.4
Schima <i>et al.</i> <sup>32</sup>	1997	NS	PTC/MWS	41	NS	SP	0	NS	39	0	NS	6
Gerhards <i>et al.</i> <sup>31</sup>	2001	7	ENDO & PTC/PS	41	162	Value NS	0	78	3	12	7	9
Cheng <i>et al.</i> <sup>33</sup>	2002	10	ENDO/MWS	36	NS	NS	3	31	6	8	NS	5
Clarke (this study)	2004	10	PTC/MWS	14	251	SD	14	14	14	14	6	7
<b>Average</b>		<b>6</b>		<b>24</b>	<b>208</b>	<b>84 <math>\mu\text{mol/l}</math> by 7 days</b>	<b>9</b>	<b>32</b>	<b>14</b>	<b>21</b>	<b>16</b>	<b>5</b>

NS = not stated; PTC = percutaneous transhepatic cholangiography; ENDO = endoscopic; PS = plastic stent; MWS = metal wall stent; SD = significant drop; SP = stent patency.

in quality of life between the 2 groups. Most stent occlusions can be dealt with radiologically or endoscopically as we did in 2 of our patients. If follow-up is good and the development of jaundice is recognised early, then appropriate intervention can be elective with minimal inconvenience to the patient. There has never been a double-blind randomised trial comparing stenting with operative bypass, and results are further confounded by the tendency to select patients for stenting on the basis of co-morbidity and advanced malignancy. Neo-adjuvant therapy has been advocated by some units for hilar lesions, however reported numbers remain

small and benefits marginal.<sup>36,37</sup> If adjuvant therapy were to become an established part of treatment of this disease and to prolong survival the choice of palliative technique may be further complicated.

In general, fitter patients with reasonable life expectancy are selected for operative biliary bypass, while frail patients are selected for non-operative palliation. Consequently the development of prognostic scoring systems in these patients has received attention.<sup>30,38</sup> The difficulty in obtaining statistically significant numbers has necessitated multi-centre pooling of data, thus compounding selection bias. A number

of mathematical models have been derived from pooled data to predict poor outcome in patients with malignant hilar obstruction and thus select patients for non-operative palliation.<sup>30,38</sup> However these scoring systems remain cumbersome and their universal applicability is unclear.

Ultimately local bias, referral patterns and available expertise influence the choice of therapy. We feel that PTC can be performed with minimal morbidity and can provide sustained relief of jaundice. If the event of occlusion salvage is usually possible, either endoscopically or percutaneously. Operative bypass is a major abdominal operation, which carries a definite mortality rate. We have moved away from operative bypass for all but the fittest of patients, or for patients who undergo laparotomy with intention to resect.

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#### REFERENCES

- Nakagohri T, Asano T, Kinoshita H, *et al*. Aggressive surgical resection for hilar-invasive and peripheral intrahepatic cholangiocarcinoma. *World J Surg* 2003; **27**: 289-293.
- Guthrie CM, Haddock G, De Beaux AC, Garden OJ, Carter DC. Changing trends in the management of extrahepatic cholangiocarcinoma. *Br J Surg* 1993; **80**: 1434-1439.
- Parc Y, Frileux P, Balladur P, Delva E, Hannoun L, Parc R. Surgical strategy for the management of hilar bile duct cancer. *Br J Surg* 1997; **84**: 1675-1679.
- Sarmiento JM, Nagorney DM. Hepatic resection in the treatment of perihilar cholangiocarcinoma. *Surg Oncol Clin N Am* 2002; **11**: 893-899.
- Abraham NS, Barkun JS, Barkun AN. Palliation of malignant biliary obstruction: A prospective trial examining impact on quality of life. *Gastrointest Endosc* 2002; **56**: 835-841.
- Bismuth H, Castaing D, Traynor O. Resection or palliation: priority of surgery in the treatment of hilar cancer. *World J Surg* 1988; **12**: 39-47.
- Souppault R, Couinaud CL. Sur un procédé nouveau de dérivation biliaire intra-hépatique - Les cholangiojejunostomies gauches sans sacrifice hépatique. *Presse Med* 1957; **65**: 1157-1159.
- Chaudhary A, Dhar P, Tomez S, Sachdev A, Agarwal A. Segment III cholangiojejunostomy for carcinoma of the gallbladder. *World J Surg* 1997; **21**: 866-870.
- Guthrie CM, Banting SW, Garden OJ, Carter DC. Segment III cholangiojejunostomy for palliation of malignant hilar obstruction. *Br J Surg* 1994; **81**: 1639-1641.
- Jagannath P, Bhansali MS, Desouza LJ, Swaroop VS, Mohandas KM. Palliative segment III biliary bypass (left cholangio-jejunostomy) in malignant block at porta hepatis. *Indian J Gastroenterol* 1992; **11**: 71-72.
- Jarnagin WR, Burke E, Powers C, Fong Y, Blumgart LH. Intrahepatic biliary enteric bypass provides effective palliation in selected patients with malignant obstruction at the hepatic duct confluence. *Am J Surg* 1998; **175**: 453-460.
- Kuvshinoff BW, Armstrong JG, Fong Y, *et al*. Palliation of irresectable hilar cholangiocarcinoma with biliary drainage and radiotherapy. *Br J Surg* 1995; **82**: 1522-1525.
- Ragins H, Diamond A, Meng CH. Intrahepatic cholangiojejunostomy in the management of malignant biliary obstruction. *Surg Gynecol Obstet* 1973; **136**: 27-32.
- Shimada H, Niimoto S, Matsuba A, Nakagawara G, Kobayashi M, Tsuchiya S. Experience with intrahepatic cholangiojejunostomy for unresectable carcinoma of the hepatic hilus. *Int Surg* 1988; **73**: 1-5.
- Suzuki S, Kurachi K, Yokoi Y, *et al*. Intrahepatic cholangiojejunostomy for unresectable malignant biliary tumors with obstructive jaundice. *J Hepatobiliary Pancreat Surg* 2001; **8**: 124-129.
- Taschieri AM, Elli M, Danelli PG, Cristaldi M, Montecamozzo G, Porretta T. Third segment cholangio-jejunostomy in the treatment of unresectable klatskin tumors. *Hepatogastroenterology* 1995; **42**: 597-600.
- Traynor O, Castaing D, Bismuth H. Left intrahepatic cholangio-enteric anastomosis (round ligament approach): an effective palliative treatment for hilar cancers. *Br J Surg* 1987; **74**: 952-954.
- Myburgh JA. Resection and bypass for malignant obstruction of the bile duct. *World J Surg* 1995; **19**: 108-112.
- Vellar ID, Banting SW, Hardy KJ. The anatomical basis for segment III cholangiojejunostomy with analysis of 13 cases. *Aust N Z J Surg* 1998; **68**: 498-503.
- Blamey SL, Fearon KC, Gilmour WH, Osborne DH, Carter DC. Prediction of risk in biliary surgery. *Br J Surg* 1983; **70**: 535-538.
- Pellegrini CA, Allegra P, Bongard FS, Way LW. Risk of biliary surgery in patients with hyperbilirubinemia. *Am J Surg* 1987; **154**: 111-117.
- Pitt HA, Cameron JL, Postier RG, Gadacz TR. Factors affecting mortality in biliary tract surgery. *Am J Surg* 1981; **141**: 66-72.
- Su CH, P'eng FK, Lui WY. Factors affecting morbidity and mortality in biliary tract surgery. *World J Surg* 1992; **16**: 536-540.
- Hatfield AR. Palliation of malignant obstructive jaundice - surgery or stent? *Gut* 1990; **31**: 1339-1340.
- Nordback IH, Pitt HA, Coleman J, *et al*. Unresectable hilar cholangiocarcinoma: percutaneous versus operative palliation. *Surgery* 1994; **115**: 597-603.
- Ahlstrom H, Lorelius LE, Jacobson G. Inoperable biliary obstruction treated with percutaneously placed endoprosthesis. *Acta Chir Scand* 1986; **152**: 301-303.
- Andersen JR, Sorensen SM, Kruse A, Rokkjaer M, Matzen P. Randomised trial of endoscopic endoprosthesis versus operative bypass in malignant obstructive jaundice. *Gut* 1989; **30**: 1132-1135.
- Heffernan N, Cella D, Webster K, *et al*. Measuring health-related quality of life in patients with hepatobiliary cancers: the functional assessment of cancer therapy-hepatobiliary questionnaire. *J Clin Oncol* 2002; **20**: 2229-2239.
- Terwee CB, Nieveen Van Dijkum EJ, Gouma DJ, *et al*. Pooling of prognostic studies in cancer of the pancreatic head and periampullary region: the Triple-P study. Triple-P study group. *Eur J Surg* 2000; **166**: 706-712.
- Rai R, Dick R, Doctor N, Dafnios N, Morris R, Davidson BR. Predicting early mortality following percutaneous stent insertion for malignant biliary obstruction: a multivariate risk factor analysis. *Eur J Gastroenterol Hepatol* 2000; **12**: 1095-1100.
- Gerhards MF, den Hartog D, Rauws EA, *et al*. Palliative treatment in patients with unresectable hilar cholangiocarcinoma: results of endoscopic drainage in patients with type III and IV hilar cholangiocarcinoma. *Eur J Surg* 2001; **167**: 274-280.
- Schima W, Prokesh R, Osterreicher C, *et al*. Biliary wallstent endoprosthesis in malignant hilar obstruction: long-term results with regard to the type of obstruction. *Clin Radiol* 1997; **52**: 213-219.
- Cheng JL, Bruno MJ, Bergman JJ, Rauws EA, Tytgat GN, Huibregtse K. Endoscopic palliation of patients with biliary obstruction caused by non-resectable hilar cholangiocarcinoma: efficacy of self-expandable metallic wallstents. *Gastrointest Endosc* 2002; **56**: 33-39.
- Wagner HJ, Knyrim K, Vakil N, Klose KJ. Plastic endoprosthesis versus metal stents in the palliative treatment of malignant hilar biliary obstruction. A prospective and randomized trial. *Endoscopy* 1993; **25**: 213-218.
- Lai ECS, Chu KM, Lo CY, Fan ST, Lo CM, Wong J. Choice of palliation for malignant hilar biliary obstruction. *Am J Surg* 1992; **163**: 208-212.
- Snady H. Interventional endoscopy, neoadjuvant therapy and the gastroenterologist. *Hematol Oncol Clin North Am* 2002; **16**: 53-79.
- Shinchi H, Takao S, Nishida H, Aikou T. Length and quality of survival following external beam radiotherapy combined with expandable metallic stent for unresectable hilar cholangiocarcinoma. *J Surg Oncol* 2000; **75**: 89-94.
- Lacaine F, Fourtanier G, Fingerhut A, Hay JM. Surgical mortality and morbidity in malignant obstructive jaundice: a prospective multivariate analysis. *Eur J Surg* 1995; **161**: 729-734.