**Scholars Journal of Applied Medical Sciences (SJAMS)** **ISSN 2320-6691 (Online)**
**Sch. J. App. Med. Sci., 2015; 3(2D):833-842** **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublisher.com

**Research Article**

# Pattern of Liver Biochemical Profile Restoration Following Biliary Decompression in Benign and Malignant Conditions

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**Abstract:** Liver functions tests (LFTs) are used for determining the presence of liver disease that suggest the underlying cause, estimate the severity, assess prognosis and monitor efficacy of therapy. Altered LFTs may be the first indication of subclinical liver disease and may thereby guide further diagnostic evaluations. Specific pattern of liver test abnormalities may suggest the category of the underlying liver disease such as, hepatitis, biliary obstruction or infiltrative liver disease. Severity of liver dysfunction, especially when performed serially, may predict prognosis and their sequential measurements may be helpful in assessing response to medical therapy or a surgical intervention. This was a prospective study including fifty (50) cases of surgical obstructive jaundice admitted to the department of General and GI surgery in Command Hospital (western command), Chandimandir. The data was collected in all these patients in terms of age, sex, clinical presentation, etiology, total duration of stay in hospital, Surgical intervention carried out for biliary decompression and the laboratory liver biochemical and coagulation profiles on a day prior (D-1) to surgical intervention and post-operatively on 3rd , 7th and 28th day were also recorded. A total of 50 patients were included in the study; of these 21 were males and 29 were females with a male to female ratio of 3:4. Duration of illness ranged from 7 to 60 days with a mean duration of 18 days. Age of patient population ranged between 26-72 years with a mean age of 52 years. Of the fifty patients, 17 had a benign and 33 had an underlying malignant cause for obstruction. Hepatomegaly and palpable gallbladder were observed in all the malignant lesions and distinguished them clinically from the benign conditions. Clay coloured stools and pruritis was more frequent in patients with underlying malignancy (66% & 81%) as compared to patients with benign conditions (29% & 41%). Serum bilirubin and transaminases were significantly higher ($p<0.000$) in patients with malignant lesions on different days of pre-op and postoperative assessment, however, a better biochemical recovery profile was observed in patients with benign lesions. Pre-operative serum bilirubin levels gave an indication towards the nature of obstructive lesion (benign or malignant). After decompression the rate of fall of Serum bilirubin, ALT & AST were almost identical in both benign and malignant biliary obstructions. However, a better biochemical recovery profile was observed in patients with benign lesions, as they returned to normal by 4 weeks but remained at 3 to 4 times of the normal in malignant lesions. Thus, sequential biochemical assessment of liver functions has diagnostic as well as prognostic value in surgical obstructive jaundice.
**Keywords:** Surgical obstructive jaundice, Liver function tests, Hepatobiliary decompression.

## INTRODUCTION

The liver exerts a wide variety of functions, including carbohydrate, lipid and protein metabolism, storage of vitamins, production of bile, detoxification and excretion of endotoxins and xenobiotics.

Although many of these aspects of hepatic function have been used to assess functional reserve, a few are used in everyday clinical practice. Unfortunately none of the tests have been unambiguously validated in prospective studies [1, 2]. In surgical practice, clinical status and its co-relation with altered liver biochemical tests play a vital role in guiding a surgeon to undertake the type and kind of surgical intervention, especially, in patients with neoplastic disorders of hepatobiliary system [3, 4].

Liver functions tests (LFTs) are used for determining the presence of liver disease, suggest the underlying cause, estimate the severity, assess prognosis and monitor efficacy of therapy. Altered LFTs may be the first indication of subclinical liver disease and may thereby guide further diagnostic evaluations [5, 6]. Specific pattern of liver test abnormalities may suggest the category of the underlying liver disease such as, hepatitis, biliary obstruction or infilterative liver disease. Severity of liver dysfunction, especially when performed serially, may predict prognosis and their sequential measurements may be helpful in assessing response to medical therapy or a surgical intervention [7-9].

Prolonged jaundice causes progressive impairment of liver functions with progressive damage of liver parenchyma leading to secondary biliary cirrhosis. Early decompression of the biliary obstruction can recover the liver functions [10, 11], nevertheless recovery pattern of liver functions after surgical treatment of obstructive jaundice particularly after partial (single lobe) biliary decompression, have not been studied properly.

In the present study we planned to assess and compare the liver biochemical profile in patients with benign and malignant disorders of hepatobiliary system with obstructive features, before and after biliary decompression and study the pattern of their restoration by sequential recording.

## MATERIALS AND METHODS

The study was conducted in Command Hospital, Western Command, a 700 bedded tertiary care referral hospital located in northern India. Fifty patients of surgical obstructive jaundice admitted for treatment in the department of General Surgery and GI Surgery were included in the study and assessed as follows:

1. A complete liver biochemical profile was assessed and compared in both benign and malignant cause of obstructive jaundice in these patients as below
   a) one day prior to biliary decompression
   b) Following biliary decompression, (partial or complete as the case may be) on day 3, 7 and 28.
2. An informed and written consent of the patients was taken prior to the biliary decompression, including the biopsy of tissue leading to biliary obstruction.
3. The tissue was sent for histopathology examination to the department of pathology.

Inclusion and exclusion criteria were as follows:

### Inclusion criteria

All patients with benign as well as malignant conditions leading to surgical obstructive jaundice who are amenable to surgical decompression.

### Exclusion criteria

The patients with following clinical diagnosis will be excluded from the study:

1. All cases of medical jaundice.
2. Surgical causes.
   a. Advanced stage of the tumor/terminally ill patients
   b. Patient was unfit for surgery/stenting.
   c. Patient with severe cholangitis.
   d. All emergency decompressions.

## RESULTS

This was a prospective study including fifty (50) cases of surgical obstructive jaundice admitted to the department of General and GI surgery in command hospital (western command), Chandimandir, between August 2004 to July 2008. The data was collected in all these patients in terms of age, sex, clinical presentation, etiology, total duration of stay in hospital, Surgical intervention carried out for biliary decompression and the laboratory data for the liver biochemical and coagulation profile on a day prior (D-1) to surgical intervention and post-operatively on 3$^{rd}$ , 7$^{th}$ and 28$^{th}$ day was recorded.

### Patient categorization

Patients were categorized on the basis of etiology of surgical obstructive jaundice (Benign vs Malignant) and the type of surgical intervention carried out for biliary decompression (complete and partial). The liver biochemical and coagulation profiles were assessed and compared amongst these groups at presentation (prior to surgery) and subsequently on three post-operative days i.e. 3$^{rd}$, 7$^{th}$ and 28$^{th}$ day.

### Patient profile

A total of 50 patients were included in the study; of these 21 were males and 29 were females with a male to female ratio of 3:4. Duration of illness ranged from 7 to 60 days with a mean duration of 18 days. Age of patient population ranged between 26-72 years with a mean age of 52 years.

### Etiology

The Patient population was classified into two broad groups on the basis of the cause of obstruction

- Benign (n=17 patients)
- Malignant (n=33 patients)

**Benign (Group I, n=17):** The patients in this group had following underlying conditions

- Choledocholithiasis (n=11) with
  a. Cholelithiasis (n=6)
  b. Retained CBD stones (n=5)
- Benign biliary stricture after cholecystectomy (n=6)

**Malignant (Group II n=33):** This group was further sub grouped into two categories based on the type of surgical intervention.

IIa: Patients undergoing **complete biliary drainage -** after complete removal of the tumor lesion (n=15)

IIb: Patients undergoing **palliative drainage** (n=18)

These patients had following underlying conditions:

- Carcinoma of Gall Bladder with Surgical Obstructive Jaundice (SOJ) (n=11)

- Cholangiocarcinoma (n=6)
- Periampullary carcinoma (n=8)
- Carcinoma head of Pancreas (n=8)

**Type of surgical intervention**

Following modes of surgical intervention were applied in these two groups of patients:

**In benign group (Group I, n = 17)**

- For choldocholithiasis with (n=11)
  a. Cholelithiasis:
  Cholecystectomy with choledocholithotomy with T- tube drainage (n=6)
  b. Retained CBD stone:
  Choledocho duodenostomy (n=5)
- For benign biliary stricture after cholecystectomy (n=6):
  Roux-en-y hepatico-jejunostomy.

**In malignant group (Group II, n=33)**

- Carcinoma Gall Bladdder (n=11)
  (i). Radical / extended clolecystectomy + hepatico-jejunostomy (n=4) Gp IIa
  (ii). Segment III bilio-enteric (Roux-en-y) bypass - (n=5) Gp IIb
  (iii). Left hepatico-jejunostomy (n=2) Gp IIb
- Cholangiocarcinoma (n=6)
  (i). Roux-en-y hepatico-jejunostomy (n=3) Gp IIa
  (ii). Segment III by-pass (n=6) Gp IIb
- Periampullary carcinoma (n=8)
  (i). Whipple's procedure (n=6) Gp IIa
  (ii). Roux-en-y choledochojejunostomy / cholecystojejunostomy (n=2) Gp IIb
- Carcinoma head of pancreas (n=8)
  (i). Whipple's procedure (n=2) Gp IIa
  (ii). Hepaticojejunostomy / choledochojejunostomy (n=6) Gp IIb

**Clinical signs and Symptoms**

All the patients presented with clinical features of obstructive jaundice and the frequency of sign and symptoms is shown in Table 1.

**Table 1: Clinical signs and Symptoms**

| Sl. No. | Sign/symptoms | Benign (n=17) | Malignant (n=33) | Total (n=50) |
|---|---|---|---|---|
| 1. | Pain abdomen | 12 (70%) | 22 (67%) | 34 (68%) |
| 2. | Yellowish discoloration (sclera, skin) | 17(100%) | 33 (100%) | 50 (100%) |
| 3. | High coloured urine | 17 (100%) | 33 (100%) | 50 (100%) |
| 4. | Clay coloured stools | 5 (29%) | 22 (66%) | 27 (54%) |
| 5. | Pruritis | 7 (41%) | 27 (81%) | 34 (68%) |
| 6. | Anorexia & weight loss (≥10%) | 10 (58%) | 33 (100%) | 43 (86%) |
| 7. | Hepatomegaly | Nil | 33 (100%) | 33 (66%) |
| 8. | Palpable Gallbladder | Nil | 22 (66%) | 22 (44%) |
| 9. | Ascites | Nil | 2 (6%) | 2 (4%) |

The commonest complaints seen were; pain abdomen (68%), yellowish discolouration (100%) of sclera and skin, high coloured urine in all the patients, in both benign and malignant conditions.

However hepatomegaly, palpable GB and ascites were observed only in patients with underlying malignancies (Group II, n=33). Anorexia and weight loss (≥ 10% of body weight) were observed in all patients with malignant conditions and in 58% of benign conditions (n=10). History of clay coloured stools and puritis was more frequent in patients with underlying malignancy (Group II; 66% & 81% respectively) as compared to patients with benign conditions (29% & 41% respectively).

**Patient biochemical profile and their recovery patterns**

In both the groups, patients were assessed for complete liver biochemical parameters including their coagulation profile on a day prior to surgery (D-1), and $3^{rd}$, $7^{th}$, $28^{th}$ post operative days.

**1. Serum Bilirubin**

The pre and post-operative comparative analysis of bilirubin levels between Group I (n=17) and Group II (n=33) is shown in Table 2 and their recovery patterns in Fig. 1**.**

**(i). Pre-operative day-1**

At day-1: The pre-operative serum bilirubin levels ranged between 3.2 to 12 mg/dL in group I patients and 5.8 to 17.6 mg/dL in Group II with mean values of 5.9 mg/dL and 11.4 mg/dL respectively, statistically it was found to be highly significant with a p value of <0.0000002 (2.8E-07), indicating its discriminatory significance between benign and malignant conditions. The serum bilirubin levels did not differ much between group IIa & IIb on day-1 as seen in Table 3.

**(ii). Postoperative Days $3^{rd}$, $7^{th}$ and $28^{th}$**

The bilirubin levels dropped to 61% and 69.2% of the pre-operative values on day 3 in benign and malignant conditions respectively. These levels further dropped to 37% and 48.2% on day 7 and reached within normal limits on day 28, in Group-I, whereas they were thrice the upper limit in Group IIa & IIb patients. The drop rate in bilirubin levels on days 3, 7 & 28 was found statistically significant (p<0.000) both in Group I & II when compared to the respective pre-operative levels, however, bilirubin levels on day 3, 7 & 28 were much higher in group II as compared to Group I patients with p values of <0.0000 (5.8E-09), <0.000 (2.3E-09) and <0.000 (3.18 E-09), on these three different days indicating an early and better patient recovery in group I as compared to Group II as shown in Table 2. The Group IIa and IIb patients did not show much variation in their pre-operative (D-1) and post-operative bilirubin levels on day 3, 7 and 28.

**Table 2: Serum Bilirubin (0.2 to 0.8 mg/dl)**

| | **Benign condition (Group I) (n=17)** | | | **Malignant condition (Group II) (n=33)** | | | **p value** |
|---|---|---|---|---|---|---|---|
| Days | Range (mg/dL) | Mean (mg/dL) | SD | Range (mg/dL) | Mean (mg/dL) | SD | B vs M |
| 1 | 3.2-12 | 5.9 (100%) | 2.8 | 5.8-17.6 | 11.4 (100%) | 3.1 | <2.8E-07 |
| 3 | 1.8-8.5 | 3.6 (61%) | 1.6 | 3.4-12.4 | 7.9 (69.2%) | 2.4 | <5.8E-09 |
| 7 | 0.8-4.4 | 2.2 (37%) | 1 | 1.5-9.2 | 5.5 (48.2%) | 1.9 | <2.3E-09 |
| 28 | 0.6-1.4 | 0.8 (13%) | 0.1 | 0.8-8 | 3 (26.3%) | 1.5 | <3.18E-09 |
| p value | $D_1$ Vs $D_3$ < 0.000<br>$D_1$ Vs $D_7$ < 0.000<br>$D_1$ Vs $D_{28}$ < 0.000 | | | $D_1$ Vs $D_3$ < 0.000<br>$D_1$ Vs $D_7$ < 0.000<br>$D_1$ Vs $D_{28}$ < 0.000 | | | |

**Table 3: Serum Bilirubin (0.2 to 0.8 mg/dl)**

| | **Complete Drainage (Gr IIa) (n=15)** | | | **Partial Drainage (Gr IIb) (n=18)** | | |
|---|---|---|---|---|---|---|
| Days | Range | Mean | SD | Range | Mean | SD |
| 1 | 5.8-17.6 | 11.17 (100%) | 4.54 | 7.2-16.4 | 11.83 (100%) | 2.72 |
| 3 | 4.8-12.2 | 8.22 (73%) | 2.74 | 3.4-12.4 | 7.82 (68%) | 2.44 |
| 7 | 3-9.2 | 6.31 (56%) | 2.28 | 1.5-9 | 5.26 (45.6%) | 1.86 |
| 28 | 1.5-6 | 3.55 (32%) | 1.75 | 0.8-8 | 2.85 (25%) | 1.46 |
| p value | $D_1$ Vs $D_3$ 0.01<br>$D_1$ Vs $D_7$ 0.002<br>$D_1$ Vs $D_{28}$ 0.000 | | | $D_1$ Vs $D_3$ 0.000<br>$D_1$ Vs $D_7$ 0.000<br>$D_1$ Vs $D_{28}$ 0.000 | | |

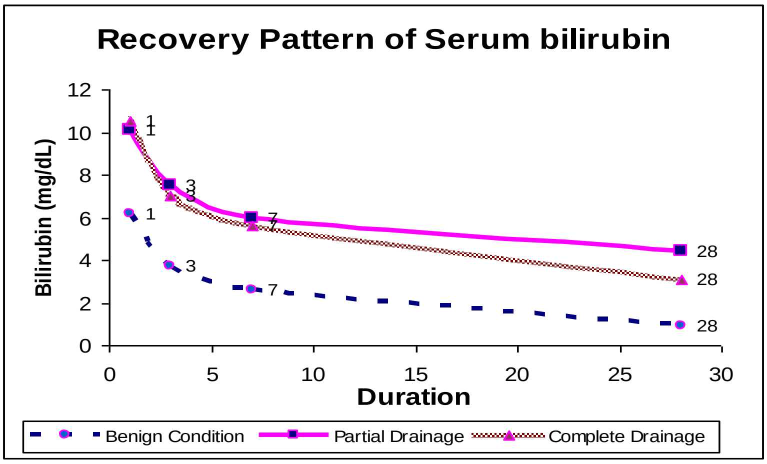


**Fig. 1: Recovery pattern of serum bilirubin**

**2. Serum Amino Transferases [Alanine Amino Transferase (ALT, SGPT)]**

**(i). Pre-operative day-1**

The serum ALT levels in patient population ranged between 65-485 IU/L in Group-I (mean 210.7 IU/L) and 83-828IU/L in Group II with a mean of 400.9 IU/L. The serum pre-operative ALT values were much higher in patients in Group II as compared to Group I with a P value of <0.000. However, they did not differ much between Group IIa & IIb.

**(ii). Post-operative Days 3, 7 and 28**

The Serum ALT levels were 73 and 75 percent of the pre-operative levels on day 3, in Group I and Group II patients, respectively. The levels further dropped to 55 and 53 percent on day 7 and reached near normal in Group I patients, but were more than three times the upper normal limit in Group II on 28th post-operative day. On statistical analysis the serum ALT levels were significantly higher on all the three post operative days (day 3, 7 &28) in Group II patients as compared to Group I with p values of 0.000, 0.0002 and 0.000127 respectively. On intra group assessment of ALT levels on pre-operative and post-operative days. It was observed that ALT drop rate was statistically significant (p values < 0.000) in both Groups on all the post operative days i.e. Day 3, 7 & 28 as shown in Fig. 2 and Table 4 & 5.

No significant difference was observed when ALT levels of patient with partial drainage (Group IIa) were compared with compete drainage (Group IIb). Both the groups also showed a similar pattern of ALT drop when pre-operative levels were compared with post-operative levels with significant p values of 0.01 and less.

**Table 4: SGPT (10-40 IU/L)**

| | **Benign conditions (Group I) (n=17)** | | | **Malignant condition (Group II) (n=33)** | | | **p value** |
|---|---|---|---|---|---|---|---|
| **Days** | **Range (IU/L)** | **Mean (IU/L)** | **SD** | **Range (IU/L)** | **Mean (IU/L)** | **SD** | |
| 1 | 65-485 | 210.7 (100%) | 110.7 | 83-828 | 400.91 (100%) | 143.92 | 6.5E-06 0.000 |
| 3 | 42-478 | 154 (73%) | 104.23 | 68-503 | 301.27 (75%) | 101.11 | 3.9E-05 0.000 |
| 7 | 40-365 | 116.5 (55%) | 78 | 64-368 | 213.52 (55%) | 76.07 | .0002 0.000 |
| 28 | 25-147 | 69.7 (33%) | 35.6 | 20-361 | 130.55 (32%) | 37.3 | .000127 0.000 |
| p value | $D_1$ Vs $D_3$ 0.000<br>$D_1$ Vs $D_7$ 0.000<br>$D_1$ Vs $D_{28}$ 0.000 | | | | $D_1$ Vs $D_3$ 0.000<br>$D_1$ Vs $D_7$ 0.000<br>$D_1$ Vs $D_{28}$ 0.000 | | |

**Table 5: SGPT (10-40 IU/L)**

| | **Complete Drainage (Gr IIa) (n=15)** | | | **Partial Drainage (Gr IIb) (n=18)** | | | **p value** |
|---|---|---|---|---|---|---|---|
| Days | Range (IU/L) | Mean (IU/L) | SD | Range (IU/L) | Mean (IU/L) | SD | |
| 1 | 83-828 | 440.4(100%) | 253.3 | 231-553 | 388.2 (100%) | 90.7 | N.S |
| 3 | 68-503 | 239.9 (67%) | 147.8 | 159-475 | 303.6 (78%) | 85.08 | |
| 7 | 64-341 | 212.2 (48%) | 102 | 114-368 | 213. 9 (55%) | 68.4 | |
| 28 | 24-259 | 132.25 (30%) | 83.5 | 20-361 | 130 (33%) | 63.38 | |
| p value | $D_1$ Vs $D_3$ 0.014<br>$D_1$ Vs $D_7$ 0.004<br>$D_1$ Vs $D_{28}$ 0.003 | | | | $D_1$ Vs $D_3$ 0.000<br>$D_1$ Vs $D_7$ 0.000<br>$D_1$ Vs $D_{28}$ 0.000 | | |

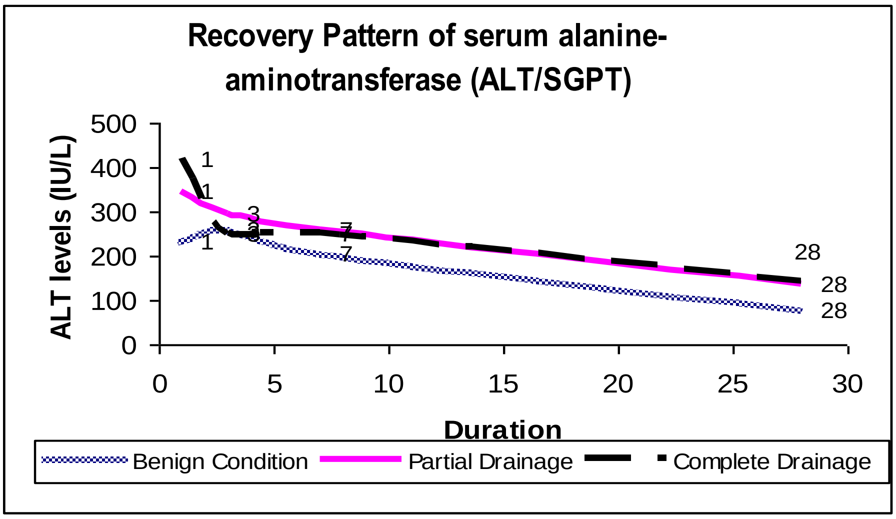


**Fig. 2: Recovery pattern of serum alanine amino transferase (ALT/SGPT)**

### 3. Aspartate aminotransferase (AST/SGOT)

#### (i). Pre-operative Day-1

The serum AST levels of the patient population ranged between 46-390 IU/L with a mean of 167 IU/L in Group I and 94-696 IU/L with mean of 300 IU/L in Group II. They were found to be statistically significant ($p<0.0001$) when Group I values were compared with II, indicating much higher levels of serum AST in patient with malignant obstructive jaundice (Group II).

#### (ii). Post operative Days 3, 7 & 28

The serum AST drop rate was more or less similar in Group I and Group II patients. There were 29, 49 and 70 percent drops in AST levels on day 3, 7 & 28 in Group I and 28, 45 and 64 percent fall in Group II patients. On comparison between benign (Group I) and malignant (Group II) conditions the serum AST levels were significantly higher on all post-operative days (3,7 and 28 days) in Group II as compared to Group I patients with p values of .003, < 0.000 and < 0.000 respectively. The mean AST levels reached near the upper limit of normal in Group I patients and were two and a half times the normal upper limit in Group II patients on day 28. On Intra Group assessment of AST levels on preoperative and the postoperative days. It was observed that AST drop rate was statistically significant (p values < 0.000) in both groups on all the post-operative days when compared individually with the pre-operative levels. No significant difference was seen in AST levels of Group IIa and Group IIb patients, both pre-operatively and post-operatively.

**Table 6: SGOT (10-40 IU/L)**

| | Benign condition (n=17) | | | Malignant condition (n=33) | | | p value |
|---|---|---|---|---|---|---|---|
| Days | Range (IU/L) | Mean (IU/L) | SD | Range (IU/L) | Mean (IU/L) | SD | |
| 1 | 46-390 | 167 (100%) | 95.8 | 94-696 | 300 (100%) | 116.47 | .0001 |
| 3 | 34-362 | 118.8 (71%0 | 82 | 51-387 | 215.8 (72%) | 70 | .0003 |
| 7 | 32-271 | 85.3 (51%0 | 60 | 50-341 | 166.4 (55%) | 60.5 | 7.9E-05 |
| 28 | 30-120 | 50.1 (30%) | 24.8 | 27-201 | 106.4 (35.4%) | 44 | 5.95E-07 |
| p value | $D_1$ Vs $D_3$ 0.000<br>$D_1$ Vs $D_7$ 0.000<br>$D_1$ Vs $D_{28}$ 0.000 | | | $D_1$ Vs $D_3$ 0.000<br>$D_1$ Vs $D_7$ 0.000<br>$D_1$ Vs $D_{28}$ 0.000 | | | |

**Table 7: SGOT (10-40IU/L)**

| | Complete Drainage (Gr IIa) (n=15) | | | Partial Drainage (Gr IIb) (n=18) | | | p value |
|---|---|---|---|---|---|---|---|
| Days | Range | Mean | SD | Range | Mean | SD | |
| 1 | 94-696 | 336.3 (100%) | 204.5 | 162-490 | 288.8 (100%) | 72.9 | N.S. |
| 3 | 51-387 | 206.5 (67%) | 103.5 | 119-345 | 218.8 (76%) | 58.19 | |
| 7 | 50-341 | 167 (50%) | 98.4 | 78-275 | 166.32 (58.6%) | 45.43 | |
| 28 | 30-201 | 106.2 (31%) | 61.8 | 27-200 | 106.48 (37%) | 38.56 | |
| p value | $D_1$ Vs $D_3$ 0.04<br>$D_1$ Vs $D_7$ 0.003<br>$D_1$ Vs $D_{28}$ 0.007 | | | $D_1$ Vs $D_3$ 0.000<br>$D_1$ Vs $D_7$ 0.000<br>$D_1$ Vs $D_{28}$ 0.000 | | | |

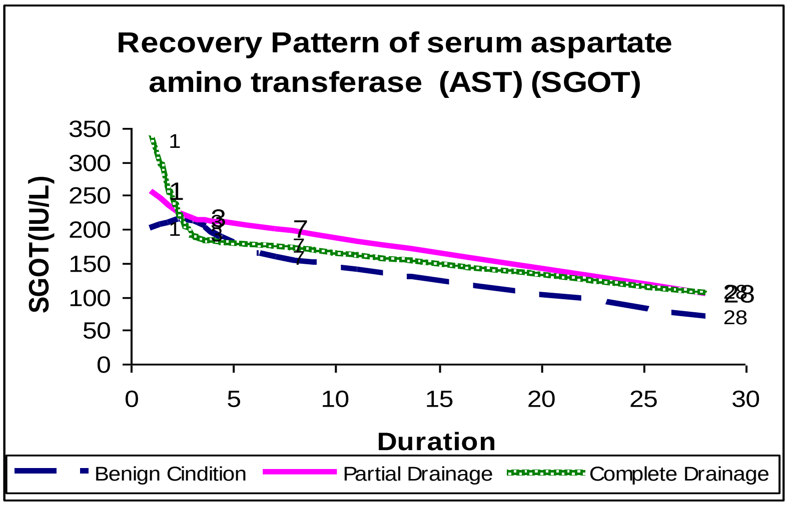


**Fig. 3: Recovery pattern of serumaspartate amino transferase (AST/SGOT)**

**4. Serum Alkaline Phosphatase (SAP)**

**(i). Pre-operative Day-1**

The serum AP levels in the patient population ranged from 110-2000 KAU/L in Group I and 130-2524 KAU/L in Group II patients with a mean of 456 KAU/L and 674 KAU/L respectively. These levels did not show much variation between the two groups and hence were not found to be statistically significant between benign and malignant conditions pre-operatively.

**(ii). Post-operative days 3,7 and 28**

The ALP levels dropped gradually to 82 and 77.6 percent of the pre-operative levels respectively on day 3 in Group I & II patients. These levels further declined to 58 & 40 percent of the pre-operative values on day 7 and 28 in both the groups. On comparing the SAD levels between the two groups (Group I & II) on different post-operative days, they were found to be more or less similar and statistically insignificant. This indicates that SAD assessment alone in patients with obstructive jaundice has low diagnostic value. However, on intra group comparison of Pre-operative and post-operative SAD values, it was observed that the ALP level drop was significant on day 7 and 28 in Group I patients, on day 3,7 and 28 in Group IIb patients, whereas it was not significant on any of the days in Group IIa as shown in Table 8 & 9.

**Table 8: ALP (70-220 KAU/L)**

| | **Benign condition (n=17)** | | | **Malignant condition (n=33)** | | | **p value** |
|---|---|---|---|---|---|---|---|
| Days | Range (KAU/L) | Mean (KAU/L) | SD | Range (KAU/L) | Mean (KAU/L) | SD | |
| 1 | 110-2000 | 456 (100%) | 435 | 130-5254 | 674 (100%) | 964.9 | N.S. |
| 3 | 86-2414 | 376.2(82%) | 532.3 | 70-4532 | 523.5 (77.6%) | 817.3 | |
| 7 | 80-1468 | 266 (58%) | 315 | 94-3211 | 396.82 (58.8%) | 589.8 | |
| 28 | 85-804 | 183.5 (40.2%) | 165.3 | 53-2014 | 276 (40.9%) | 393.3 | |
| p value | $D_1$ Vs $D_3$ 0.1<br>$D_1$ Vs $D_7$ 0.000<br>$D_1$ Vs $D_{28}$ 0.001 | | | $D_1$ Vs $D_3$ 0.000<br>$D_1$ Vs $D_7$ 0.001<br>$D_1$ Vs $D_{28}$ 0.001 | | | |

N.S. = Not Significant

**Table 9: SAP (70-220 IU/L)**

| | **Complete Drainage (Gr IIa) (n=15)** | | | **Partial Drainage (Gr IIb) (n=18)** | | | **p value** |
|---|---|---|---|---|---|---|---|
| Days | Range | Mean | SD | Range | Mean | SD | |
| 1 | 135-1852 | 532 (100%) | 576.4 | 130-5254 | 719.4 (100%) | 1065.7 | N.S. |
| 3 | 70-809 | 350.8 (66%) | 280.9 | 112-4532 | 578.8 (80%) | 924.4 | |
| 7 | 94-576 | 271.2 (51%) | 167.3 | 97-3211 | 437 (61%) | 669.8 | |
| 28 | 90-520 | 209.13 (39%) | 144.2 | 53-2014 | 297.6 (41%) | 445.2 | |
| p value | $D_1$ Vs $D_3$ 0.187<br>$D_1$ Vs $D_7$ 0.165<br>$D_1$ Vs $D_{28}$ 0.121 | | | $D_1$ Vs $D_3$ 0.000<br>$D_1$ Vs $D_7$ 0.002<br>$D_1$ Vs $D_{28}$ 0.003 | | | |

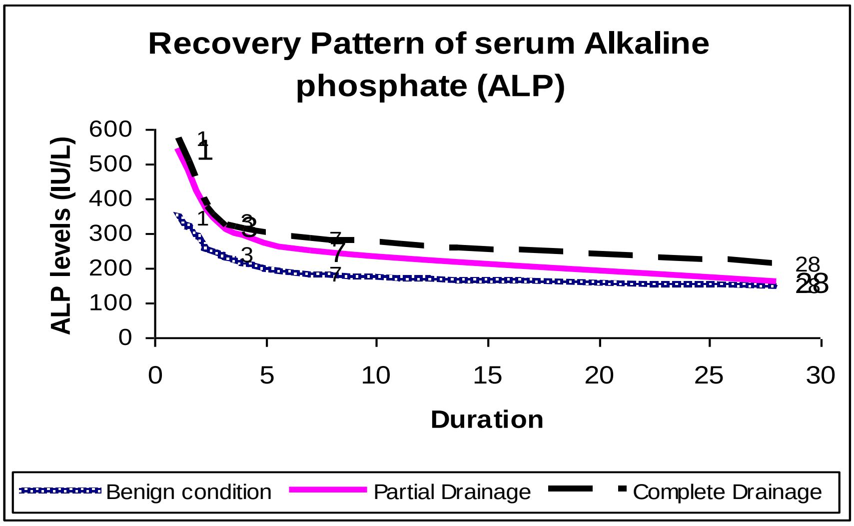


**Fig. 4: Recovery pattern of serum alkaline phosphate (ALP)**

**5. Serum Proteins**

**(i). Pre-operative**

Total serum protein levels ranged between 6.2 to 8 mg/dL with a mean of 6.6mg/dL both in Group I and Group II patients. Similary serum albumin levels ranged from 3.4 mg/dL to 4.2 mg/dL with a mean of 3.4±0.2 mg/dL in both the groups without much of difference.

**(ii). Post-operative Day 3, 7 & 28**

Total serum proteins and albumin levels remained more or less same as compared to the pre-operative levels on all post operative days, in the both the groups

**6. Coagulation profile:** (Prothrombin time and Activated Partial Thromboplastin time)

**(i). Pre-operative Day-I**

PT and PTTK values were slightly deranged and ranged between 12-17 seconds and 30-38 seconds with mean of 14.5 & 32.6 seconds in both the Groups. As these values were within one and a half times of the control values therefore these patients did not have any significant coagulation abnormality pre-operatively and found to be statistically insignificant on comparison between the two groups.

**(ii).Post-operative Days 3, 7 and 28**

Post operative coagulation profile in Group I and II patients did not show much alteration as compared to the pre-operative values indicating a normal hepatic synthesis of coagulation factors.

**Morbidity and Mortality in the patient population**

All the patient with benign causes (n=17) of surgical obstructive jaundice recovered completely at the 4 weeks follow up period. However, two of 33 patients with malignant obstructive jaundice succumbed to post-operative multiorgan dysfunction syndrome due to advanced metastatic disease.

## DISCUSSION

The diagnosis and management of patients with jaundice can be one of the more perplexing and challenging problems confronting physicians and surgeons. The diagnosis may be elusive and the treatment less than straight forward. A rational approach to the evaluations and management of surgical jaundice is greatly facilitated by the understanding of essential liver biochemical and coagulation abnormalities, especially by their sequential recording and analysis and the same has been tried in the present study to understand its importance in distinguishing between benign and malignant surgical conditions leading to jaundice.

Patient profile and their clinical presentation: In the present study, we included fifty patients of surgical obstructive jaundice and followed them up for 4 weeks post operatively with sequential recording of their liver biochemical and coagulation profiles on a day prior to surgery and post operatively on 3rd, 7th and 28th day. These patients were broadly classified into two groups based on the cause of surgical obstructive jaundice i.e.

- Benign (Group I, n =17)
- Malignant (Group II, n = 33)

The group II, patient were further classified into IIa & IIb depending upon the type of biliary drainage.

Group IIa – Patients underwent complete biliary drainage (n=15)

Group IIb – Patients with partial of palliative drainage due to iresectability of tumor (n=18)

The ratio of benign versus malignant causes of obstructive jaundice in our study is 1:2. This has also been previously observed by P. Kar *et al*. [12] in a retrospective analysis of 130 patients with obstructive jaundice at AIIMS, New Delhi. This reflects that the malignant lesions are more common in patients with surgical obstruction with progression of age as the mean age in our patient population was 52 years. Therefore, it is essential to workup patients with surgical obstructive jaundice for underlying malignant lesions after the 5th decade of their life.

The typical complaints of obstructive jaundice in our patient population were in the form of yellowish discoloration of sclera (100%), high coloured urine (100%) and pain abdomen (100%) in all the patients, however, clay coloured stools, hepatomegaly, palpable ball bladder and ascites were found only in patients with malignant lesions. Anorexia and weight loss (≥10% of body weight) were noted in all the patient with underlying malignancy and only in 58%benign conditions. Thus, presence of a palpable gall bladder along with enlarged liver and clay colored stools in patient with Surgical obstructive Jaundice are the pointer to an underlying malignant process and hence should be viewed with great suspicision for an underlying malignant process as has been reported previously in the literature [12, 13].

Liver Biochemical Profile and its recovery pattern following biliary decompression:-

**Serum Bilirubin**

Serum Bilirubin levels hold a prognostic value in chronic liver disease and in our study it proved to be of highly discriminative and diagnostic value between benign and malignant conditions preoperatively and their recovery patterns were also quite distinct between the two groups (I&II). The biochemical profile values were statistically significantly higher in patients with malignant lesions as compared to patients with underlying benign conditions ($p<0.000$) on all the post operative days i.e.3rd, 7$^{th}$ and 28$^{th}$. These values returned to near normal in patients with of benign conditions whereas they were thrice the upper limit in patients with underlying malignant disorders even after 4 weeks of surgery.

Although serum bilirubin levels are neither very sensitive non specific in detecting liver, disease however, in surgical practice they provide useful information regarding the underlying pathology alongwith clinical signs & symptoms in patients with obstructive jaundice. The significance of serum bilirubin value in discriminating between benign and malignant obstructive jaundice has also previously been proved in various studies in literature [13-15] and support our findings. However, the pattern of recovery of serum bilirubin was not influenced by the mode of surgical intervention in malignant obstructive jaundice, as has been documented previously by Watanpa *et al.* [16], where the authors have observed that drainage of one hepatic lobe is enough to preserve the overall liver function in a partially obstructed biliary system.

**Serum Transaminases: Aspartate amino transferase (AST) & Alanine amino transferase (ALT)**

Serum levels of AST & ALT were elevated to some extent in almost all live disorders and hence carry a low prognostic significance due to lack of correlation with the level of elevation and the extent of liver necrosis or severity of disease [17, 18]. However, they have been found to be useful screening tools for the presence of traumatic liver injury in pediatric and adult patients [19].

In the present study the serum transaminase levels (ALT & AST) were significantly higher in malignant conditions as compared to benign disorders both in pre-operative and post-operative period. However following decompression, both the patient groups showed a similar pattern of enzymatic recovery as shown in table 4 and fig 2 with enzyme levels approaching near normal at 4 weeks time in benign group and were almost two to three times the normal in malignant conditions. Similar patterns of enzymatic recovery have also been previously documented in the literature. The serum transaminase recovery patterns were more or less similar in patients with compete and partial modes of decompression. Since, none of our patients developed cholangitis post operatively; the persistent elevation AST & ALT in the malignant group at 4 weeks reflects the direct damaging effect of the partially undrained biliary system in addition to the higher pre-operative values compared to benign conditions where transamminases returned to near normal in all the patients. Thus it implies that malignant obstructive lesions cause a higher degree of hepatocellular damage are compared to benign conditions, which persists even after surgical decompression.

**Serum Alkaline phosphatase**

The serum alkaline phosphatase levels were markedly raised (4 to 10 times the normal) in our patient population both with benign and malignant conditions. However, they were not found to be statistically different in these two groups and hence proved to be of less discriminative value in benign and malignant conditions, pre and post operatively, and our observations are in accordance with the literature [20, 21] where alkaline phosphatase assessment alone in patients with obstructive jaundice is of low diagnostic value. This is due to the fact that elevated serum alkaline phostphatase of hepatic origin may also result from variety of other disorders such as, abscess, granulomatous liver disease and infiltrative disorders including amylidosis. Mechanisms of elevation of serum AP in obstructive jaundice are complex. Most data indicate that the elevation occurs because of accelerated de-novo synthesis of the enzyme in the liver and subsequent regurgitation into serum. The recovery patterns of serum AP in both benign and malignant conditions were similar with significant decline following decompression in some and while remained persistently elevated in others.

**Serum proteins**

Total protein and serum albumin were not much altered in our patient population and did not show much intergroup variation.

Although serum albumin is quantitatively the most important plasma protein synthesized by the liver and hypoalbuminemia remains an important feature of patents with biliary obstruction. However, due to long half life of albumin in circulation (20 days) only minimal changes may occur secondary to hepatocyte damage produced by biliary obstructive as has been reported by Youne’s *et al*. [22]. Since the mean duration of illness in our patient population was 17 days, so, we did not find significant alteration in total serum protein and albumin levels. In addition, they did not show much intergroup variation. Nevertheless several studies have shown that low serum albumin level represent a significant risk factor in chronic debilitated patients undergoing major biliary surgery [4, 23, 24].

Similarly the coagulation protein synthesis was also seemed to be preserved in our patient population as shown by prothrombin time and partial thromboplastin time recordings both pre and post operatively. Thus total serum protein, albumin and coagulation protein synthesis were well preserved in our patient due to short mean duration of illness of 17 days.

## CONCLUSION

Pre-operative serum bilirubin levels gave an indication towards the nature of obstructive lesion (benign or malignant).

After decompression the rate of fall of Serum bilirubin, ALT & AST were almost identical in both benign and malignant biliary obstructions. In benign they returned to normal by 4 weeks but in malignancy they remained at 3 to 4 times of the normal.

In patients with malignant obstruction the restoration pattern of these values had no difference whether the primary lesion was removed or not.

The other biochemical markers such as alkaline phostphatase total proteins, albumin and coagulation proteins were of little value in discriminating these groups in our study.

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