BRIEF NOTE

**Clinico-Biochemical Study on Experimental Common Bile Duct
Obstruction in Bovine (*Bubalus bubalis*)**

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Naturally occurring choleliths do not occur with equal frequency in all species of mammals but has been reported in most including some species without gall bladder [22]. In domestic animals majority of cases were discovered at necropsy and were not reported to be associated with clinical signs. Most of the experimental work on bile duct obstruction has been done in laboratory animals [4, 8, 15, 18, 24, 27], but there seems to be paucity of reports in large animals and hence, the present investigation was aimed to study clinico-biochemical changes following experimental common bile duct obstruction in buffalo calves.

The study was conducted on 10 apparently healthy male buffalo calves of about 1-1½ years of age. The animals were kept off feed for about 24 hours prior to surgery. Laparotomy through incision on right 10th intercostal space under linear infiltration anaesthesia with 2% procaine hydrochloride was carried out. The common bile duct was identified and about an inch above from the Vater's papilla and it was ligated. A second ligature was placed just above the first one to ascertain the complete obstruction of bile flow and abdominal cavity was then closed in routine manner.

About 20 ml of blood samples for plasma were collected from each animal prior to surgery and on the 1st, 2nd, 3rd and then on the every 3rd or 4th day till the death of the animals. Two ml of blood samples were collected separately with sodium fluoride for estimation of blood glucose. Plasma samples were analysed for glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) [23], alkaline phosphatase [3], total, direct and indirect bilirubin [10], total cholesterol [28] and total protein [14].

All the experimental animals survived the surgery. After 3-5 days, the general condition of animals started deteriorating and the water and food consumptions were considerably reduced. The skin coat was rough, with sunken eyeball and pale mucous membrane. All the animals died in between 10 to 12 postobstruction days. The pre-operative values were closely varied around the means of 74.50 ± 14.96 and 17.33 ± 1.33 Reitman & Frankel units (RFU) for GOT and GPT, respectively (Fig. 1). The values recorded during bile duct obstruction showed a wide variation from animal to animal and also in the patterns of activities of two enzymes. The highest mean value for GOT (335.50 ± 22.70) and GPT ($31.16 \pm$

Fig. 1. Effect of bile duct obstruction on values of plasma GOT, GPT and alkaline phosphatase.

Fig. 2. Effect of bile duct obstruction on plasma total, direct and indirect bilirubin.

2.01) were recorded on the 7th and the 3rd days of obstruction which was almost static up to the 7th day (30.33 ± 2.53) in case of GPT. Later on both the enzymes showed decreasing tendency but were significantly higher ($GOT = 245 \pm 20.60$, $GPT = 28.83 \pm 1.54$) up to the 10th day than the pre-operative values. The increased GOT and GPT activities have been reported by a number of workers in experimental long term or transient cases as well as in clinical cases of common bile duct obstruction in dogs and other animals [1, 2, 5, 13, 19, 27]. Most of these workers have recorded higher value for GPT than GOT during biliary stasis. While in this study increase in plasma GPT was much lower than GOT. This difference in pattern of enzymatic activities might be due to the fact that liver of cattle, sheep and pigs do not contain significant levels of GPT and hence only very small elevation in the GPT value is observed from hepatic disorders in these animals [9]. The causes of GOT and GPT elevation in animals with obstructive jaundice in the absence of apparent hepatic parenchymal diseases have not been precisely

defined. However, increased activities of these enzymes in biliary stasis may be attributed to a greater leakage from hepatic cells.

The mean pre-operative value of alkaline phosphatase was 2.50 ± 0.36 Bessey-Lowry units (BLU) with a range of 1.20 to 3.60 BLU (Fig. 1). The enzyme activity of alkaline phosphatase started increasing from the very first day (7.62 ± 1.00) with a maximum mean value of 11.02 ± 1.82 on the 7th day of obstruction. Thereafter the value of enzyme showed decline phase, but it was above normal up to the end of experiment (9.21 ± 0.75). This is in confirmation with the observations of other reports dealing with clinical and experimental bile duct obstruction in dogs, rabbits and rats [2, 5, 8, 15, 24]. However, increase in the alkaline phosphatase activity recorded in buffalo calves was much lower and only three- to fourfold elevation was noticed against 20- to 100-fold elevations reported in dogs and rats [2, 5, 8]. Leaver [16] did not observe any significant increase in plasma alkaline phosphatase during bile duct obstruction in sheep. It seems that this variation in

Fig. 3. Plasma cholesterol, total protein and blood glucose during bile duct obstruction.

degree of elevation of enzyme activity may be due to species variation, and like sheep [16] buffalo calves also present a very small rise in alkaline phosphatase activity in obstructive jaundice.

The values observed for the plasma total, direct and indirect bilirubin concentrations are presented in Fig. 2. During biliary stasis, the plasma bilirubin increased rapidly and the highest mean value (4.23 ± 0.19 mg/100 ml) was recorded on the 7th day, after which the level of total bilirubin tended to fall and it was 3.30 ± 0.18 mg/100 ml on the 10th day. The value for direct bilirubin observed on the 7th day was 2.60 ± 0.18 mg/100 ml against 1.63 ± 0.08 mg/100 ml for indirect bilirubin. The observations recorded for bilirubin were in accordance with the previous findings [7, 17, 24]. However, the maximum mean total bilirubin level of 4.23 ± 0.19 mg/100 ml recorded in buffalo calves was much lower than the reported maximum mean values for total bilirubin in dogs [5, 17, 25]. The values

for direct reacting bilirubin after biliary stasis were more than that of indirect bilirubin in buffalo calves. The greater percentage of direct reacting bilirubin in extrahepatic bile duct obstruction was also recorded [2, 5, 25]. Cornelius [9] also reported that extrahepatic obstruction of bile duct system was always accompanied by more than 50% of conjugated bilirubin in serum. The presence of unexplained amount of plasma indirect bilirubin may result from either increased hepatic de-conjugation of bilirubin glucuronide or different net fractional clearance rates of bilirubin and its conjugate from serum during the process of active transport.

The total plasma cholesterol level showed rising tendency from the 1st day and was highest (320.83 ± 7.59 mg/100 ml) on the 3rd day of bile duct obstruction. Later on its value again declined towards the normal value but it was significantly higher (199.16 ± 8.23) than normal (82.50 ± 3.83) up to the end of experiment (Fig. 3). The increase in total cholesterol levels in biliary obstruction may be due to its overproduction and regurgitation into the blood [6] or retention of cholesterol normally excreted into the bile or both.

During biliary obstruction the blood glucose level showed a slow trend of rise with a maximum mean value of 68.66 ± 2.20 mg/100 ml on 7th day of bile duct ligation (Fig. 3). On the 10th post day though the value of blood glucose has decreased than on 7th day, it was still higher (67.16 ± 2.30) in comparison to pre-operative value (47.50 ± 2.30). The determination of blood glucose levels during biliary stasis has demonstrated its rising trend up to the end of present experiment. Edlund [11] had reported decreased levels of liver glycogen content and blood sugar after partial and complete bile duct obstruction in rats. While MacGregor

[17] was not able to observe any reduction in the galactose tolerance in dogs with complete biliary stasis. The unexplained increase in blood glucose concentration in this study might be correlated to increased glycogenolysis [12]. Furthermore during stress (biliary stasis) elevated epinephrine might result in breakdown of liver and muscle glycogen and subsequent hyperglycemia in early stages [21].

There was no significant alteration in total protein concentrations after bile duct obstruction (Fig. 3). Similar observation has also been made by Putnam [20], Van-vleet and Alberts [27] and Scott et al. [26] in experimental and clinical cases of bile duct obstruction in dogs.

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要 約

牛の総胆管の実験的閉塞に伴う臨床検査成績 (短報): A.P. Singh and J.M. Nigam (Department of Veterinary Surgery & Radiology, College of Veterinary Science, Haryana Agricultural University, INDIA)——10 頭の健康な雄の水牛の子牛に対し右横腹から総胆管を結紮した。これらの子牛から約 20 ml の血液を手術前, 手術後 1 日, 2 日, 3 日その後 3~4 日おきに採り GOT, GPT, アルカリフォスファターゼ, 直接・間接ビリルビン, 総コレステロール, 総蛋白, 血糖値を測定した。GOT, GPT はそれぞれ 74.50 ± 14.96 , 17.33 ± 1.33 単位であったものが, 7 日目には 335.50 ± 22.70 および 31.16 ± 2.61 までに上昇し, その後少しずつ低下した。アルカリフォスファターゼは 2.50 ± 0.36 単位であったものが 7 日目には 11.02 ± 1.82 に上昇した。ビリルビン値は間接型に対し直接型の方が上昇は大きかった。コレステロール値は正常値 82.50 ± 3.83 mg/100 ml に対し術後 3 日で 320.83 ± 7.59 mg/100 ml を示し, その後わずかに低下した。血糖値は術後 7 日にして 68.66 ± 2.20 mg/100 ml と最大値を示した。