"LIMY BILE" — CASE REPORT AND REVIEW OF LITERATURE

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SYNOPSIS

Limy Bile is an uncommon clinical entity. Pathological, radiological and clinical features of this condition are discussed and the relevant literature reviewed.

INTRODUCTION

Limy bile is a pathological accumulation of calcium carbonate in the gallbladder. Volkmann (1) used the term Kalk Milchgalle (Milk of limy bile) and Knutson (2) coined the term 'Limy bile'.

The calcium carbonate found in the gallbladder in cases of limy bile varies in consistency from fluid to a putty like mass or even firm to solid. Its colour is variable from white, grey, yellow to brown and sometimes black depending upon the amount of bile pigments in the gallbladder.

CASE REPORT

A 49 year old Chinese male was hospitalised with right .sided abdominal discomfort of 3 years duration. He had an appendicectomy performed in this hospital for acute appendicitis three years ago, the course of which was uneventful. The right sided abdominal pain was in the nature of an intermittent dullache, initially attributed to the appendicectomy. There was no history of fever, or jaundice.

On examination, he was thin, with no pallor and there was slight tenderness over the right lumbar region. Investigations: Blood-Hb 13.5 gm/dl, P.C.V. 35%, total protein 74 g/l, albumin 51 g/l, bilirubin 24 mmol/l, aspartate amino-transaminase 12 IU/l, alanine amino-transferase 4 IU/l, alkaline phosphatase 88 IU/l, serum calcium 2.2 mmol/l, phosphate 0.92 mmol/l. On a normal diet, urinary calcium excretion was 4 mmol/l, in 24 hours (Normal 2.8 — 8 mmol/l). Plain X-ray of the abdomen showed a pear shaped opacity in the right hypochondrium (Fig. 1). The ultra sound examination was not conclusive. A gastroscopic examination demonstrated a normal oesophagus, stomach and duodenum. A cholecystectomy was performed on 23/2/81. An operative cholangiogram revealed no abnormality. The gallbladder was whitish yellow in colour and weighed 31.5 gms, the wall was thickened, and showed no areas of fibrosis or calcific deposits. It contained greyish substance of clay consistency, which on cut section was speckled with a few pigment stones (Fig. 2). Two gallstones were found impacted in the cystic duct (Fig. 3). The contents of the gallbladder were chemically analysed by standard procedures.

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The pH of the bile was 10.65. The solids amounted to 46%, which were made up of calcium salts in the form of phosphates and carbonates, and with 8% of cholesterol (Table 1). The gallbladder on histological examination showed evidence of chronic cholecystitis, with no calcium carbonate deposition in its wall.

DISCUSSION

Most patients with limy bile in the gallbladder have very few symptoms, mainly abdominal discomfort or pain. In some it could be a chance finding at the time of renal investigation or for vague abdominal symptoms as in our patient. Jaundice is rare, when present, it may be due to the passage of stones or calcium carbonate into the common bile duct. In some cases calcium carbonate in the gallbladder bile could spontaneously pass down the bile ducts with or without any signs or symptoms, depending on th consistency of the bile (3).

The diagnosis of limy is made on plain radiograph of the abdomen where the gallbladder is shown as a radio-opaque shadow (Fig. 1). Our patient presented with vague abdominal pain of three years duration and on clinical examination no significant abnormality was found, and a routine plain X-ray of the abdomen had clinched the diagnosis. Following cholecystectomy he was reviewed six months later and has remained well.

The pathogenesis of limy bile has not been clearly defined. Various factors have been suggested for its formation as obstruction to the cystic duct, abnormal calcium metabolism, and a variable pH of the gallbladder bile.

The normal gallbladder bile has a mean pH of 7.3 with a range of 6.5 to 9.0 (4). Calcium carbonate crystallisation occurs only when the pH is above 6.6, so one of the factors for calcium carbonate formation is the inadequate change in the reaction of gallbladder bile to acid side (5, 6). Diffusion of calcium passively into the bile has been suggested (6) as bile is concentrated in the gallbladder, calcium is not absorbed and hence there is a calcium concentration. This calcium is held in a soluble state as bile salt complexes. Abnormality of bile salts, as a change in isomer or a pathology in the gallbladder could lead to the precipitation of calcium carbonate (6).

Phemister (7) was able to produce coarse sand like calcium carbonate deposition in the gallbladder of animals by ligating the cystic duct, implanting human gallstone and injecting streptococci into the gallbladder. A.L. Wilkie (8) in more or less similar experiments in animals produced gallstones, some of which were calcium carbonate. Tera (8) using radioactive Ca^{45} has shown calcium deposition in the lumen or in the wall of the gallbladder under conditions of chronic inflammation and biliary stasis.

CONCLUSION

In our case there was no evidence of abnormal calcium metabolism to account for precipitation of calcium salts. Liver function tests did not reveal any malfunction of the liver. The abnormally high pH (Table 1) in the gallbladder bile could have caused the precipitation of calcium salts from solution in the gallbladder, aided by the partial obstruction to the cystic duct (Fig. 3) along with a low grade cholecystitis.

This is the first such case seen at the University Hospital, Kuala Lumpur among 745 consecutive cholecystectomies performed between 1967 to 1981, with typical presentation and radiological features.

Fig. 1
Plain X-ray of the abdomen showing a pear shaped opacity in the right hypochondrium.

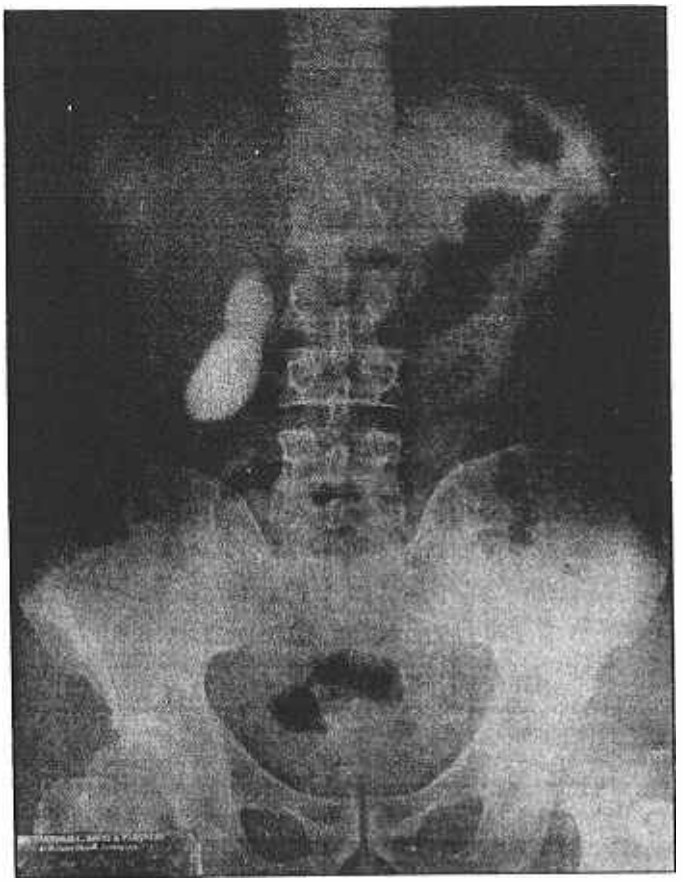
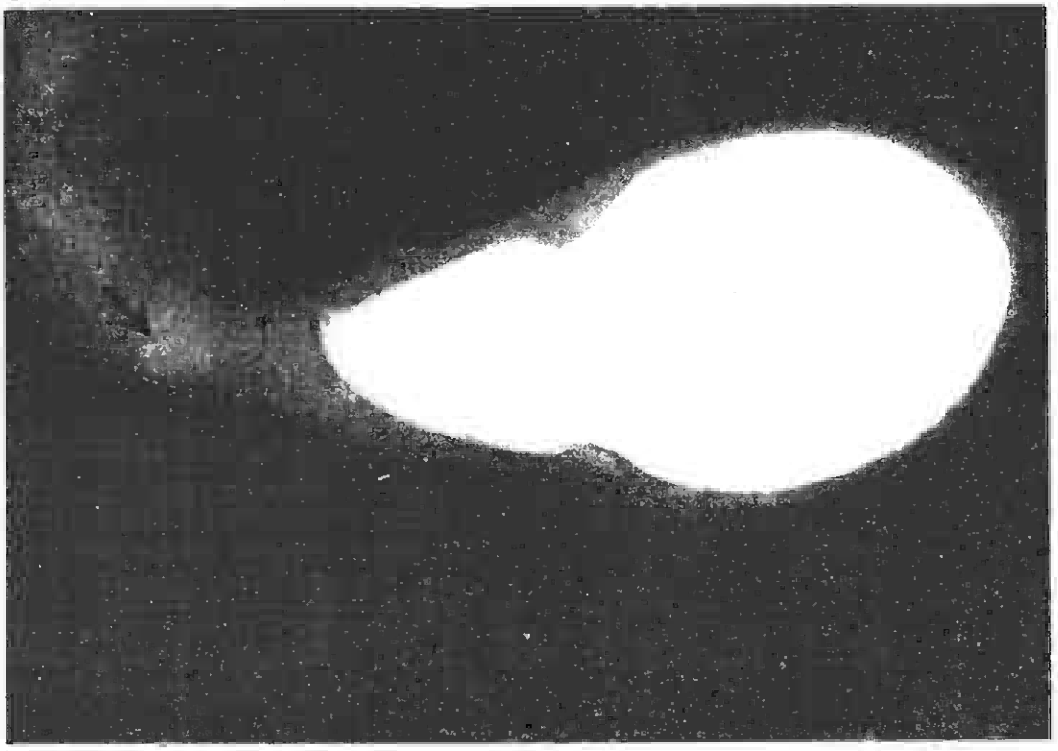


TABLE 1
COMPOSITION OF LIMY BILE

Constituent	Normal bile	Limy bile
pH	7.25	10.65
Moisture (%)	81.7	53.67
Total solids (%)	18.30	46.33
Total cholesterol mmol/l	0.259	8.029
Triglycerides mmol/l	0.0994	0.00
Calcium mmol/l	0.075	3.35
Sodium mmol/l	28.00	12.00
Potassium mmol/l	1.20	0.25
Phosphate mmol/l	4.199	16.3115
Carbonate mmol/l	15.00	104.00
Chloride mmol/l	13.50	1.50
Bilirubin mmol/l	769	684

Fig. 2
Showing the semisolid limy bile in the gallbladder with bile pigments imbeded within it.

Fig. 3
A radiograph of the excised gallbladder showing limy bile with calcific impaction of the cystic duct



REFERENCES

1. Volkmann J: Uber Kalk Milchartige galle. Muchener Medizinische Wochenshrift 1926; 73: 2014-5.
2. Knutson F: On limy bile. Acta Radiol Stockh 1933; 14: 453-62.
3. Hilden WS, Turner MJ: Disappearing limy bile. Clin Radiol 1972; 23: 500-7.
4. Crawford N, Brooke BN: The pH and buffering power of human bile. Lancet 1955; 1: 1096-7.
5. Houghton LW: Calcium carbonate in the gallbladder. Br J Surg 1952; 39: 336-8.
6. Cooke M: Limy bile. Proc Roy Soc Med 1968; 61: 1110-2.
7. Phemister DB, Day L, Hastings AB: Calcium carbonate gallstones and their experimental productions. Ann Surg 1933; 96: 595-614.
8. Wilke AL: The bacteriology of cholecystitis. Br J Surg 1928; 15: 450-3.
9. Tera H: The passage of calcium into the gallbladder through its wall. Act Chir Scand 1961; 120: 358-65.