

## PERITONEOSCOPY\*

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Some of you may be wondering what the nature of this evening's talk is. Peritoneoscopy is an uncommonly performed operation in the surgeon's repertoire. This is probably unfortunate as it has advantages which will greatly benefit our already overworked medical staff and hard pressed hospital beds.

What is peritoneoscopy?

Peritoneoscopy is the visualization of the peritoneal cavity by an instrument introduced into it via the ventral abdominal wall. It is also known as "laparoscopy" derived from the term "laparotomy". This technique of peritoneoscopy differs from culdoscopy in that the latter affords the visualization of only the pelvic organs by an instrument introduced via the posterior vaginal fornix.

### HISTORY

Attempts to examine the peritoneal cavity without a major operation, like other endoscopic examinations, have been made a long time ago. As far back as 1901, Ott, a Russian, reported the first attempt to view the peritoneal cavity without employing a large incision. He used a head mirror and a speculum but did not record what he saw. The first successful attempt was by Kelling of Dresden, who in the same year visualized the peritoneal cavity of dogs by using a Nitze cystoscope, then just invented. In 1910 he reported two successful attempts on human patients. In the same year in Sweden, Jacobaeus the pioneer of thoracoscopy, reported three cases.

No further attempts were made till 1924 when Kalk reported its use. Rendle Short reported a case in 1925 when he also used a cystoscope. He advocated the use of the term "coelioscopy".

These sporadic attempts were followed by a paper by Ruddock of Los Angeles in 1934 when he described a specially designed instrument which he called a peritoneoscope. In 1937 he gave an account of the procedure and his experience on 200 such examinations. Since then there has been little change in the procedure, interest has been greatly stimulated and the technique became well established in the United States, the other American countries, continental Europe and Russia.

The spread of the technique was particularly rapid in the United States, where in 1935 there were only three peritoneoscopes in use and by 1941 there were over four hundred.

Peritoneoscopy has been little practised in Britain until 1942 when Milnes Walker published a paper on the subject describing a peritoneoscope of his own design and reported 125 instances of its use. Peritoneoscopy was the subject of a meeting of the Royal Society of Medicine in 1943.

That the procedure is now well established is shown by the fact that Ruddock has reported over 5,000 examinations, and Kalk of Germany has reported 4,134.

The first peritoneoscopy performed in this country was by Professor G. S. Yeoh and myself in 1958, and it is worth commenting on it.

Case I. A. bin M., a Malay man of 70 was admitted on 21st November, 1958 with a history of epigastric pain, anorexia and severe weight loss over the past three months. Examination showed an emaciated, deeply jaundiced man with an enlarged, hard liver. Laboratory investigations: Haemoglobin, 75% and a normal blood picture. Serum bilirubin was 12 mgm.%; alkaline phosphatase 40 units; total proteins 7.73 gm.%; albumin 4.30 gm.%; globulin 3.43 gm.%; thymol turbidity 6 units. Urine contained no bile. F.T.M. showed achlorhydria. B.M.X. revealed no lesion in the gastrointestinal tract but radio-opaque gall-stones were present. A diagnosis of carcinoma of the liver with gall-stones was made. In view of his poor general condition laparotomy was judged to be unwise and a peritoneoscopy decided upon to confirm the diagnosis: if the liver was not the seat of a malignant pathology, a bypass of the biliary tract would have been worthwhile to relieve the jaundice pending a definitive operation later.

Peritoneoscopy was performed on 3rd December, 1958 under a general anaesthetic which was thought advisable owing to our lack of experience. The liver was found to be studded with growth. The stomach, colon from caecum to sigmoid, small bowel and the spleen were seen but there was no demonstrable pathology.

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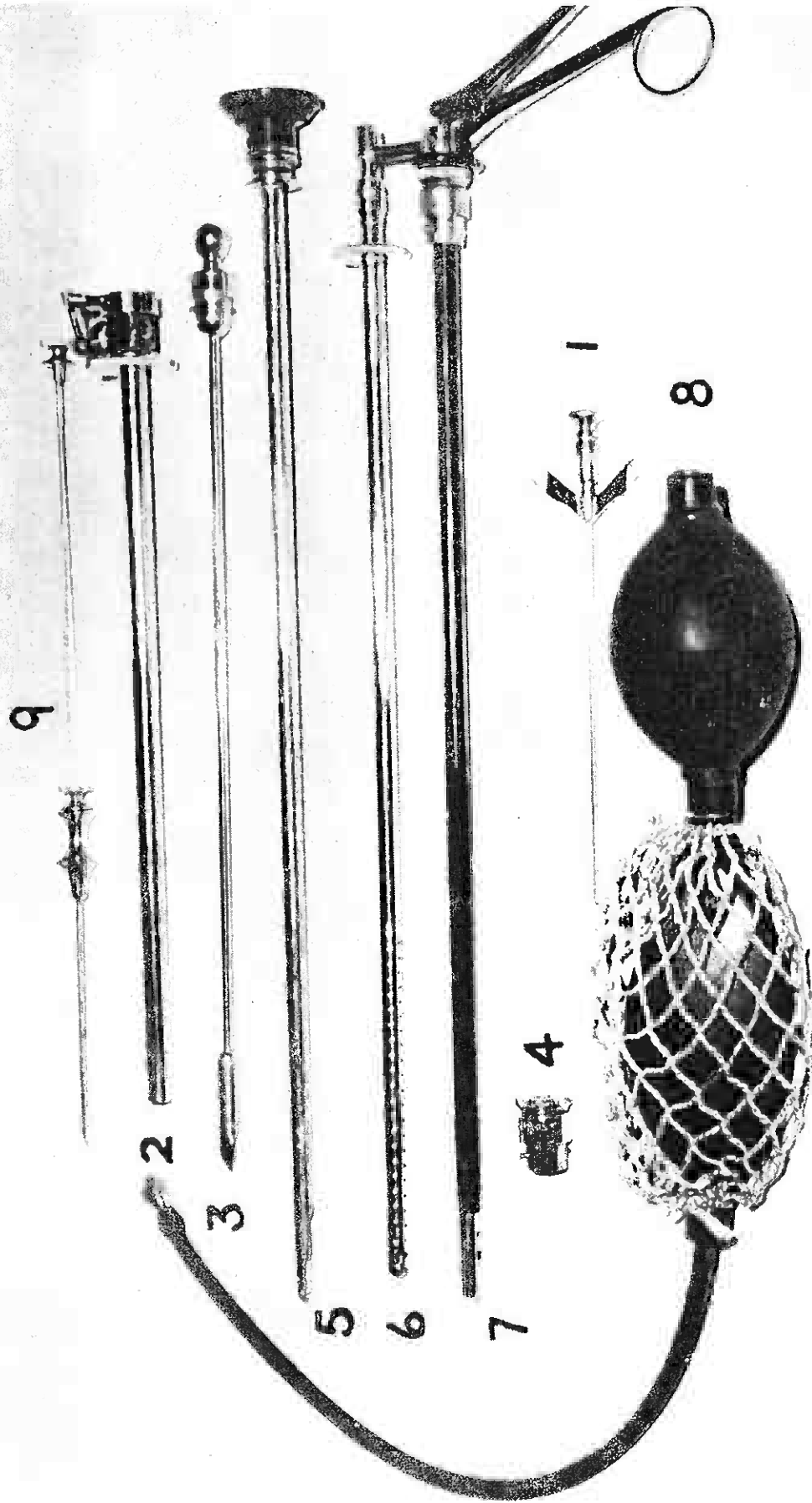


Fig. 1. Armamentarium. (1) Pneumoperitoneum needle. (2) Sheath of peritoneoscope. (3) Obturator. (4) Adaptor for airtight union. (5) Fore-oblique telescope. (6) Multiple-hole sucker. (7) Punch biopsy forceps. (8) Rubber double bellows. (9) Vim-Silvermann's biopsy needle.

A diagnosis of a primary liver carcinoma was made but no biopsy was attempted. Recovery from the procedure was uneventful and he was discharged the next day as owing to the findings, no active treatment was possible.

No further peritoneoscopic examinations were carried out in this hospital till 1961 when having returned to Singapore after a period with Professor Milnes Walker, I began using his instrument and have since performed over 70 such examinations.

### ARMAMENTARIUM

Several designs of peritoneoscopes are in common use today. The instrument designed by Ruddock is the most widely used in the American hemisphere. Several laparoscopes of German design are popular in Europe. The peritoneoscope of Milnes Walker is the instrument used in Britain and is the instrument we are using here.

The instrument consists of six parts: (1) A sheath with provision to allow air to be introduced or withdrawn. (2) A sharp pointed obturator used to effect the introduction of the instrument. (3) A fore-oblique telescope which carries a light at its tip. This telescope is used with an adaptor to secure an air-tight joint with the sheath. (4) A multiple-hole sucker allows ascitic fluid to be withdrawn, increasing and improving the view. (5) An insulated biopsy forceps which also allows coagulation by diathermy. (6) A pneumoperitoneum needle completes the equipment. A Vim-Silverman's needle is included for obtaining a biopsy specimen; for reasons given later I do not use the punch forceps for biopsy (See Fig. 1).

The only other instruments needed are a rubber double bellows to induce a pneumoperitoneum, a Labat's syringe to inject the local anaesthetic, a knife to make the skin incision, a few artery forceps and the usual instruments and materials needed to sew up peritoneum and skin.

### TECHNIQUE OF EXAMINATION

The examination is carried out under local anaesthesia with the patient premedicated by 20 mgm. of omnopon and 0.4 mgm. of hyoscine. If opium alkaloids are contraindicated as in the presence of gross liver damage, 120-180 mgm. of luminal is substituted. Premedication is reduced in dosage or may be entirely omitted in gravely ill cases. Jaundiced patients should have a preliminary course of vitamin K given parenterally. Patients with a prolonged a bleeding time should be blood grouped and matched fresh

blood be available. The skin is prepared as for a laparotomy.

The patient lies on the table with the arms raised. The skin is cleansed and then towelled exposing a strip of midline skin above and below the umbilicus. The point of entry is  $1\frac{1}{2}$ " below the umbilicus in the midline and is infiltrated with 1% lignocaine down to the linea alba (Fig. 2). A  $\frac{1}{4}$ " incision is made on the skin and the linea alba further infiltrated with local anaesthetic down to the peritoneum. A pneumoperitoneum needle is then introduced into the peritoneal cavity and an artificial pneumoperitoneum induced by the double bellows (Fig. 3). This is an essential prerequisite so as to allow safe introduction, by puncture, of the much larger peritoneoscope and space for visualization and manoeuvre. That air has been introduced into the abdominal cavity is checked by percussion over the liver area and sufficient air is pumped in to secure an adequate space between the ventral abdominal wall and the abdominal contents. Usually about 1.5 to 2 litres of air is required for a man of average size. Tolerant of the pneumoperitoneum is usually excellent even in cases without ascites. The pneumoperitoneum needle is withdrawn and the peritoneoscope is then introduced via the same skin incision. The instrument is first fixed on the linea alba vertically and then slanted upwards and outwards towards the patient's left, i.e. in the direction of the spleen, which if not enlarged is 12" or more away from the site of puncture, and therefore very unlikely to be damaged. The instrument is then pushed through steadily and firmly. Two planes of resistance will be felt, the first when the instrument goes through the linea alba, the second when it goes through the peritoneum. The obturator is then withdrawn and the telescope introduced (Fig. 4). If there is ascites, the fluid is first withdrawn by means of the special sucker. The pneumoperitoneum must now be re-induced as all the air will have escaped on withdrawal of the obturator; this escape of air serves as proof that introduction into the peritoneal cavity has been successfully effected. The telescope is then pushed home and viewing commenced; the carrying sheath can be introduced to varying extents depending on which part of the abdominal cavity is being viewed. The abdomen is examined systematically beginning on the left hypochondrium and passing round in a clockwise direction. If the pelvic structures need a more thorough examination the patient is put in a steep Trendelenburg position and an excellent view of the pelvic organs can be obtained. In a female patient the uterus and appendages can be manipulated through the vagina by a colleague



Fig. 2. Towelled, exposing a strip of skin above and below umbilicus. Local anaesthetic being infiltrated.



Fig. 3. Pneumoperitoneum needle inserted and air being introduced by double bellows.

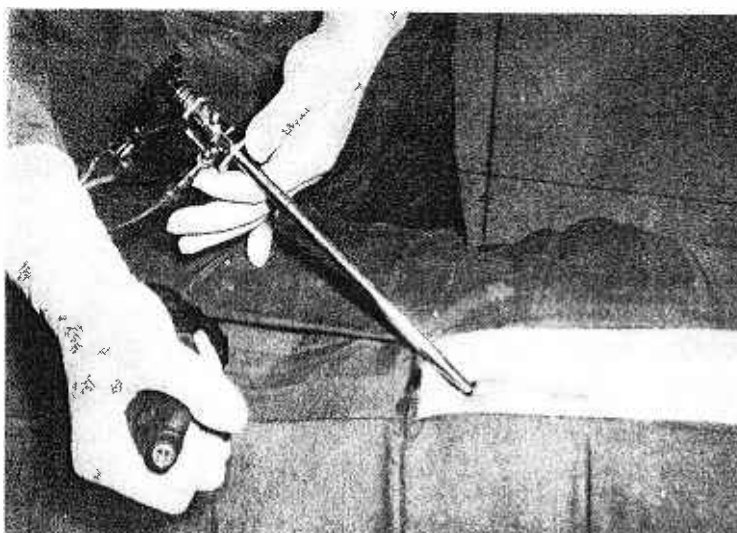


Fig. 4. Peritoneoscope introduced and air is being re-introduced.



Fig. 5. Site for biopsy being located.



Fig. 6. Biopsy being effected: the Vim-Silvermann's needle is introduced under vision.

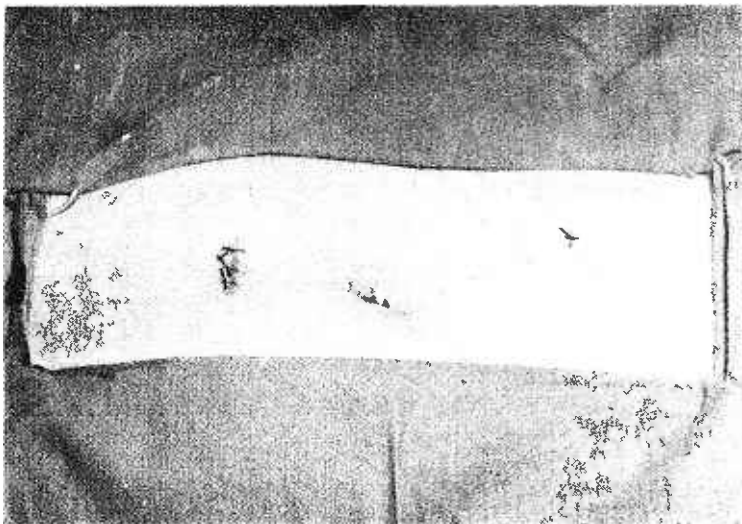


Fig. 7. Wound closed with silk sutures and "plastic skin" spray applied. No other dressing required.

and this allows a complete examination of the pelvis.

I favour biopsy under vision obtained by means of a standard Vim-Silverman's biopsy needle introduced through a separate puncture, sited over the organ or area to be biopsied. This site is first located by depressing the ventral abdominal wall with a finger and its dimpling effect observed intraperitoneally through the telescope (Fig. 5). After infiltration with local anaesthetic the biopsy needle is introduced first through the abdominal wall and then under vision, pushed into the part to be biopsied (Fig. 6). By this technique, any piece of tissue that can be visualized can be accurately obtained. A nodule as small as a few millimetres across can thus be biopsied. The biopsy needle is withdrawn under vision and any bleeding that follows can be seen clearly. The liver is the usual organ biopsied and in most instances bleeding is slight and stops within 30 seconds. If bleeding is severe, I use a very simple measure to secure haemostasis: the air is let out of the peritoneal cavity and direct pressure is applied on the biopsy site through the abdominal wall. This stopped the bleeding in every case in my experience. The site of biopsy should be so selected as to allow this simple manoeuvre. If direct pressure is not possible, haemostasis can be secured by diathermy coagulation via the peritoneoscope.

When the examination is completed the instrument is withdrawn and the air escapes at the same time. There appears to be no discomfort or danger associated with this sudden decompression of the abdomen. As haemorrhage is the most dangerous complication it is wise to have a good look round the abdomen before withdrawal of the instrument just as it is a wise routine to see that there is no bleeding before closing the abdomen in a laparotomy.

The skin only need be sutured and herniation does not follow (Fig. 7). Ascitic fluid seeps readily into the subcutaneous tissues if the peritoneum is not closed, though this is in itself harmless. In one of my cases who had a haemorrhagic ascites this leakage occurred, resulting in discolouration of a large area of skin around the puncture site some days after peritoneoscopic examination. Though the patient was quite without symptoms the physician was greatly perturbed by this big area of blue black skin and must have thought that this procedure was unusually traumatic. Since then, I have closed the peritoneum by a purse-string suture routinely and no leakage of ascitic fluid has occurred in subsequent cases. The skin is closed by a few silk

sutures and the biopsy needle puncture wound sealed with collodion or closed with a stitch.

A complete examination takes 15-30 minutes to perform including a biopsy.

### Peritoneoscopy in Children

There is no contraindication to peritoneoscopy in children of any age. For infants an instrument of suitable size is used. A general anaesthetic is essential and to prevent a ventral hernia from developing, introduction through one or the other rectus abdominis muscle is advised.

### ASSOCIATED TECHNIQUES

There are at least nine procedures that can be done in conjunction with peritoneoscopy:

- (1) Biopsy has already been described. One other method of biopsy can be performed during peritoneoscopy, that is via the peritoneoscope itself with a punch biopsy forceps. In the Milnes Walker model this is done blind; the Ruddock design has the advantage of a built-in telescope.
- (2) Photography. So far it appears that only the German instruments allow photography. Kalk designed such a peritoneoscope in 1954. As the view is excellent this limitation in other instruments is regrettable.
- (3) Drainage of liver abscesses can be effected safely under vision by a large bore needle or a small trocar and cannula. Aspiration of ovarian cysts has been performed but is probably a more controversial procedure except in inoperable cases to relieve gross abdominal distension as a palliative measure.
- (4) Percutaneous trans-splenic portavenography has also been done under vision and seems to be a desirable advantage when this study is not performed as an immediate pre-operative procedure, as any excessive splenic haemorrhage can be seen immediately and suitable treatment effected.
- (5) Cholangiography by the transhepatic route or via the gall-bladder is a very useful associated technique as any bleeding or bile leakage can be seen and sealed by diathermy or operative measures if necessary.
- (6) Division of suitable intra-abdominal adhesions and bands, like pneumolysis in the thoracic cavity, is occasionally possible and has been described. I suggest "peritoneolysis" is an appropriate term for such a procedure.

- (7) Sterilization by diathermy fulgration of the Fallopian tubes has been described by Anderson in 1937.
- (8) The implantation of radioactive isotopes has been performed by Hope in 1937.
- (9) Various operative procedures have been tried, such as repair of inguinal herniae intra-abdominally, but have been discarded because of the far more satisfactory standard operations available.

## LIMITATIONS

It must be stressed that peritoneoscopy has its limitations. It is largely a diagnostic procedure with little scope for therapeutic measures of an operative nature. It cannot replace laparotomy, but in selected cases has advantages over laparotomy and is the procedure of choice. Its chief advantages are **safety, simplicity, short period of hospitalization and avoidance of a general anaesthetic**, allowing it to be carried out in very ill and poor risk cases where a full scale laparotomy may prove to be unwise.

Its chief disadvantage is that the organs cannot be palpated. The view is necessarily confined to structures lying on the front of the peritoneal cavity, therefore retroperitoneal pathology cannot be diagnosed with certainty though a presumptive diagnosis can be made if the peritoneal structures are seen to be normal. Attempts to visualize the structures on the posterior abdominal wall by the introduction of saline into the peritoneal cavity so as to float the bowel up have not been successful. Judicious positioning of the patient on one side or the other may be a more promising manoeuvre. Lesions situated inside an organ cannot be visualized; therefore deep-seated tumours or abscesses of the liver and early cases of carcinoma of the bowel without serosal involvement are examples of conditions that cannot be diagnosed by peritoneoscopy. Gall-stones cannot be seen but a diseased gall-bladder, the seat of present or past inflammation can usually be accurately determined.

Difficulties may be encountered in obese patients: first in the introduction of the instrument owing to the great thickness of abdominal wall to be penetrated; second in the induction of a pneumoperitoneum of adequate capacity owing to the great weight of the abdominal wall that has to be lifted off the abdominal organs; and third in the visualization owing to the presence of a thick, adipose, non-transparent omental apron lying on top of the structures to be viewed.

With regard to the difficulty of penetration due to adiposity I overcome it by making a longer

skin incision — of 1" to 1½" — down to the peritoneum which is then opened formally between haemostats as in a laparotomy, but making only a tiny nick; the telescope in the sheath can then be easily introduced through this nick and air is then introduced. This is a neater, quicker and more elegant technique than prolonged, repeated, unsuccessful and potentially dangerous prodding of the abdomen.

A negative examination is not necessarily uninformative: it may mean the absence of a suspected disease such as cirrhosis in a jaundiced patient, or absence of a complication such as hepatic deposits in a case of an extraperitoneal cancer with an enlarged liver. A negative examination may also usefully direct attention to other diagnostic or therapeutic measures pertaining to the retroperitoneal or thoracic regions.

## SAFETY

The safety of peritoneoscopy is established. Ruddock reported only one death in over 1,500 examinations; it was due to haemorrhage from a sarcoma which was biopsied during the examination. Kalk had 2 deaths in 4,134 peritoneoscopies, one from haemorrhage and the other from heart failure following induction of the pneumoperitoneum. Herrera-Llerandi recently reported 390 cases with 2 deaths, one due to excessive premedication and the other following accidental perforation of the gall-bladder.

In the 72 examinations I have made so far there has been no fatality directly due to the procedure. One case died 10 hours after peritoneoscopy from haemorrhage arising from a primary liver cancer. He had been bleeding for some days prior to the examination and on peritoneoscopy 2 pints of dark altered blood were aspirated from the abdomen. As bleeding persisted throughout the examination, laparotomy was carried out immediately. A large clot, 2 inches thick, was found over the anterior surface of the right lobe of the liver which contained a huge growth. No attempt was made to remove it or secure haemostasis as the bleeding was a generalized ooze; the abdomen was closed. He collapsed suddenly 9 hours later and despite resuscitative measures died within an hour. Autopsy showed the whole right lobe of the liver was replaced by a massive tumour measuring 17 cm. by 11 cm. It had undergone haemorrhagic degeneration, the interior being composed of a pultaceous material. Haemorrhage had originated high up on the right lobe near the dome of the diaphragm and the clot on the anterior surface was adherent and brownish in colour. More recent haemorrhage had also occurred from the

inferior surface of the tumour. From the sites of haemorrhage and age of the clot the bleeding could not have been precipitated during or by the peritoneoscopic examination. (Haemorrhage is one of the commonest terminations of primary liver neoplasms and it has been our experience that such bleeding is usually a generalized ooze from the surface of the tumour with no specific bleeding points). On looking back, the laparotomy was unnecessary.

## COMPLICATIONS

The complications met with are tabulated here :

1. Haemorrhage.
2. Peritoneal shock.
3. Perforation of hollow organ.
4. Penetration of solid organ.
5. Peritonitis.
6. Wound sepsis.
7. Surgical emphysema.
8. Leakage of ascitic fluid.

Air embolism has not been recorded as a complication.

The incidence of complication is low. Rud-dock had 10 cases of perforated viscus out of 1,500 examinations; in none was the outcome fatal as it is usually recognized during the examination or soon afterwards and appropriate treatment instituted. Kalk recorded 5 serious complications with 2 deaths in over 4,000 cases : 3 cases had punctured colon in which only one necessitated operative closure; none had a fatal termination. The 2 deaths were due to haemorrhage and heart failure.

The complications I have experienced are : one case of wound sepsis following examination of a case of tuberculous peritonitis, undiagnosed and unsuspected clinically prior to peritoneoscopy — it healed well on topical streptomycin and PAS powder; one case of leakage of ascitic fluid which had been mentioned earlier and one case of surgical emphysema which will be commented on later. Thus the incidence of complication is very low and major complications are rare.

## INDICATIONS FOR PERITONEOSCOPY

Peritoneoscopy is most useful for the following types of cases :

(1) **Unexplained abdominal mass :** It is most useful when there is an abdominal mass and the clinical, laboratory and radiographic features are equivocal. If the mass is in the epigastrium it can usually be determined whether it is of hepatic,

gastric, colonic or splenic origin. If it is retro-peritoneal, irradiation has to be considered if the renal tract and aorta show no evidence of disease.

(2) **Unexplained hepatomegaly :** Direct visualization of the liver often gives the diagnosis, e.g. in cirrhosis, carcinoma or secondary deposits and can be confirmed by biopsy at the same time. A blind liver biopsy is less helpful as normal liver tissue is quite likely to be taken.

(3) **Unexplained and prolonged jaundice :** Diagnostic information has been obtained in every such case in my experience when combined with biopsy.

(4) **Unexplained ascites :** Clinical examination of a grossly ascitic patient is difficult without a preliminary paracentesis abdominis and peritoneoscopic examination at the same time adds little to the risk or discomfort to the patient — diagnostic information may be obtained at once and biopsy effected at the same time. (Incidentally I have aspirated at "one sitting" 9 pints of fluid from the abdomen of a patient without any ill effects; 4-6 pints have been aspirated on several occasions uneventfully; in another case 4 pints of fluid were removed in a patient who had a paracentesis a few days earlier).

(5) **Peritonitis suspected to be tuberculous or pelvic in origin :** In the former, miliary tubercles can be seen on the peritoneal or serosal surfaces and an unnecessary laparotomy avoided. There are two such cases in my series, both presenting as unexplained ascites and undiagnosed till peritoneoscopy. Pelvic peritonitis due to acute pelvic inflammatory disease usually respond well to conservative treatment and operation is usually unnecessary. Sometimes the differential diagnosis between it and other causes of localized peritonitis, such as appendicitis, is difficult. Peritoneoscopy will usually be decisive.

(6) **Various Gynaecological Conditions** such as ovarian cysts intact or ruptured, haemorrhage from Graafian follicles, broad ligament cysts, uterine tumours and ruptured or "leaking" ectopic pregnancies can be effectively distinguished.

(7) **Suspected Intraperitoneal Haemorrhage :** Sometimes it is impossible to exclude this except by laparotomy, or alternatively to keep a careful watch for signs of haemorrhage and thus running the risks associated with delay. Such doubts can be settled by a peritoneoscopic examination. Or the patient may have grave injuries elsewhere concomitantly, such as intrathoracic or intracranial injury, necessitating operative treatment. If peritoneoscopy reveals a clean abdominal cavity in a case of suspected intra-abdominal haemorrhage,



hage the patient will be saved of another major operation and his chances of recovery will be thus improved.

(8) Suspected Intraperitoneal Perforation of a Hollow Viscus: The remarks of the previous apply here equally well.

(9) Determination of Sex, has been successfully done and a gonadal biopsy can be effected at the same time.

### CONTRAINDICATIONS

There is only one absolute contraindication to peritoneoscopy — total intestinal obstruction with gross abdominal distension due to dilated bowel. In such cases the risk of puncture of bowel is too great to warrant the procedure.

Multiple previous operations constitute a relative contraindication as adhesions will increase the risk of puncture of an organ and limit the field of view. A single previous operation is usually not a great disadvantage especially if the operation had been over a region away from that to be viewed.

Adhesive tuberculous peritonitis if suspected is a contraindication as the view will be severely restricted, if introduction can be successfully effected which is unlikely.

In selected cases useful or diagnostic information can be obtained in almost every instance. Each case must be judged on its own merits and a careful selection of cases is the secret of success.

### RESULTS

Time does not permit me to present a full analysis of my results and I shall only make a few general comments.

Of the 72\* peritoneoscopies done to date, I was unable to introduce the instrument in only one instance — owing to surgical emphysema. He was re-examined a week later successfully. It is an interesting case.

Case II. W.K.N., a male Chinese of 38 is a known case of hypersplenism with a low platelet count and a prolonged bleeding time. He also had clinical evidence of liver cirrhosis. A full scale laparotomy was deemed undesirable as splenectomy is contraindicated if cirrhosis is present for he may need either a spleno-renal or portacaval shunt later. A blind liver biopsy was considered too dangerous owing to the bleeding tendency. Peritoneoscopy was decided upon and

was completely successful as a grossly cirrhotic hobnail liver was clearly seen and no biopsy was necessary.

Little technical difficulty had been experienced in the other cases; if a pneumoperitoneum can be successfully induced, there is little difficulty in introducing the peritoneoscope.

Toleration of the procedure by the patient is extremely good. Apart from a 2 year old child, all examinations had been carried out under local anaesthesia and there has been no instance of having to abandon the procedure owing to discomfort or pain on the part of the patient.

Of the 71 successful examinations, 22 are from medical wards; the rest are from Surgical A Unit. 49 are males and 22 are females. The age distribution is shown in the table below.

Age Group	Number of cases
0 - 9	1 ( 2 years)
10 - 19	1 (18 years)
20 - 29	7
30 - 39	6
40 - 49	17
50 - 59	26
60 - 69	11
70 +	2
Total	71

The youngest is a child of 2 years and the oldest a man of 76. The commonest age group is between 40 and 60, this being the common age for carcinoma of liver, cirrhosis and carcinoma of stomach, conditions for which peritoneoscopy is usefully performed.

### ILLUSTRATIVE CASES

The purpose of peritoneoscopic examination may be one or more of the following:—

1. To corroborate a diagnosis,
2. To decide on the differential diagnosis,
3. To determine the presence of metastasis,
4. To determine operability,
5. To obtain a biopsy,
6. To effect some therapeutic measure.

\*The author has now performed over 150 examinations with no increase in morbidity or mortality.

### Corroboration of diagnosis

Case III. L.K.S., a male Chinese of 29 was admitted on the 22nd April, 1961 with a history of 2 months epigastric discomfort, anorexia, vomiting and weight loss. Examination showed he was deeply jaundiced and the liver was hard and enlarged to the extent of four fingers below the right costal margin. Serum bilirubin was 2 mgm.%; alkaline phosphatase 80 units. Other tests were not significant. Clinical diagnosis. Hepatoma. Peritoneoscoped on 25/4/61: Varices seen at pelvic brim and hepatic flexure of colon; vessels of bowel tortuous, dilated and engorged. Large cirrhotic liver. Hepatoma 5 cm. in diameter in right lobe adjacent to gall-bladder. Biopsied; histological report — "hepato-cellular carcinoma in a cirrhotic liver".

Sometimes the diagnosis is altered after peritoneoscopy.

Case IV. L.C.S., a male Chinese of 46 was admitted on the 9/XI/61 with features of cirrhosis of liver. Clinically there were many spider naevi obvious "liver palms" and a tinge of jaundice. Laboratory tests: Serum bilirubin 0.5 mgm.%. Thymol turbidity 3 units. Alkaline phosphatase 8 units. Platelet count 60,000 per cc. Prothrombin, bleeding and clotting times normal. Bromsulphthalein test 17% excretion. Normal serum proteins. Barium swallow: "early oesophageal varices". Diagnosis: Cirrhosis of liver. Peritoneoscoped on 4/12/61: Normal liver seen; smooth surface, normal colour, soft consistency, sharp edge. Gall bladder normal. Spleen not enlarged. Conclusion: no liver disease. Biopsy confirmed that the liver was normal.

The commonest diagnosis confirmed or made by peritoneoscopy is hepatoma, there being 23 cases. 11 of these were confirmed histologically on needle biopsy specimens. 3 other cases were operated on subsequently. One case (Case IX) had a right hepatic lobectomy but died two weeks after operation, a second (Case X) had a right hemihepatectomy surviving now six months; the third, a doctor, had a very localised growth 3 cm. in diameter situated at the liver edge in the right lobe, a wedge resection easily removed the growth in toto with a surrounding layer of normal liver tissue; this was confirmed by subsequent histological examination. He is still alive and quite well almost a year after operation. The remaining 9 cases were not biopsied or operated on, but there is little doubt about the diagnosis on the peritoneoscopic appearances.

### Differential Diagnosis

Peritoneoscopy is most useful in differentiating the origin, whether hepatic, gastric, colonic, splenic

or retroperitoneal, of an epigastric mass when the clinical, laboratory and radiographic findings are inconclusive.

Case V. N.G., a female Chinese of 56, admitted on 14/5/61 with a history of epigastric pain for a month and past history of haematemesis. Clinically there was a mass in the epigastrium. Laboratory findings: not significant. No barium meal studies. Diagnosis: Carcinoma Stomach. Differential diagnosis: Carcinoma liver. Peritoneoscoped: Both lobes of liver enlarged and studded with growths up to 2.5 cm. across; did not appear to be secondaries. Needle biopsy done on one of the nodules. Histology: hepatocellular carcinoma with cirrhosis.

Case VI. C.T., a female Chinese of 58, admitted on 24/3/61 with a history of epigastric pain associated with meals and severe weight loss. Examination showed an epigastric mass which seemed to be arising from the liver. Occult blood was present in the stools. Fractional Test Meal showed achlorhydria. Liver function tests within normal limits. Barium meal X-ray was inconclusive: "a growth at the cardia cannot be excluded". Differential Diagnoses: Carcinoma stomach and carcinoma liver. Peritoneoscoped on 10/4/61: Large solitary hepatoma seen on the right lobe of the liver the rest of which was cirrhotic but appeared free of growth. Final Diagnosis: Primary Carcinoma of the Liver.

Sometimes the case may turn out to have an unsuspected condition which was not considered in the differential diagnosis.

Case VII. G.A.S., a 76 year old Eurasian man was admitted on 10/12/61 for abdominal pain, anorexia and weight loss for one month. The clinical signs of an epigastric mass and enlarged liver pointed to a diagnosis of hepatoma or carcinoma stomach. Peritoneoscopy was performed on the next day: liver was enlarged but appeared normal; stomach was not seen as the colon was dilated from sigmoid to caecum. Conclusion: carcinoma of the lower sigmoid probably with deep-seated liver secondaries. As a barium enema involved a wait of several weeks, laparotomy was performed on 20/12/62 on the strength of the peritoneoscopic findings. The diagnosis was confirmed: both lobes of the liver contained deposits which were palpable but not visible on the surface. A palliative resection was effected.

### Detection of Metastases

This is most useful in poor risk or late cases of cancer where a major laparotomy will be

associated with an unnecessarily high morbidity and mortality and where a more minor palliative procedure is all that is needed or feasible. A case recently operated on is good example. T.W.C. a Chinese woman of 52 was admitted with a carcinoma of the rectum. Operation was performed on 26/2/62 when a large solitary umbilicated secondary was found in the right lobe of the liver. A palliative loop colostomy was effected in anticipation of obstruction as the growth was too low to allow a palliative anterior resection. A peritoneoscopic examination would have saved her of a laparotomy, a general anaesthetic and a long hospital stay for a colostomy could have been effected under local anaesthesia and the patient discharged in a few days.

Sometimes a suspected secondary deposit may not be present.

**Case VIII.** K., a male Indian of 43 was admitted on 15/8/61 with a recurrent carcinoma of the cheek previously treated by radium. He had a liver enlarged to 3 finger breadths below the costal margin and hepatic metastases were suspected. Peritoneoscopy was performed and an enlarged but quite normal liver was seen; there was no other visible abdominal pathology. A hemimandibulectomy was performed and the patient has remained quite well till now.

#### Determination of Operability

The remarks on the previous section apply to the question of operability with regard to the presence or absence of metastases. Operability also depends on the local extent of a neoplasm. The assessment of this factor can be effectively done by peritoneoscopy in cancers of some abdominal organs, especially in the case of liver growths.

**Case IX.** L.G.S., a male Chinese of 55 was admitted on 3/1/61 and clinically diagnosed as a carcinoma of liver. Peritoneoscopy confirmed this: a large solitary growth was seen in the right lobe, the falciform ligament area appeared uninvolved and the left lobe was also quite free of growth. These findings were confirmed at the definitive operation later when a right hepatic lobectomy was performed.

**Case X.** B.J.L., a Chinese woman of 49 was admitted on 11/9/61 for an enlarged liver probably due to a new growth. Peritoneoscopy was performed on 15/9/61 when a well localised hepatoma 8 cm. in diameter was seen in the right lobe of liver at the inferior border. A

right hemihepatectomy was performed 3 days later and she is still alive and well.

#### To obtain a Biopsy

Biopsy is usually effected incidental to the examination; occasionally biopsy under vision was done electively in a case of known diagnosis for prognostic purposes. 23 needle biopsies were performed. In every case the liver was the organ biopsied. In 3 instances the tissue obtained was insufficient for satisfactory histological interpretation. Of the 20 successful cases, there were 11 cases of hepatomas, 4 cases of cirrhosis, 2 cases of obstructive jaundice, 2 cases of cirrhosis with obstructive jaundice and 1 case of normal liver tissue (Case IV). Secondary liver deposits were seen on several occasions but biopsy had not been necessary as in every case there was a known primary.

The ascitic fluid of 3 patients was examined. In one case — a carcinoma of colon with peritoneal deposits — malignant cells were present in the ascitic fluid. In the other two cases, one a hepatoma and the other a carcinoma of the colon, no malignant cells were detected.

#### Therapeutic Measures

Therapeutic measures by means of aspiration have been attempted in 7 cases. One was a case of acute gonococcal pelvic peritonitis treated by peritoneoscopic aspiration of pus and antibiotics with uneventful recovery. Another case presenting as an unexplained ascites of 2 weeks duration was examined and found to be due to a generalised peritonitis of some duration probably from a perforated peptic ulcer. Two pints of purulent fluid were withdrawn but he succumbed a few days later. He was gravely ill when first seen and would not have survived a laparotomy. Peritoneoscopy was successful only in establishing the diagnosis.

A huge ovarian cyst in a young unmarried woman of 20 was accidentally punctured during the introduction of the pneumoperitoneum needle. This was realized immediately and it was decided to empty the cyst as much as possible before cystectomy. Three pints of chocolate-coloured fluid were aspirated and on withdrawal of the needle there was practically no leakage from the puncture site as seen through the peritoneoscope. The cyst was then removed under spinal anaesthesia through a midline subumbilical incision. A further six pints of fluid was aspirated before the cyst could be delivered through the incision. Without prior aspiration it would have been irremovable except through a "post-mortem" incision.

A retention cyst of the liver presenting as a mass in the right hypochondrium was aspirated under vision without incident. 200 ml. of straw-coloured bile-stained fluid which was sterile on culture was withdrawn. He appeared to have no recurrence of symptoms so far.

Two amoebic abscesses were aspirated. Both had been diagnosed clinically as liver carcinomas and peritoneoscopy was performed with a view only to confirm the diagnosis. Thick-walled abscesses with a whitish, smooth surface were seen instead in both instances and on aspiration "anchovy sauce" was obtained. They were treated by repeated aspirations and emetine. It is gratifying to record that both cases made a complete recovery, and had the diagnosis not been made by peritoneoscopic examination both would surely have perished for laparotomy was out of the question as they were far too ill.

I think I have spoken enough for this evening and so I shall stop on this happy note.

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