6. *Education*.—The last, but certainly not least important, method is the education of officers and men as to the habits of the mosquito and the means of avoiding infection. Pamphlets, posters, lectures, lantern slides, cinema films, all have their place according to circumstance and opportunity.

In conclusion, I should like to thank my brother, Captain H. A. Treadgold, R.A.M.C., for valuable assistance.

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INTERLOBAR EMPYEMA AND OTHER SURGICAL COMPLICATIONS OF THE THORAX.*

BY

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EMPYEMA is the commonest complication in the thorax needing surgical treatment. In most cases it is quite easy to diagnose, as it occurs after pneumonia; an increasing rise of evening temperature, with morning remissions and dullness and silence at the base of the lung, with displacement of the heart, pointing definitely to it; but, in quite a number of cases, matters are not so simple.

In rare instances there is no history of pneumonia. This is more common in poor children with bad mothers. I can recollect instances of children being brought to the outpatient department with a chest half full of pus who have not been a day in bed. They have had a cough for some time, are short of breath, and have lost flesh. I have never seen it in better class children.

In an adult it is very rare. About five years ago I was asked to see a shopkeeper's wife who for some weeks had had night sweats, with a temperature of about 100° F. each night and 97° in the mornings. There had been no acute illness, and there was very little cough and no sputum. The suggested diagnosis was phthisis, but no physical signs had been found. The upper lungs were normal, but there was dullness and silence below the angle of the right scapula, and the heart was slightly displaced to the left. My diagnosis was pleural effusion, probably tuberculous, but on inserting a needle pus was found.

Difficulties may occur from the situation of an empyema; it is not altogether uncommon between the lobes of the lungs, where it is often undiagnosed. If untreated such an empyema may burst into a bronchus, and after weeks of coughing, sometimes of fetid sputum, may clear up, or chronic bronchiectasis may result.

CASE I.

A man, aged 47, was admitted under me this spring. He had had left-sided pneumonia six or seven months before, but had recovered and been working at Newhaven until shortly before admission. He had a severe cough and a good deal of expectoration; the temperature was 100° at night. There was dullness in the second and third right spaces in front and diminished resonance below; bronchial breathing at the apex, distant tubular breathing in the second and third spaces, weak breathing below, with coarse crepitations. Over the right back breathing was bronchial and rather weak in the upper half, but there was no dullness. The left chest was normal except for some rhonchi.

The previous pneumonia had been on the left side and was too long ago to count, but I thought the case was one of interlobar empyema. A needle was introduced in the second space, over the dull area, that afternoon without getting pus.

* Read before the Medical Society of London.

Owing to an attack of influenza I did not go up to the hospital again for a fortnight; by that time Captain Prowse had examined the man with x rays, and reported a large abscess cavity in the upper part of the right side of the thorax rather more than half filled with fluid, on which waves could be seen when the man was shaken. In the meantime the patient was coughing up large quantities of sputum, and, when I saw him again, all dullness had disappeared and breath sounds were almost normal over the right upper chest. He had coughed up the whole empyema.

These interlobar empyemata may burst into the general pleural cavity. Of this I have seen three cases.

CASE II.

A youth, aged about 18, had a very severe pneumonia, implicating both lobes of the left lung and part of the lower lobe of the right. His temperature came down gradually for ten days, and then began to rise in a hectic manner. The left chest remained dull, but tubular breathing and crepitations could be heard all over. I could not detect any special dullness over the interlobar area. One day his temperature and pulse-rate both fell and he said he felt better, but I was surprised to find a large area of absolute dullness and silence at the left base, where the day before had been breath sounds. On putting in a needle pus was found, and at the operation there was a good pint of it. I believe that his empyema was originally interlobar, and, when it burst into the general pleural cavity, the relief of tension caused the fall of pulse-rate and temperature.

CASE III.

A soldier, admitted under me last autumn with dullness from the spine of the left scapula down to the base. A needle drew off pus. Major Buck operated in the usual situation and found very little pus. A few days later the temperature was still high and the man was worse. I then found that the lower part of the back was slightly resonant, but just below the level of the spine of the scapula there was an area of absolute dullness about three inches in depth. An aspirator inserted here withdrew much pus, which, however, reaccumulated, and Major Buck removed a portion of the fourth rib between the scapula and the spine, and opened a large empyema between the upper and middle lobes of the lung. The operation was one of some difficulty owing to the depth of muscle. In this case the original empyema was evidently interlobar and some of the pus had leaked down over the lower lobe, where it was found at the first operation.

CASE IV.

In this case an operation for empyema of the right side of the chest in a child set free only a very small quantity of pus, but a few hours later a sudden gush of quite half a pint of pus soaked the dressings. This must have come from between the lobes.

My father, Sir William Broadbent, described three cases of interlobar empyema in the *Practitioner* in 1905.

In the first pus made its way to the surface above and just outside the left mamma, and the patient made a good recovery.

In the second several unsuccessful aspirations had been made in the lower part of the right chest before he saw the case. It had been noted that breath sounds could sometimes be heard lower on the right front one day than the day before. This led him to suspect interlobar empyema. He found a band of dullness above the spine of the scapula and in the apex of the axilla. Pus was found on passing in a needle high up in the axilla. A piece of rib was removed in this situation, and half a pint of pus was evacuated, with rapid recovery.

The third was a boy, aged 10, who had a left-sided influenzal pneumonia spreading from base to apex. After a crisis on the ninth day, the temperature assumed a suppurative type. The doctor, finding dullness on the whole left base up to the spine of the scapula, absence of vocal fremitus and marked oegophony, put in a needle in three different places, but without success. He noted that the upper part of the lung was becoming duller and more silent. When seen by my father there was absolute dullness with no vocal fremitus or resonance or breath sounds from the apex down to the fourth space, whereas the lower part of the chest in front was comparatively resonant. At his suggestion a needle was put in at the lower edge of the pectoralis with the arm at right angles to the chest. A whole pint of pus was withdrawn. After operation at the site of puncture, a large collection of sloughs came away, and the boy ultimately made a good recovery.

When much pus collects in an interlobar fissure the lower lobe of the lung is so compressed that it becomes dull and airless, leading to the belief that there is an ordinary empyema, until exploration in the usual areas finds no pus. In the last case mentioned both upper and lower lobes were so compressed.

The characteristic of interlobar empyema appears to be a very dull band, either in the second and third spaces in front or just below the spine of the scapula behind. As a rule, there is much diminished resonance over the lower part of the chest, but not the flat dullness of the band of fluid, and breath sounds are very weak and usually absent at the base. The best place to insert a needle is the

second or third space in the anterior axillary region, with the arm extended above the head.

Even clear fluid may be confined between the lobes. Quite recently I saw a child with a high evening temperature in whom the physical signs were very similar to those of the last case mentioned, and two needles had already been inserted in the lower part of the chest without result. I put in a needle high up in the axilla and was surprised to find clear fluid, of which ten ounces were withdrawn. Microscopically, lymphocytes were present in abundance; the effusion was probably tuberculous.

A very rare position for an empyema is between the mediastinum and the lung. I have only seen one case:

CASE V.

An elderly gentleman had a very severe influenzal pneumonia of the left lung, during which he was desperately ill. He had a good deal of pleurisy over the left lower lobe. After a fall by lysis the temperature rose again, and the lower lobe of the lung, which had appeared to be clearing, became dull and silent, but no pus was found by exploration. After some days he suddenly coughed up a quantity of pus, and continued to do so, the temperature meanwhile remaining hectic, and the lung dull and silent. The patient was then seen by Sir William Osler, who found a strip of resonance about three inches broad just to the left of the vertebral column over the angles of the sixth, seventh, and eighth ribs. He pointed out that, as the patient was spitting up pus, there was probably a pyo-pneumothorax, and he had a needle put into the resonant area just external to the angle of the eighth rib. Pus was at once obtained. Later a piece of rib, just beyond the angle, was resected, and a large empyema opened, which extended forward to a depth of eight inches, but was bounded externally by the lung, which was completely adherent to the parietal pleura.

In this case the pressure of the pus had collapsed the adherent lung and rendered it absolutely dull and silent. To take a different complication:

CASE VI.

A man was admitted to hospital under me, having had a bad cough for ten days and having been in bed for four days. He looked very ill, and his temperature was 102° to 103° F. He had signs of bronchopneumonia of the right middle and lower lobes, tubular breathing being most marked between the middle of the scapula and its angle. The numerous crepitations were coarser than those of lobar pneumonia. He was very thin, and myoidema was obtainable in unusually striking degree.

Three days later he spat about an ounce of blood, and the day after his sputum became most offensive. A small patch of cavernous breathing could then be heard in the centre of the tubular area. There was no history of any possible foreign body having been inhaled. A radiograph taken by Captain Morton showed a round abscess cavity surrounded by inflammatory thickening at the level of the sixth rib.

My corresponding surgeon was anxious to attack this, but my small experience of operation for abscess of the lung was so unfavourable that I decided to treat it medically by inhalation of creosote, carbolic, and iodine from a Burney Yeo inhaler for several hours a day. The result was complete cure in about six weeks, cough ceasing, physical signs all clearing up, and the man putting on over a stone in weight.

Another interesting case was one admitted to St. Mary's Hospital when I was house-physician in 1894.

CASE VII.

A soldier who had been spitting blood for a fortnight and complained of pain in the right side was found to have impaired resonance below the angle of the right scapula. Breath sounds were good down to the angle, but diminished below with fine crepitations; vocal resonance was increased. The right front was normal. The haemoptysis increased and his sputum consisted of nummulated sticky masses of bright red blood. No tubercle bacilli could be found nor cancer cells. In six weeks he lost $1\frac{1}{2}$ st. in weight. Signs in the chest had greatly increased. On the right front dullness began at the fifth space in the nipple line, and ran to above this level in the axilla. Breath sounds were diminished below the second space and entirely absent over the dull area. The right back was dull from the middle of the scapula downwards, there was some friction in the upper part, silence below. The heart was not displaced to the left, the apex being within the nipple line. Exploration of the back several times yielded no fluid or pus. The temperature was irregularly raised from 99° to 102° , but not of a hectic character. As the heart was not displaced the case was considered one of malignant disease of the lung. In another month the right side of the chest was dull up to the third rib and the spine of the scapula.

Post mortem a large ragged abscess was found in the front part of the middle and lower lobes of the lung into which large bronchi opened. The abscess was in contact with the chest wall as far as the mid-axillary line. Behind that, over the whole back, inflamed lung was adherent to the chest wall, the lung being two or three inches in thickness, which accounted for the exploring needles failing to reach the pus. Further, an abscess of the right lobe of the liver was found which projected

through the diaphragm, and on examining the large intestine typical recently healed ulcers of dysentery were seen.

The course of events in this case had evidently been dysentery, tropical abscess of the liver, which burst through the diaphragm and led to abscess of the lung. The lesson to be learnt is that exploration should be tried in front of the chest when no fluid is found at the back. This was illustrated by a case under my care quite recently.

CASE VIII.

The patient was a soldier who had had a long illness with continued pyrexia and occasional attacks of diarrhoea. The stools had been found negative to typhoid, paratyphoid, and dysentery. There was dullness and silence over the lower half of the right chest, back and front. The liver was felt an inch below the costal margin, and appeared rather more enlarged towards the middle line, where it was also tender. I failed to get fluid by a needle inserted into the back of the chest, but in the anterior axillary line I drew off a pint of chocolate-coloured pus, typical of hepatic abscess. Colonel Jowers subsequently opened a large abscess in the upper part of the liver, and the man is doing well.

The next case was supposed to be an empyema of the right side of the chest, but needles had been put in in four different places without obtaining any pus before I saw him.

CASE IX.

The man looked very ill, and had been running a hectic temperature for a couple of weeks. The back of the right chest was dull up to three inches above the angle of the scapula.

Breath sounds were absent and vocal resonance was much diminished. In front of the right chest there was dullness from the fourth rib downwards external to the nipple line, but, between the nipple line and the sternum, instead of the usual liver dullness, there was an area of tympanitic resonance. On percussing over this with two coins a loud bell note could be heard with the stethoscope, and the same bell note could be heard as far as the left anterior axillary line, and down to the umbilical level. On rolling the man over on to his right side most of this tympanitic area to the right of the sternum was replaced by the absolute dullness of fluid. Obviously here was a gas-containing cavity, and the diagnosis was subphrenic abscess due to perforated duodenal ulcer. A needle passed deeply into the right sixth space in the tympanitic area immediately drew off foul-smelling pus. After operation the patient made a slow recovery.

By a singular coincidence, since the meeting was adjourned, a case has been sent into hospital under me as pneumonia, because there was tubular breathing and some fine crepitations over the lower half of the right back with a temperature of 102° .

CASE X.

On listening to the front of the right chest breath sounds were fairly normal down to the level of the nipple, below which they ceased abruptly. On percussion resonance was good down to the fourth rib, but hyper-resonant below over the liver area. On tapping one coin on another a bell note could be heard from the fourth rib down to the umbilical level in the mammary line.

The edge of the bell note area curved upwards to an inch above the umbilicus, and passed three inches to the left of the middle line, crossing the left costal cartilages, and then back across the sternum, about an inch below the level of the mamma. External to the right mamma the bell note area extended beyond the posterior axillary line round to the lower part of the back of the chest. The heart was pushed upwards and outwards, the apex beat being in the fourth space, two inches outside the nipple. It was impossible to feel anything in the abdomen itself as it was kept so rigid. The diagnosis was, of course, a right subphrenic abscess. A needle inserted in the eighth space in the anterior axillary line brought away foul gas and thin fetid pus. The same evening a portion of the tenth rib in the mid-axillary line was removed and a large amount of pus and gas let out. When this had been done an irregular hard mass could be felt in the right side of the abdomen, about the umbilical level, which might have led to further operation if the condition of the patient had not been so bad. Unfortunately the man died two days later.

At the post-mortem examination a perforation of the duodenum was found, $\frac{1}{2}$ in. in diameter, which had thick edges, as if of some weeks' standing. The abscess was limited below by

FIG. 1.

FIG. 2.

adhesions of the colon and edge of the liver to the abdominal wall with thick inflammatory tissue; this was the hard irregular mass felt at the operation. The falciform ligament formed the left limit.

A subphrenic gas-containing abscess under the left wing of the diaphragm is caused by perforation of a gastric or duodenal ulcer with a slow leak of the stomach contents, so slow that there is often no history pointing to ulcer. The abscess is limited below by adhesions of the great omentum and the front of the stomach to the abdominal wall, to the left by the spleen and gastro-splenic omentum. On the right it is bounded by the falciform ligament of the liver, which, as the abscess enlarges, is pushed very much to the right of its normal position, even to the right nipple line, as in the first case described. Abscess under the right wing of the diaphragm is much rarer, and is more usually due to inflammation of a retrocolic appendix causing an abscess communicating with the colon than to a perforated duodenal ulcer. Its boundaries are by adhesions of the edge of the liver, the transverse colon, and the omentum to the abdominal wall, the mesocolon, and the falciform ligament, which in this case is pushed well over to the left of the middle line. The gas evolved in these foul abscesses makes the area over them tympanitic, and the bell note is heard on the use of two coins.

The pressure upwards of the diaphragm and the inflammation invariably cause changes at the base of the lungs. With gastric ulcer it is the left lung which is affected; with duodenal ulcer sometimes the left and sometimes the right. At first a pleural friction is very often heard over the lower part of the lung, usually at the back, but sometimes in front as high as the fifth rib. In a case of perforated duodenal ulcer where there was no vomiting, this friction over the right lower front led to a few hours' hesitation as to whether it was only a case of diaphragmatic pleurisy, but commencing loss of liver dullness soon settled the diagnosis. The friction is usually followed by adhesion of the pleural surfaces and progressive collapse of the lung, or by a low form of pneumonia. In a few cases there is a clear pleural effusion, and instances have occurred where, a needle having been inserted and clear fluid withdrawn, an accidental push of the needle has sent it through the diaphragm, and the clear fluid has been followed by pus. For some reason it is very rare indeed for pus to form above the diaphragm in these cases. The usual condition is for the lower half of the back of the left chest to become quite dull and silent. The temperature is hectic and suggestive of empyema, and the left base is suspected. But, on examining the heart, instead of finding it displaced to the right, its apex beat will be found external to the left nipple and up in the fourth space, owing to the pushing up of the diaphragm, and there will be a large tympanitic area from the fourth rib downwards.

CHOLEDOCHO-ENTEROSTOMY FOR CONSTRICTION OF THE COMMON BILE DUCT FOLLOWING A PERFORATED DUODENAL ULCER.

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THIS case is of interest as a rare sequel of perforated duodenal ulcer.

A German, aged 54, was admitted to the Seamen's Hospital, Greenwich, under the care of Mr. E. Rock Carling, on December 14th, 1912. The history was that he had been operated upon in Bremen in June. He stated that bile drained from the wound for several weeks; the flow ceased towards the end of October, when he was discharged. When he started work an incisional hernia developed in the epigastrium, and it was for this he came to the hospital.

Condition on Admission.

He was emaciated and slightly jaundiced, his appetite was capricious, and he had a special distaste for protein and fatty foods. There was a healed scar in the right iliac fossa and a transverse scar running from the tip of the ninth costal cartilage across the right rectus muscle to about two inches beyond the linea alba; it was stretched, and near the costal margin was superficially ulcerated. When the patient strained a large ventral hernia, the size of a football, protruded through the cut recti muscles. The opening in the

latter measured 3½ in. from above downwards and 6 in. from side to side. At the right margin of the scar was a depression, apparently at the place where the abdominal cavity had been drained. There was some thickening and induration of the wound, and more deeply could be felt a vague resistant tender mass passing backwards into the right loin. The faeces were clay-coloured and contained no bile. The urine contained bile; no sugar was present.

The resistant mass on the right side increased, and the jaundice became more pronounced. The temperature rose to 100° F., and five days after admission a sinus formed at the side of the depression in the upper scar, and large quantities of bile escaped. The jaundice rapidly disappeared, but the faeces still contained no bile. After some days the sinus closed, but it opened again subsequently. Consequently, on January 2nd, 1913, Mr. Carling decided to operate.

First Operation.

An incision was made along the upper transverse scar. The omentum, which was adherent to the sac of the hernia, was dissected off and found to be tucked up over the front of the liver. After this had been separated the transverse colon, which was also adherent to the liver, was drawn down. At this stage some coils of small intestine adherent to the sac of the hernia had to be repaired after damage in detaching them.

The biliary sinus was then dissected out and traced downwards and backwards, where it entered a large cystic swelling situated deeply in the right loin on the outer side of the duodenum. This was opened, and 6 oz. of thick, viscid, green bile escaped. The wall of this swelling was lined by mucous membrane; on further investigation it proved to be a dilatation of the common bile duct; the gall bladder was fibrosed and contracted, and contained a small quantity of glairy mucus only. On dissecting out the cystic duct a small quantity of non-odorous, thick yellow pus was discovered between the first part of the duodenum and the liver. The pylorus was adherent to the neck of the gall bladder. There were other adhesions between the omentum, small intestines, and stomach, but these were too numerous to separate.

Diagrammatic schema showing the dilated common bile duct and the site of constriction of the duct. A, Site of obliteration of common bile duct; B, fibrosed gall bladder and obliterated cystic duct; C, choledocho-enterostomy; D, entero-enterostomy; E, transverse mesocolon.

The opening in the dilated common bile duct was brought forwards and sutured to the peritoneum at the right margin of the wound and a drainage tube inserted into the cyst. A tube was also sutured in the gall bladder, and cigarette drains were put above and below the cyst, on account of the escape of bile that occurred during the manipulations. The sac of the hernia, along with the adherent skin, was cut away, and the margins of the neck of the sac drawn together by strong silk mattress sutures. The skin wound was closed by silk-worm-gut sutures. The operation was attended by a good deal of shock.

After-History.

The tube in the gall bladder was removed the next day as no bile was draining through it; the upper cigarette drain was removed on the second day and the lower drain on the fifth day. Bile drained through the tube in the dilated common bile duct freely (3x a day). The wound was kept dry by draining the bile away with a Sprengel's pump. The wound healed very well and the deep sutures held perfectly. After the operation the faeces continued to be clay-coloured, and the sinus showed no attempt to close.

On thinking over the problem which the case presented, it seemed clear from the many peritoneal adhesions present that there had been a general peritonitis, probably of perforative origin. The lower incision in the right