Some Experiences

IN

BRONCHOSCOPY AND OESOPHAGOSCOPY.

BY

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(With Special Plate.)

THERE can be few accidents productive of more acute mental anxiety and physical distress than those caused when the entry of a foreign body into the lower air passages brings about an immediate difficulty in breathing. On rare occasions, but with less suddenness, a pathological lesion will effect the same results, and I will later describe a case in point. Similarly, lesser degrees of alarm and discomfort may follow the impaction of a foreign body in the oesophagus if it should happen to prevent or render difficult the natural and unhindered passage of food into the stomach.

It was as a method for the safe and successful treatment of such accidents that direct endoscopy first established itself and still remains without a rival, but its range of usefulness has been extended to the diagnosis and treatment of such pathological conditions in the lower air passages and the oesophagus as can be directly inspected by the surgeon. For such advances we are mainly indebted to the brilliant work of Chevalier Jackson (Philadelphia), and those interested in the subject will do well to read the report of his address given at the meeting of the British Medical Association at Bath in 1925.¹

It will be my purpose in this communication to mention some of the more serious symptoms consequent upon the entry of a foreign body into the lower air passages or the oesophagus, and to emphasize how they may be avoided or minimized by the general practitioner who is usually the first to whom the patient applies. It may be more convenient to give the histories of six illustrative cases first of all and then to see what lessons may be learnt from them.

CASE I.—A portion of rabbit bone lodged in a lower lobe of the right bronchus for sixteen months: Removal by peroral bronchoscopy: Recovery.

I am indebted to Dr. Eric Gardner (Weybridge) for the following history of his patient's symptoms. "A married woman, aged 56, consulted me in the evening of October 11th, 1925. She thought she had asthma, although she had never had it before. For certain reasons the consultation was a hurried one, but I had time to notice that any slight exertion caused a definite inspiratory stridor, and that the movement of the right side of the chest was defective. I made no diagnosis, and arranged for a further and more detailed examination, because I suspected the possibility of a foreign body. At her second visit the following history was obtained. About three weeks previously she choked during dinner time, and a medical man living next door was sent for. He passed his finger down her throat and the spasm stopped. The next day any quick movement caused cough, and this became worse and was particularly noticeable when motoring against the wind. Meantime, difficulty in breathing increased and was accompanied by stridor. My examination revealed deficient air entry into the base of the right lung, and a small area below the angle of the right scapula where occasionally a few râles could be heard.

"A radiograph of the chest was taken by Mr. Charles Roberts (Woking), and showed a very indefinite linear shadow low down in the base of the right lung. On October 25th bronchoscopy was performed with a negative result.

"A few days later the patient was operated on for anal fistula and haemorrhoids and did not get out till the second week in December. In the meanwhile her cough had gone.

"She caught a severe cold, and, on December 31st, had one of the most terrible coughs I have ever heard. It failed to respond to any treatment, was incessant day and night, and was accompanied by expectoration. The evening temperature for four days was 104°. Physical signs were very indefinite; there were a few scattered râles in both bases, but more marked in the right.

"Improvement was slow except that the cough remained, and the patient went to the South of France in February, 1926. There the symptoms were very troublesome, but improved slightly during March and April, although talking, moving quickly, and cold air always brought it on, and it persisted during the summer. In September the patient went to Scotland, caught cold, the cough became very severe, and she expectorated a quantity of pus, which gave a certain amount of relief to the symptoms. She

now noticed that the cough was always aggravated if she lay on her right side.

"On November 13th a second radiograph was taken and gave a clearer definition of the linear shadow seen in the first screening. An attack of influenza precluded another bronchoscopic examination while it aggravated the cough, which was very incessant day and night. The physical signs in the right base became very definite, and over a small area the breath sounds were loud and harsh. These conditions improved very slowly, and on January 18th she saw you."

Bronchoscopy.

On January 24th the patient was anaesthetized by Mr. Raymond Apperley, and on passing a small bronchoscope into the right lower lobe bronchus it was seen to be very congested when compared with the upper and middle lobe bronchi (Fig. 4). Some minutes were spent in removing the secretion and checking its formation by the application of a mixture of adrenaline and cocaine. Then a small bead of pus appeared in the mouth of a small bronchus, and on inserting the closed ends of Jackson's "mosquito," side-grasping, bronchoscopy forceps a grating sensation was felt. The foreign body was then grasped and removed, and proved to be a thin T-shaped piece of flattened bone 2 cm. in its long and 1 cm. in its shorter limb, and one end of the latter terminated in a sharp point.

A week after the operation the patient said, "I can talk and run upstairs. I can go out into cold air, and I can lie on my right side, and nothing makes me cough at all."

(It has been found impossible to reproduce for illustration the ill defined shadow of the foreign body as seen in the negative and radiograph.)

CASE II.—A paper-fastener lodged for twenty-one months in the left lower lobe bronchus of a boy aged 7 years: Removal by peroral bronchoscopy: Recovery. (Fig. 1.)

This case was reported in the BRITISH MEDICAL JOURNAL of November 18th, 1922 (p. 973), and readers interested in the subject are referred for details to that source. It will suffice to say that the chief symptoms were a chronic cough, the child "was always bronchial and short of breath, and the noise he made at night was like air passing through a small hole." In addition, there were frequent attacks of pyrexia after exertion, and examination of the chest by Dr. Batty Shaw showed definite physical signs of deficient air entry into the left lower lobe. Dr. Salmond's radiograph clearly showed the paper-fastener in the left bronchus, with the extended wings directed upwards.

On June 29th, 1922, I removed it by peroral bronchoscopy. The patient left the nursing home two days later and has remained well since. The operation was very difficult owing to the bleeding caused by oedematous granulations which surrounded and obscured the foreign body.

CASE III.—Spicule of chicken bone removed from the oesophagus of a man four days after it had been swallowed: Cellulitis in the neck: Oesophagoscopy: Recovery.

A man, aged 50, felt a sharp pain in his throat when eating some chicken. Shortly after dinner he experienced discomfort in the left side of his neck about the level of the collar bone, and at each succeeding meal difficulty and pain in swallowing increased. On the third day he could not swallow liquids. When I saw the patient he looked ill and distressed; temperature 100.6°. There was a diffuse and tender swelling over and in the neighbourhood of the lower half of the left sterno-mastoid.

He went at once into a nursing home, and four hours later and by direct oesophagoscopy I detected the bone about three to four inches below the entrance of the gullet. One end of the bone transfixes the mucous membrane, and on dislodging it about 3 drachms of intensely fetid pus escaped. A rubber feeding tube was passed through the gullet and a feed of egg, milk, and brandy was administered. The patient left the home in three days, and quickly recovered his normal health.

CASE IV.—A splinter of rabbit bone impacted in the oesophagus for five days: Cervical cellulitis: Oesophagoscopy: Recovery.

A man, aged 35, consulted me in 1924 because of increasing difficulty and severe pain on swallowing. The symptoms were ascribed to scratching the throat when he "was eating some of the stump of a broccoli."

I had known the patient as a typical English athlete, a playing member of one of the leading county cricket clubs and of a prominent Association football club. I mention these facts because of the dramatic change in his usual appearance since the above accident occurred. He was very weak, the complexion pale and sallow, and the eyes sunken; temperature 101.2°, pulse 110. The left side of the neck was diffusely swollen and very tender on pressure. I sent him to Dr. Salmond, who reported to me within an hour that the x-ray screen revealed a foreign body in the gullet about the level of the manubrium sterni.

The patient immediately went in a nursing home, and a few hours later I removed a spicule of bone 3 cm. long and 1 cm. broad. The sharp end was deeply embedded in the left wall of the oesophagus, and on gently dislodging it with Paterson's forceps

about an ounce of intensely foul pus escaped. When the flow had ceased liquid nourishment was administered through a stomach tube passed through the oesophagoscope. The following day sips of sterilized water were allowed and nutrient enemata administered. The patient recovered slowly but completely from his septic intoxication and left the home a week later.

CASE V.—A denture which lodged in the oesophagus but passed into the stomach and remained there for nine weeks—the result of a delayed oesophagoscopy.

History.—Shortly after midnight on January 13th, 1927, I received a telephone message from the hospital to say that a woman, aged 51, had swallowed her denture and that it could be seen on the screen in the cervical region of the oesophagus. From a considerable experience of this type of accident, and having been assured that the denture had no hooks, I felt confident it would involve no risk if it were allowed to remain *in situ* for a few hours longer. At 9 o'clock the same morning I passed an oesophagoscope, but found nothing in the whole length of the gullet. Later the same day the patient was again x-rayed, and the foreign body could be seen in the stomach, and here it remained until it was passed with the stools on March 22nd. In the meantime it had caused no trouble to the patient but an uneasiness in my mind which increased as week by week passed by, and this was not relieved by a surgical colleague who suggested that artificial teeth in the stomach might possibly be regarded as an "accessory organ of digestion." I presume he had in mind the gizzard of a bird.

The method which finally proved successful in getting rid of the denture was, in my experience, novel. The patient was given pieces of gauze to swallow, each being 6 in. by 5 in. and two layers thick, with each meal, and after five to six days the foreign body was evacuated and found to be entangled in some of the gauze.

CASE VI.—Removal of a papillary granuloma from the proximal end of the right bronchus by peroral bronchoscopy: Recovery. (Figs. 2 and 3.)

In March, 1918, Captain R. was "gassed" and kept in bed for a fortnight, and then invalided home for twelve weeks. During this time he noticed difficulty in breathing when he hurried, and in the following October there was occasional blood-spitting in the morning. He was demobilized in January, 1919, as C1, with 20 per cent. disability, though still dyspnoeic on exertion. In May, 1919, there was stridor on walking and much yellow expectoration. On June 16th he had marked stridor with impeded inspiration and expiration and distressing cough when lying down; there was recession of the supraclavicular fossae on inspiration, with feeble breath sounds around the root of the right lung. Bacteriological examination of sputum showed no tubercle bacilli, but numerous *M. catarrhalis*, streptococci, and coliform bacilli. The radiographer reported "some evidence of infiltration of the mediastinal contents at the level of the manubrium sterni."

On this same date (June 16) I saw him with Dr. MacWhirter of Clapham Common, and the mere exertion of walking into my house caused the patient extreme dyspnoea with both inspiratory and expiratory stridor. The laryngoscope revealed a reddish tumour at the lower end of the trachea, which moved downwards and upwards with inspiration and expiration, suggesting that the growth was pedunculated. Therefore we were confronted with what may be termed an "autogenous foreign body." We sent him straight into a nursing home, and the next day I removed the tumour by direct peroral bronchoscopy. In spite of the preliminary and free application to the growth of cocaine and adrenaline solutions, the first grasp of it in Paterson's forceps caused very free and a somewhat alarming degree of bleeding. This caused many delays, but ultimately all traces of the tumour were removed, and the patient made a rapid recovery and left the nursing home four days later. On September 28th, more than three months later, he expressed himself as being "as fit as I have ever been in my life."

The late Professor Shattock examined a portion of the tumour and described it as a "papillary granuloma." He agreed with the suggestion that it probably arose from proliferating granulations growing from a small ulceration caused by the inhalation of mustard gas.

I cannot recall any operation which gave me more anxiety during its performance or gratification on its successful issue. The physical distress of the patient was obvious and only equalled by a bravery and self-control which had not been undermined by months of suffering. The bleeding of the tumour from the moment it was seized was so free that it not only blotted out the restricted field in which one had to work but threatened an additional and possibly immediate danger if the left bronchus had become blocked by a clot. The pedicle of the tumour was attached to the posterior wall of the right bronchus close to its tracheal margin.

To these sources of mental anxiety were added the extremely tiring effect on the left arm of maintaining the bronchoscope in position in a man with a short, thick neck and a perfect set

of teeth. (Endoscopists know full well how much easier it is to manipulate the direct tube in an edentulous patient.) Finally, the operation was performed during a heat wave, so that those who were actively engaged during the operation were eventually reduced to a condition of complete exhaustion.

(For fuller details of this unique case see the *Journal of Laryngology and Otology*, January, 1920.)

REFLECTIONS AND DEDUCTIONS.

The outstanding lesson which the history of these cases teaches is the *danger of delay*, with its obvious corollary that intervention should be immediate when the presence of a foreign body in the lower air passages or in the oesophagus has been diagnosed or even suspected from the history, the nature of the symptoms, or the results of radiographic examination.

What are the chief dangers and difficulties which may be engendered by delay?

1. *Shifting of the Position of the Foreign Body.*

If it has been proved by any or all of the methods of examination to have recently lodged in a bronchus, a violent fit of coughing may expel the foreign body upwards into the glottis or its immediate vicinity and cause a glottic spasm which may prove fatal in a few minutes.

Should the foreign body be like a nail or large-headed pin, which most frequently descend head first, severe coughing will with deep inspiration and forcible expiratory efforts often tend to make the object pass deeper and deeper by a kind of ratchet movement. It is needless to point out that a foreign body primarily lodged in a main bronchus would be infinitely easier to remove than when delay has allowed it to pass downwards into a smaller secondary bronchus (see Case I).

Again, an object at first detected in the lower airways may be coughed up and then swallowed, so that an unnecessary and fruitless search with the bronchoscope may result from a policy of waiting. Furthermore, it may be expelled from one bronchus and find its way into the other.

In the case of the oesophagus the passage of the foreign body into the gastro-intestinal tract frequently causes no trouble, especially if there are no sharp projections to impede its progress (Case V). Indeed, it is surprising what large objects have been swallowed and recovered later from the stools. It was probably with such experiences in his mind that an American general practitioner said, after looking over a large array of endoscopic instruments, "Waal, the best foreign body catcher I know of is, the old-fashioned English bed-pan."

If it were established that a needle had passed into the stomach the question would arise, "Which is the greater risk, a laparotomy or the danger of perforation during the passage downwards of the foreign body?" Fatalities have followed perforation of the bowel by a needle, and knowing this the surgeon may be tempted to explore, but even with the help of an expert radiographer it may be very difficult to locate the exact portion of the small bowel in which the foreign body lies. Possibly it might be well to have the patient radiographed at least every day and for the surgeon to wait at any rate so long as the object continues to move downwards.

2. *The Swelling and Maceration of a Soft Foreign Body.*

Amongst the most difficult and dangerous objects which may enter the lower airways are those which quickly swell and become soft, such as a pea, bean, or nut kernel. Such an accident demands immediate intervention. Delay means maceration, and even with the highest skill particles may escape the most cunningly devised instrument and set up a diffuse and fatal form of bronchitis or bronchopneumonia. From this point of view the peanut has a particularly evil reputation amongst our American colleagues.

3. *Septic Foreign Bodies.*

One of the most dangerous of these when it gains access to the lower air passages is a septic tooth or "filling" which has slipped from the forceps during extraction. In no circumstances should hesitation in searching for it be countenanced, because serious pulmonary symptoms of a septic nature are liable to set in very quickly, and the

rapid development of local inflammatory reaction around such a foreign body may render its detection and removal very difficult.

Cases III and IV prove how rapidly a sharp foreign body lodged in the oesophagus may endanger the life of the patient. In each case another day's delay might have meant the commencement of a quickly fatal mediastinitis. Valuable time should not be lost in trying the effect of quantities of new bread or other stodgy forms of food. The word "criminal" is scarcely too strong a term to use for the employment of bougies to push blindly the foreign body downwards or of probangs to draw it upwards. I am quite aware that many cases could be quoted in which these methods have been successful, but they involve a grave danger which it is not fair to risk if the safer and more certain procedure of direct endoscopy be available. Is this too great an assumption? I do not think so, because in these days of telephonic facilities and rapid transport, with skilled endoscopists in almost every city and large town, help would be available without dangerous delay. It may be asked, What should be done in a case of laryngeal spasm or severe stridor when delay seems out of the question and no skilled endoscopist could be obtained for hours or even a day? The obvious answer is, "Do a low tracheotomy." By this the risk of suffocation would be removed, and if the tracheal wound be held well open during any coughing fit the foreign body may be expelled through it or driven against it so that it can be removed. Should these desirable ends not occur, the later bronchoscopy will be very much easier because the tube can be passed through the tracheotomy wound instead of through the mouth, and a novice could scarcely fail in such circumstances to see and remove the *corpus delicti*.

As a pregnant instance of the danger of blind bougieing in the oesophagus the following case may be quoted. The patient was a middle-aged man, who was brought into University College Hospital in a moribund condition and with the history that he had swallowed his denture (Fig. 5, No. 15) during sleep two nights before admission. The morning after the accident two prolonged but ineffectual attempts had been made with bougies to force it into the stomach. On admission to hospital we were able to remove the denture by oesophagoscopy within five minutes. Pulmonary symptoms of a septic character developed, and the patient died on the third day. *Post-mortem* examination revealed two large sloughing perforations in the cervical portion of the gullet, and it was obvious that through one of these the bougie had passed four inches downwards into the left mediastinum. There was a large effusion of purulent fluid in the corresponding pleural cavity. Comment is needless. (For fuller details see *Lancet*, February 23rd, 1918.)

4. The Significance of Certain Symptoms.

The sudden onset of a cough in an otherwise normal patient should always arouse suspicion, and particularly in the case of children who, from fear of punishment or from ignorance, may afford no history of the accident. This difficulty will obviously arise if, unbeknown to the nurse, a foreign body be inhaled or swallowed before the child has begun to talk. I once removed the teat of a "comforter" from the oesophagus of an infant 4 days old; it had completely prevented nursing at the breast and, but for the fortunate confession of the nurse, more serious results might have followed.

Reference has been made already to the need for care in diagnosis when with cough and other symptoms suggestive of tuberculosis no tubercle bacilli have been found after repeated examinations of the sputum. Suspicion should be all the stronger if the physical signs in the chest be limited to one of the lower lobes of the lungs. In all such doubtful cases the services of a skilled radiographer should be insisted upon, and if his report be negative a careful examination should be made with the bronchoscope.

5. The Silent Period.

It not uncommonly happens that the first symptoms of irritation, such as cough, wheezing, and shortness of breath, pass off when the mucous membranes have become tolerant of the presence of a foreign body, and a latent

or silent period follows. Too frequently this lulls both patient and surgeon into a sense of false security, with consequent dangerous optimism and delay. Such latent periods may last for hours, days, weeks, or years, but the day of reckoning is almost inevitable, and the technical difficulties of direct endoscopy, when this is ultimately carried out, may be increased to such a degree as to involve risks which would not arise in an early intervention.

6. Increased Difficulties of Treatment.

Cases I and II show that when a foreign body lodges in one of the bronchi prolonged delay in its removal will afford time for the formation around it of vascular and oedematous granulations which not only obscure the object but hinder its removal because of the profuse bleeding and secretion which must be controlled before the foreign body can be seized and withdrawn. If impaction has lasted long enough for cicatrization of the granulations to occur, the surgeon may be faced with the great difficulty of dilating a stricture before the release of the foreign body is possible.

RADIOGRAPHY.

There can be few exceptions to the rule that in every case where a foreign body is known or suspected to have been inhaled or swallowed the services of an *expert* radiographer should be enlisted. I emphasize the qualification because a poor skiagram is misleading and often worse than useless. In Case II the boy's chest was x-rayed shortly after the accident, but the heart and the neighbouring bronchial regions only revealed a homogeneous deep black shadow. It was assumed that no foreign body was present, and this resulted in twenty-one months' delay during which the patient suffered from serious pulmonary symptoms. Dr. Salmond's radiograph showed the paper-fastener very clearly through the heart substance, and a few days later it was removed. (See *BRITISH MEDICAL JOURNAL*, November 18th, 1922.)

Should there be an interval between the primary radiographic detection of the foreign body and the operation for its removal a second exposure should be carried out immediately before bronchoscopy or oesophagoscopy, because the foreign body may have moved from its original position. Had this been done in Case V oesophagoscopy would have been unnecessary.

It may be asked, Of what value would radiography be in the case of bodies not opaque to the x ray, such as fish-bones, bone buttons, glass beads, vegetable substances, macerated meat, etc.? The answer is, In such cases, though the object itself may not be rendered visible by radiography, its *position* can often be indicated.

(a) Lung.

If a foreign body so completely blocks a main bronchus that no air can enter or leave it, the lung tissue will soon give the physical signs and symptoms of atelectasis, and the radiogram will reveal a characteristic shadow. A more restricted effect will naturally result if a secondary bronchus be obstructed.

Should the object be of such a shape that air can be inspired through but not expired from a primary or secondary bronchus an obstructive emphysema beyond the location of the foreign body will result, and will be manifested if good radiograms be taken; these must be made with the shortest exposure, at the moment of full inspiration and deep expiration.

In the case of smaller non-opaque bodies which permit of unimpeded ingress and egress of air, the insufflation of bismuth subcarbonate or the injection of lipiodol may render its location determinable.

For fuller information on these problems and their treatment readers should refer to the masterly exposition of the subject by Chevalier Jackson in the *BRITISH MEDICAL JOURNAL* of October 17th, 1925.

(b) Oesophagus.

When such objects as spicules of bone or other non-opaque bodies are lodged in the gullet, a swallowed capsule of bismuth may be seen by the x rays to be held up at a definite spot. Small pledgets of wool soaked in bismuth

solution and swallowed may be caught up in the same way (H. K. Wilson). Bone buttons can frequently be detected after the swallowing of a bismuth solution.

Whether the foreign body be located in the larynx, the trachea, the bronchi, or the oesophagus, an antero-posterior and a lateral or lateral oblique x-ray examination should always be made. A comparison of the results thus obtained may be of the utmost value to the endoscopist.

Radiography is indeed the handmaiden of endoscopy, and her aid has often been and will continue to be of indispensable assistance in this branch of surgery.

In conclusion I make no apology for omitting any description or illustrations of the many types of endoscopes

and instruments used with them; they can be seen in the surgical instrument catalogues, their number is legion, and they increase more rapidly than the foreign bodies which they are devised to deal with. Still less would it be worth while to dwell on the details of manipulative technique, because these can only be acquired by patient and pains-taking practice.

My object will be attained if those who have glanced through the histories of the cases which I have reported will learn from them some of the lessons which it has seemed worth while to emphasize.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, October 17th, 1925, p. 686.

NORMAL CHOLECYSTOGRAPHY.*

BY

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(With Special Plate.)

ON examining a number of cholecystograms it at once becomes evident that the shadow of the gall bladder varies in different individuals, both in size, shape, position, and density. Dr. Evarts Graham,¹ the pioneer of cholecystography, predicted in an earlier paper that the shadows of gall bladders would probably be found to vary in position with the different types of bodily habitus. This preliminary report is concerned with the cholecystographic investigation of 100 medical students at University College, London, after administration by the mouth of sodium tetra-iodo-phenol-phthalein, in the endeavour to determine primarily whether the characters of the shadows of gall bladders in normal individuals vary with the different types of bodily habitus. Comment is also made on the oral administration of the dye, and on the details of the radiological technique employed.

1. Relation of Gall-Bladder Shadows to Bodily Habitus.

The students, whose ages varied from 18 to 30 years, comprised 80 males and 20 females, and they were classified after the manner of Mills into the following types of bodily habitus. Mills² gives the chief characteristics of each of these types as follows (Fig. 1):

1. *Hypersthenic*.—Massive physique, great body weight, heavy bony framework, short wide deep thorax, relatively long abdomen of greatest capacity in upper zones, subcostal angle very obtuse, lungs wide at bases and contract sharply to apices which project but little above clavicles, long axis of heart nearly transverse, alimentary tract high in position, gastric motility fastest and tonus most marked of any type (stomach emptying time about 4 hours 22 minutes), colon high and short, caecum well out of iliac basin (even standing), transverse colon truly transverse, marked colonic tonus, and motility rapid. This group comprises about 5 per cent. of individuals.

2. *Sthenic*.—Resemble hypersthenic but characters less marked; considerable body weight, rather heavy bony framework, thorax somewhat short and deep, lungs widest at bases, heart moderately transverse, subcostal angle about 90 degrees, digestive tract high with good tonus, and motility fairly rapid (stomach emptying time about 4 hours 46 minutes). This group comprises about 48 per cent. of individuals.

* This work was made possible by a grant from the Medical Research Council.

3. *Hyposthenic*.—Frailty of build approaches that of asthenic type, visceral characteristics approach those of asthenics, but lack the extremely low position and peculiar form of such; tonus rather poor and alimentary motility somewhat slow (stomach emptying time about 5 hours 26 minutes); lungs intermediate in proportions, heart pendent. This group comprises about 35 per cent. of individuals.

4. *Asthenic*.—Frail slender physique, light body weight, delicate bony structure, long narrow thorax, short abdomen of least capacity in upper zones, marked disproportion between great pelvic capacity and capacity of upper abdomen (pelvis may be as wide and capacious as that of a hypersthenic of twice the body weight); subcostal angle narrow, lungs widest in upper zones and apices extend well above clavicles, heart pendent ("drop-heart"); gastro-intestinal tract low, stomach often largely pelvic when standing, colon long, caecum capacious and low in pelvis, poor tonus and motility slowest (stomach emptying time about 5 hours 43 minutes, and often not empty after 6 hours). This group comprises about 12 per cent. of individuals.

In the investigation here described radiograms of the gall bladder were taken, after administration by the mouth of sodium tetra-iodo-phenol-phthalein, with the radiological technique described below. The data obtained from the cholecystograms are given in the table. From these data the following deductions may be made.

1. The length of the gall-bladder shadow is not definitely related to the type of bodily habitus.

2. The breadth of the gall-bladder shadow is greater in the "better" types of bodily habitus (that is, in the hypersthenic and sthenic types).

3. The neck of the gall-bladder shadow lies at a higher level and at a greater distance from the mid-line of the vertebral column in the "better" types of bodily habitus.

4. The fundus of the gall-bladder shadow lies at a higher level and at a greater distance from the mid-line in the "better" types of bodily habitus.

5. The rate of emptying of the gall bladder (as indicated by the extent of reduction in the size of the shadow at 1½ hours—that is, two hours after taking a fatty meal) is quicker in the "better" types of bodily habitus.

6. The respiratory excursion of the gall-bladder shadow is greater in the "better" types of bodily habitus.

It must be noted that, though this table indicates that the length of the gall-bladder shadow is not definitely related to the type of bodily habitus, the *actual* length of the viscus may vary with the type of bodily habitus, because in the radiograms we have a more foreshortened view of the gall bladder in the "better" types of bodily habitus.

Table of Results in Various Types and at the Intervals Specified after Administration by the Mouth.

Type of Bodily Habitus.	No. of Cases.	Length of Gall-Bladder Shadow (Inspiration).	Maximum Breadth of Gall-Bladder Shadow (Inspiration).	Position of Neck of Gall-Bladder at 1½ Hours (Inspiration).	Position of Fundus of Gall-Bladder at 1½ Hours (Inspiration).	Respiratory Excursion.
Hypersthenic	6	14½ hrs.: 4.9-9.8 cm. 16½ hrs.: 2.6-5.3 cm.	1½ hrs.: 2.8-3.7 cm. 16½ hrs.: 1.2-1.9 cm.	Upper part D12—lower border L1 3.5-5.8 cm.	Lower part L1—lower border L3 4.5-8.5 cm.	2.5-4.9 cm.
Sthenic	44	14½ hrs.: 4.9-8.5 cm. 16½ hrs.: 2.8-6.1 cm.	1½ hrs.: 2.6-3.7 cm. 16½ hrs.: 1.2-2.8 cm.	Lower border D12—middle L2 2.2-5.6 cm.	Upper part L2—upper border L4 3.8-6.9 cm.	2.5-4.2 cm.
Hyposthenic	17	14½ hrs.: 5.4-8.0 cm. 16½ hrs.: 3.5-5.9 cm.	1½ hrs.: 2.5-3.5 cm. 16½ hrs.: 1.4-2.7 cm.	Middle L1—lower part L2 2.7-4.8 cm.	Lower part L2—middle L4 3.5-5.0 cm.	1.9-2.7 cm.
Asthenic	5	14½ hrs.: 6.0-9.8 cm. 16½ hrs.: 4.9-7.8 cm.	1½ hrs.: 2.0-2.6 cm. 1½ hrs.: 1.1-.9 cm.	Upper border L2—lower border L2 2.7-4.0 cm.	Middle L1—lower border L4 3.4-4.5 cm.	1.5 cm.
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FIG. 1.—Dr. Salmond's skiagram of patient's chest, showing the paper-fastener in the distal portion of the left bronchus.

FIG. 2.—Papillary granuloma removed from the posterior wall of the proximal end of the right bronchus.

FIG. 3.—Microscopic section of a portion of the tumour prepared by the late Professor Shattock.

FIG. 4.—Bronchoscopic views of the lower end of trachea and of the deeper aspects of the right and left main bronchi, with key. (1) Mouth of right upper lobe bronchus. (2) Bifurcation between (1), (3), and (4). (3) Mouth of middle lobe bronchus. (4) Openings of lower lobe bronchi. (5) Left main bronchus. (6) Mouth of left upper lobe bronchus. (7) Openings of left lower lobe bronchi.

FIG. 5.—Foreign bodies removed from bronchi (1 to 7) and oesophagus (8 to 15).