The localization of diseased action in the oesophagus / by Harrison Allen.

THE LOCALIZATION

OF

DISEASED ACTION IN THE ŒSOPHAGUS.

BY

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THE anatomical relations of the œsophagus are more varied than those of any portion of the alimentary canal of similar length. Usually ten inches long, one to one and a half inches of this distance lie within the neck, seven inches within the thorax, and one and a half to two inches below the diaphragm. In a state of rest it is slightly flattened as well as contracted, and its mucous membrane is thrown into longitudinal folds, so that its transverse section exhibits a stellated oval. It is slightly narrowed in passing through the diaphragm, and at the beginning of the thoracic portion. Sappey compares the canal to two elongated cones whose apices join at the last-mentioned constriction.

The œsophagus describes three curves: one antero-posterior, which answers to the curvature of the vertebral column, and two lateral. The first lateral curve lies a little to the left of the median line, and terminates just below the origin of the left bronchus. The second lateral curve extends from the last-mentioned point to the diaphragm. These curves might with propriety be named the *tracheal* and the *aortic* curves, since the first lies behind the trachea, and the second to the left of the descending aorta. The relations of the *tracheal* portion of the œsophagus are as follows. The canal lies behind the trachea, with a slight inclination to the left. The pleura is in contact with it on either side. The left subclavian artery lies to the left. It is crossed by the left bronchus, and lies behind the pericardium where that membrane covers the left auricle. The *aortic* portion of the œsophagus at first lies a little to the right of the aorta, but soon crosses in front and to the left of that vessel. To the right and behind lies the azygos vein. Parallel with it pass the pneumogastric nerves, the left going in front and the right behind. The thoracic duct ascends from right to left posteriorly, while still further in the same direction are the right intercostal arteries and the vertebral column. Several lymphatic glands lie on either side of the canal as well as behind it.

Instances are on record of hemorrhages into the œsophagus from the superior vena cava, ascending portion of the aorta, the innominate and right subclavian arteries. The heart has also been wounded by a penetrating foreign body lodged in the œsophagus. These structures might be added to the normal relations under the name of *indirect* or *possible clinical* relations.

If the œsophagus possessed much elastic tissue, causing it to maintain the tubular form, the points most likely to be obstructed in disease or from foreign bodies would be those answering to its narrowest parts, namely, at the beginning of the thoracic segment and the cardiac extremity. Writers have generally assigned the upper and lower portions of the canal as the most frequent sites for the lodgment of foreign bodies and the occurrence of disease. The œsophagus, however, is not tubular in form; its walls when at rest are in contact, and indifferently resist the tendency to stricture or occlusion of the canal under moderate degrees of extrinsic pressure.

The study of the literature of obstruction arising from whatever cause has led me to believe that the œsophagus is more often obstructed at the cricoid cartilage, and at the region where the left bronchus crosses the œsophagus, than at any other place. The first of these localities, it is well known, is frequently the point of lodgment of a foreign body or the seat of carcinoma. The fact that the tracheal curve or the point crossed by the left bronchus is a locality of great pathological interest has been in great measure overlooked. Systematic writers omit any mention of the latter structure as a factor in œsophageal troubles. Thus, Bryant, in his "Practice of Surgery," says that "for-

eign bodies in the œsophagus are mostly arrested at its origin behind the cricoid cartilage, or at its lower end, just above the diaphragm, the two narrowest portions of the tube, and anything that can be swallowed may be so impacted." Erichsen states that "if a foreign body go beyond the cricoid cartilage it usually becomes arrested near the termination of the œsophagus."

From among ten cases of foreign bodies, which I have collected, three were situated behind the cricoid, four just above the left bronchus, *two* near the cardiac end, and one between the cricoid and left bronchus. I will briefly relate these cases, omitting mention of the cricoid variety.

Case I.—Male, aged 30, in taking a drink of water swallowed an artificial front tooth, with gold plate, which measured one and a quarter inches in length and five-eighths of an inch in height. *A probang was passed eleven inches* before touching it. It was removed by silver wire loops secured to the end of the probang. (John Dearden, *Lancet*, 1869, Oct. 16, p. 540.)

Case II.—Male, aged 21. Swallowed a half-crown piece. At the end of a month hemorrhage occurred from the mouth. Sudden death. Stomach distended with coagulated blood, and intestine, as far as descending colon, contained blood, more or less changed. *An ulceration was found after death at the commencement of the thoracic portion of the aorta.*

Case III.—Male, adult. An impacted fish-bone caused death on the tenth day. An ulcer was found on the right side of the œsophagus, perforating the walls *on the level of the fourth dorsal vertebra* and communicating with the aorta. A similar ulceration had excited thickening around and obstruction of the right azygos vein. (Ramskill, *Lancet*, May 13, 1871.)

Case IV.—A child, aged 5 years, swallowed a halfpenny. The coin was pushed violently downwards into the stomach. Death from enteritis. The coin was not found at the autopsy. *The lower third of œsophagus inflamed.* (Jas. Nicholls, St. George's Hosp. Rep., iv., 1869, 219.)

In Case I. the probang must have reached a point just above the left bronchus. An examination made upon a dead body lying upon a table has shown me that the left bronchus is reached by a probang at the distance of ten and a half inches from the teeth. It is in every way probable that in the living subject, in the erect position, a half-inch might be naturally added to this measurement; to say nothing of the individual variations in length of the parts traversed by the probang. In Case II. the term "commencement of the thoracic portion of the aorta," when paraphrased (as I have ventured to do) as follows, "at a point opposite the third dorsal vertebra," will bring the point of obstruction just above the left bronchus,—the latter structure answering at its origin to the fourth dorsal vertebra. The impaction from a body the size of a half-crown piece would be evident as it approached the bronchus, rather than be detected lying directly behind it. In like manner, in Case III., the phrase "on the level of the fourth dorsal vertebra" brings the point of obstruction to the region of the left bronchus. In Case IV. the coin had most probably been lodged at the bronchus, and the track of inflammation at the lower third of the œsophagus answers to the extent of bruising incurred in the violent passage of the coin and the probang.

The two cases of cardiac obstruction are as follows:

Case I.—Male, 56 years old, in whom a piece of bone had *perforated the right side of the œsophagus a half-inch above the diaphragm*, and wounded the superior vena cava. Death at end of sixth day. Stomach and right pleural cavity filled with coagula. (E. Coëster, *Berl. Klin. Wochenschrift*, Oct. 24, 1870.)

Case II.—Adult male, in whom a fish-bone had *perforated the cardiac end of the œsophagus*, perforating the stomach and diaphragm, and penetrating the posterior wall of the heart, making a jagged wound immediately in the middle of the ventricular septum, and opening the right coronary artery and vein. (*Lancet*, 1860, ii. p. 186.)

It will be at once seen that in both these instances the lesion was occasioned by the sharp, needle-like bone. It is by no means probable that a coin-like, much less a globose, substance would have been so arrested. A striking contrast exists between that portion of the œsophagus above and that below the left bronchus. The upper portion is relatively firmly held between the respiratory passages and the vertebral column, and is subject to no variable deviation from its normal line. But that portion below the bronchus must be relaxed in the marked ascent of the diaphragm accompanying gastric repletion,—a feature somewhat roughly imitated in the subject when the sternum is removed and the diaphragm sags slightly upward.

In this position the lower portion of the œsophagus is free from any pressure whatever, and to any other foreign body, save that of the character described in the cases, is not liable to present resistance.

The remaining instance of foreign bodies involves the ascending aorta.

Case I.—Male, 22, after illness of six days, occasioned by the swallowing of a bone, died suddenly from hemorrhage. *The offending body had perforated the anterior wall of the œsophagus and the ascending portion of the aorta* one and a quarter inches below the origin of the innominate artery. This point, in the language of the recorder, answered to the centre of the middle third of the œsophagus. (Farquharson, Trans. Path. Soc. Lond., 1868, 219.)

In this case it is likely that the obstruction was primarily occasioned by the left bronchus, since the middle third of the œsophagus would nearly correspond to it.*

Nine cases have been collected of cricoid disease, as follows:

Case I.—Male, aged 50. Constriction *below base of cricoid.* From this to the bronchus the œsophagus was dilated. (N. Ward, Trans. Path. Soc. Lond., i. p. 247.)

Case II.—Female, aged 53. Œsophagus *adherent to vertebral column one and a half inches opposite and below the cricoid cartilage.* The œsophagus much thickened and contracted. The constriction extending downwards two inches. A cancerous tumor lay between the œsophagus and trachea opposite the stricture. (E. Andrews, *Ibid.*, xii. p. 100.)

Case III.—Male, 44. *Upper three inches of œsophagus involved* in cancerous tumor ulcerating into left subclavian artery. (Dickinson, *Ibid.*, xii. p. 108.)

Case IV.—Female, 40. Tight stricture at "*upper part of œsophagus*" *opening into trachea.* (C. Heath, *Ibid.*, x. p. 130.)

Case V.—Female, 24. Trachea and *œsophagus excessively diseased nearly as far as bifurcation of trachea.* An oval ulceration existed between the trachea and œsophagus. (Wilkes, *Ibid.*, vi. p. 179.)

Case VI.—Stricture, *four inches below the cricoid cartilage, extending to the bifurcation* of the trachea. (Knight, *Bost. Med. and Surg. Journal*, N. S., vol. vi. p. 348.)

Case VII.—Female, aged 53. *Œsophagus constricted, adherent to vertebræ below the cricoid cartilage.* Carcinomatous tumor in trachea, growing from posterior wall. Disease cancerous. (Gibbs, Diseases of Throat, 2d ed., p. 392.)

Case VIII.—Male, aged 65. *Constriction two inches from upper extremity; an ulcer one inch long extending all round the tube.* On the right side the ulcer communicated with the cavity between the œsophagus and innominate artery. The right subclavian artery, one and a half inches from origin, showed a circumscribed opening into the above-mentioned cavity. Disease cancerous. (Balding, Trans. Path. Soc. Lond., ix. p. 194.)

Case IX.—Female, aged 35. Cancerous stricture at *cricoid, extending upward to behind thyroid cartilage.* (Holmes, *Lancet*, 1876, ii. p. 824.)

The following twelve cases of obstruction were located at the point where the left bronchus crosses the œsophagus:

Case I.—Female, adult. Cancerous ulcer situated *opposite the bifurcation of trachea.* (Wilks, Trans. Path. Soc. Lond., xii. p. 101.)

Case II.—Female, adult. *Œsophagus impervious towards lower third.* Just above beginning of constriction, free opening into bronchus. (Nunneley, Trans. Path. Soc. Lond., xiii. p. 74.)

Case III.—Male, 51. Œsophagus three inches from upper extremity involved by epithelial cancer, communicating *with trachea just above bifurcation.* Hemorrhage from first intercostal of right side. (Sydney Jones, *Ibid.*, iv. p. 202.)

Case IV.—Male, 45. *Two inches of œsophagus upward from bifurcation of bronchi* involved. Communication with trachea just above bifurcation. (Budd, *Ibid.*, x. 145.)

Case V.—Male, 50. Stricture *on level of bifurcation* extending down two inches. (Shillitoe, *Ibid.*, xiii. p. 72.)

Case VI.—Boy, 10 years. Œsophagus *dilated opposite bifurcation, where longitudinal ulcer one and a half inches long* communicated with an enlarged, suppurating bronchial gland filling up the interval between the bronchi. (O. Ward, *Ibid.*, ii. p. 208.)

Case VII.—Stricture about *the middle of œsophagus* circumscribed, without involvement of any of the neighboring parts. Associated with cancerous polypus near cricoid. (Cooper Forster, *Lancet*, 1863, ii. p. 247.)

Case VIII.—Disease situated in œsophagus *at "root of the lung."* (Bennett's Practice of Medicine, p. 424.)

Case IX.—Male, 44. *Cancerous stricture opposite bifurcation* of trachea, into which it perforated. (Partridge, *Med. Times and Gaz.*, 1866, p. 338.)

Case X.—Male, 61. Non-malignant ulceration five *inches from upper end of œsophagus, just* beneath the arch of the aorta, communicating with right bronchus. (Partridge, Trans. Path. Soc. Lond., 1857, p. 191.)

Case XI.—Carcinomatous *stricture at mid-*

* The space between the cricoid region and the left bronchus embraces the beginning of the thoracic portion and is the locality of greatest normal constriction. Yet I have secured but one example of lodgment of a foreign body therein. The diminished calibre of the canal at this point is caused by increased development of muscular fibre, and would not of necessity interfere with distention.

dle third of œsophagus. (Richardson, *Lancet*, 1873, ii. p. 596.)

Case XII.—Male, 54. Carcinomatous *stricture opposite third or fourth dorsal vertebra*, determined by œsophageal auscultation. (Morell Mackenzie, *Lancet*, 1874, i. p. 754.)

It is impossible to estimate the influence exerted by the thoracic narrowing of the œsophagus upon the cases just selected. It is well, however, to bear in mind the relationship.

The following cases, while not in all instances directly associated with the left bronchus, were at least limited by this structure above, and it is probable, since from the post-mortem appearances the lesions were of long standing, that the first deposition was at the region of the bronchus, the lower portion of the gullet being involved subsequently. This is, I think, a rational supposition, conceding the tendency of cancerous and other growths to extend in the direction of least resistance.

Case I.—Female, aged 37. Cancerous disease at lower part of *middle third of œsophagus, three inches from cardiac end*, opening into second right intercostal artery. (Bristowe, Trans. Path. Soc. Lond., 1857, viii. p. 211.)

Case II.—Female, 25. *Œsophagus from bifurcation to one inch above diaphragm* the seat of simple ulceration, with contraction. Ulceration into pericardium where that membrane is reflected from pulmonary vessels to the left auricle. (J. W. Trotter, Trans. Path. Soc. Lond., viii. p. 317.)

Case III.—Œsophagus *impervious towards lower third*, opening into bronchus. (Nunneley, Trans. Path. Soc. Lond., 1862, xiii. p. 74.) (*Mem.*—This case might be included in preceding group.)

Case IV.—Disease *five inches from the stomach, extending downward* two inches. (Page, *Lancet*, 1863, ii. p. 248.)

Case V.—Œsophagus involved *three inches above cardiac orifice*, opening into right side of the descending portion of aorta. (W. H. Flower, *Med.-Chir. Trans.*, xxxvi. p. 353.)

Case VI.—Disease extended *from bifurcation to within two inches of cardiac end.* (Sedgwick, Trans. Path. Soc. Lond., viii. p. 48.)

Case VII.—Male, 62. Cancerous disease *behind left bronchus, opening into descending aorta* below, and involving the lung of the left side. Stomach and duodenum contained clot. (Wilks, *Med. Times and Gaz.*, 1861, vi. p. 36.)

Case VIII.—Cancerous disease involving œsophagus from *bifurcation of trachea to the stomach.* (Rees, *Lancet*, ii. p. 284.)

Case IX.—Cancerous disease beginning at *bifurcation and opening thence into pericardium.* (G. W. W. Firth, *Lancet*, 1859, p. 284.)

Case X.—Male, 18 years. Small perforating ulcer of œsophagus one-quarter of an inch below bifurcation, penetrating into pericardium. (J. Forsyth Meigs, *Am. Journ. Med. Sci.*, 1875, 69, N. S., 87.)

The following eight cases were limited to the œsophagus at its lower portion, viz., *between the left bronchus and cardiac end.* In five of them the cardiac orifice was directly involved.

Case I.—Disease in the form of epithelial cancer *involved cardiac orifice.* (Bennett's Practice, p. 340.)

Case II.—Male, 56. Scirrhous *tumor at cardiac orifice extending up three inches.* (Leared, Trans. Path. Soc. Lond., vii. p. 95.)

Case III.—Male, 70. Mass of cancerous disease extended *upward from cardiac orifice three inches.* (Graham, *Ibid.*, vii. p. 128.)

Case IV.—Male, 49. *Rupture of œsophagus one inch long immediately above the diaphragm.* (J. Griffin, *Lancet*, 1869, ii. p. 336.)

Case V.—Male, 64. Cancerous stricture *near cardiac orifice of the stomach* and opposite to the third dorsal vertebra. No ulceration.

Case VI.—Male, 72. *Ulcer two inches long situated above the cardiac orifice.* (Bennett's Practice, p. 424.)

Case VII.—Male, 54. Constriction *one and a half inches above the cardiac orifice.* (Murchison, Trans. Path. Soc. Lond., xv. p. 183.

Case VIII.—Patient 80 years of age. Ulcer about *one inch above diaphragm*, measuring three inches in vertical diameter. (*Mem.*—This will bring it to about lower border of left bronchus.) (C. Heath, Trans. Path. Soc. Lond., ix. p. 211.)

In addition to the influence, fixed and probable, which the left bronchus exerts in locating œsophageal disease, a number of incidental lesions are recognized which appear to be limited by this important structure. An analysis of the cases already quoted will have suggested this truth. To illustrate it further, I give several examples under the following heading.

Limitation of morbid action and lesion by the left bronchus, viz.:

Case I.—Male, 47. A *stricture opposite the bifurcation of the trachea*, associated with engorgements of the lymphatic glands in the same neighborhood, caused dilatation of the œsophagus both above and *below* the seat of disease. The stomach was enormously distended, reaching below the umbilicus. (Lewis, *Med. Times and Gaz.*, 1861, p. 332.)

Case II.—A stricture *adherent to the bronchial lymphatic glands* caused dilatation from two inches below rima glottidis to beginning of lower third of œsophagus. (Barker, Trans. Path. Soc. Lond., x. p. 141.)

Case III.—An aneurism of the aorta *below the origin of the great vessels* (*Mem.*, between

the fourth and fifth dorsal vertebræ) *ulcerated into walls of œsophagus*, causing a hemorrhage. The blood dissected between the muscular layers of the œsophagus to the cardiac end of the tube, and escaped by a rent though the peritoneum into the abdominal cavity. (T. P. Pick, Trans. Path. Soc. Lond., 1867, p. 477.)

Case IV.—An abdominal *aneurism bursting* just above *the cœliac axis* caused the blood therefrom to pass up behind the œsophagus. The tube was *compressed for three inches above the cardiac* end. (Bristowe, Trans. Path. Soc. Lond., x. p. 88.)

Case V.—Male, 19; juggler. In swallowing a *sword, it penetrated the pericardium.* (*Mem.*—It is in every way likely that a temporary resistance encountered at the left bronchus caused the sword to pass by this point violently, with a deflection of its point anteriorly.) (Parks, Trans. Path. Soc. Lond., vol. ii. p. 40.)

Case VI.—Male, 35. Fissure through mucous and muscular coats immediately below the cardiac orifice of the stomach, and extending upward one and a half inches. An adventitious cavity containing gastric ingesta formed between the outer muscular coat and the fibrous investment, which reached upward *to the root of the left lung*. This collection had in turn communicated by a small orifice with the left pleural sac. (J. J. Charles, *Dublin Quart. Journ.*, vol. l., 1870, p. 319.)

To these cases may be added the congenital union of œsophagus and trachea, which is usually seen at a point just above the bifurcation.

All other sources of extrinsic pressure, such as cancer of the thyroid body, tumors in the posterior mediastinum, pressure from aortic aneurism, or pressure from an enlarged cervical lymphatic, are of course to be excluded; for, as important as these sources of complication are in practice, they have no bearing upon the phase of the discussion now under consideration.

Thus, out of fifty-six cases of intrinsic œsophageal disease, omitting the six cases of limitation of morbid action and lesion, ten were induced by foreign bodies, and forty by disease. The dictum concerning the points of obstruction quoted at the head of the paper will not be, I think, sustained by any impartial reader who has accompanied me thus far. Out of the nine foreign bodies, while three were lodged at the cricoid region, three were just above the left bronchus, and only two near the cardiac end: in both of these, the foreign bodies being sharp bones, the cases presented peculiar features.

In examples of diseased condition, ten were situated at the cricoid, twelve at or near the left bronchus, ten in which the disease while below the left bronchus was very near or involved the latter, and eight only in which the disease was at or near the cardiac end.

It is in every way likely that if all the cases recorded in medical literature were examined, the proportionate number of instances of invasion of the cricoid region would be increased. But the relations existing between the location of morbid action in the neighborhood of the left bronchus and cardiac end would remain about the same. This supposition is based upon the fact that many of the cricoid cases are classified with pharyngeal disease, while no such source of error is likely to occur in the examination of the remaining portion of the canal.

Mr. Crisp (*Lancet*, 1873, vol. ii. p. 628) reasserts, after an analysis of twenty-one cases recorded in Trans. Path. Soc. Lond., that the constriction was found eleven times in the lower portion, nine in the upper, and but once in the middle.

It is very evident that this writer has assumed a different standard of measurement from mine in arriving at such a widely-different conclusion. While it is convenient to speak of the œsophagus as being thus divided into thirds, it is, I think, more accurate to describe it by the standard of its most important anatomical relations; and I believe that the cricoid cartilage, and the point where the tube is crossed by the left bronchus, are the two most valuable of these.

Any one can convince himself that writers have been at a loss for fixed points of comparison in describing their cases. Some refer to a strictured point as so many inches below the epiglottis, or as so many inches below the origin of the left subclavian or the root of the lung, or as so many inches above the cardiac end, etc. In not a few cases I have been compelled to translate these terms by measurements from vertebræ in the immediate neighborhood of the assumed points, or by others instituted from above downwards in the axis of the canal. A few of these it may be well to give in this connection:

Length of the œsophagus, ten to eleven inches.

The cricoid cartilage is at the upper orifice of the œsophagus.

The left bronchus crosses the œsophagus

obliquely from the fourth to the fifth dorsal vertebra.

The distance from the cricoid cartilage to the bifurcation is from four and a half to five inches.

The distance occupied by the left bronchus in crossing, about an inch.

The distance from the left bronchus to the cardiac orifice, four to five inches.

End of the aortic arch, about the third dorsal vertebra.

From the teeth to the cardiac end of the stomach, fifteen to sixteen inches.

From the teeth to the left bronchus, from ten to ten and a half inches.

From the teeth to the upper edge of the arch of the aorta, nine inches. To the lower edge of the same, ten to ten and a half inches.

The following conclusions are drawn from the foregoing statements:

1. Foreign bodies are liable to be retained at the beginning of the œsophagus behind the cricoid cartilage.

2. Passing this point, they do not, as a rule, reach the cardiac end, or "lower part," but are apt to be lodged *just above* the left bronchus as it crosses the œsophagus.

3. The cricoid region is exceedingly liable to invasion, and if the disease extends thence downward it is often limited by the left bronchus.

4. It is probable that diseased action may occasionally originate at the point of greatest narrowing of the thoracic portion, viz., just below the superior thoracic aperture.

5. The region of the left bronchus is very frequently attacked, the disease commencing either *behind* or *just below* it, and extending thence downward.

6. The cardiac end of the œsophagus is less frequently attacked than either the cricoid or bronchial portions.

7. Resistance at or near the left bronchus can be detected by a probang meeting resistance at eleven inches from the teeth.

8. The dangers attending the forcible use of the probang below the region of the cricoid become more manifest when the relations of the left bronchus are borne in mind.

NOTE.—The statement that the œsophagus lies to the left of the aorta (see page 3), if not qualified, may mislead. It is intended that the reader should accept the relations of the œsophagus as illustrative of the subject-matter, and not as being exhaustive. The sinistral inclination of the œsophagus from a point in front of the aorta is probably determined by many variable conditions,—the most conspicuous of which are the position and size of the liver. If the liver is small and depressed, while the stomach or spleen is enlarged and elevated, the œsophagus may incline to the right.