

remained a small opening at the edge of the preliminary œsophagostomy. This case was complicated by a slight degree of retro-œsophageal suppuration. Of 2 cases in which the œsophagus was completely closed by a circular suture (Krogus, Sandelin), there was primary union except for a small temporary fistula. In the cases of Sandelin and Escher the patients were fed by rectum during the first period. Krogus passed a retention tube through the nose.

In cases of pure superficial, valve-like stricture of the cervical portion it seems simpler to divide the folds of mucous membrane, either by the aid of œsophagoscopy and galvanocautery or after external œsophagotomy, or to resect the folds of mucous membrane (even where the latter are circular), and the scars, with subsequent suture of the wound (Kendal-Frank) as far as is possible through the external œsophagotomy-wound. This latter method promises a better result than complete resection of portions of the œsophagus.

In short tubular strictures, limited to the cervical portion, which are not dilatable by simply dividing the constricted portion, the defect in the anterior half of the latter might be replaced by the formation of a long-lipped fistula, and by subsequently inverting the outer skin (external œsophagoplasty). The author proposed this operation in 1889. It must be admitted, however, that the period of recovery is considerably longer. The operation may be performed primarily or after external division of the stricture has failed. The lipped fistula can then be left open until other constrictions situated lower down have been dilated. During this time the patient can swallow food through the mouth if the opening in the œsophagus be closed anteriorly by a plate, or a rubber tube attached to the latter inserted into the upper and lower portion.

*Gastrotomy and Gastrostomy.*—Both methods of operation are employed at present for the purpose of dilating strictures of the œsophagus through the stomach. Their introduction was only rendered possible by the modern method of treating wounds, through which the dangers of opening the abdominal cavity and the stomach have been so much lessened.

Gastrotomy is certainly the more dangerous method, and is not applicable to cases with extensive scar formation that require protracted dilatation through the opening of the stomach, unless thereby the stricture were made passable for a small-size bougie, and at the end of the operation a gastric fistula were established for the purpose of subsequent dilatation. A gastric fistula must also be established in those cases in which a bougie cannot be passed through the stricture from the incision in the stomach. (Moulin.)

The stomach is opened in the usual way (see under Gastrotomy). Further steps are as follows: The edges of the incision are retracted by means of clamps or loops of silk, and according to the size of the incision the index finger or two fingers are inserted into the incision in such a way as to occlude the wound. The anterior wall of the stomach being inverted, and the whole hand being passed into the peri-

toneal cavity, the cardia is searched for with the index finger in order to reach the lower end of the stricture if possible. A safer plan would be to draw the stomach and transverse colon outside the peritoneal cavity, as in posterior retrocolic gastro-enterostomy, to pack around the former, and after removing the stomach contents to enlarge the incision sufficiently to pass the whole hand into the cavity of the stomach in order that inversion of the anterior wall of the stomach may be avoided.

Guided by the finger, an attempt should be made to pass a sound through the stricture from the stomach. If this is not successful, the stricture should be incised from the stomach by passing instruments (forceps, dilator, blunt urethrotome, etc.). If the stricture has been dilated sufficiently to pass a bougie from the mouth, a piece of iodoform gauze (Kendal-Frank) or a large drainage-tube is drawn into the stricture by means of a string passed from the mouth to the stomach, the wound in the stomach is carefully closed with sutures, and the abdominal incision closed over the latter. The object of this method is to reach the cardia more easily, which in adults is situated about 20 cm. from the abdominal incision.

If it is not possible to accomplish dilatation at the time gastrotomy is performed (Moulin), or if protracted dilatation through the stomach is desirable, the wound in the stomach is carefully closed by a double row of silk sutures, leaving an opening to form the fistula, surrounding which the stomach is sutured to the parietal peritoneum and fascia, the remaining portions of the latter being sutured separately. The abdominal incision is closed except at the site of the fistula. A drainage-tube is passed into the latter from without. A string is drawn out through the tube, having been attached to the œsophageal tube (drain) inserted into the stricture from the mouth. (Körte.) In most cases in which permanent results are hoped for, it will be desirable to establish a gastric fistula after gastrotomy, as after complete closure of the gastric incision and the abdominal cavity, as in Loreta's method; subsequent dilatation can only be carried out from the mouth.

In the author's opinion it is advisable to carry out gastrotomy by a longitudinal incision through the middle of the left rectus muscle (v. Hacker) in view of the fact that it is generally better to establish a gastric fistula at the close of the operation. If this incision is made sufficiently long, enough room will be provided, and after dilatation has been completed, or after the stricture has been rendered passable and a drainage-tube has been inserted into the latter, the string attached to the tube can be led out through the fistula after the rest of the incision in the stomach has been carefully sutured. It would be possible also to close entirely the incision in the stomach, and utilize some other portion of the organ for the establishment of a fistula between the recti muscles. If more space is required for manipulation within the abdominal cavity and within the stomach, and if for this reason Fenger's incision has been chosen, it is more difficult to close the gastric fistula. If "dilatation" is to be carried out subsequently, it is ad-

visible to combine Kader's or Lucke's method of gastrostomy, with the formation of a sphincter from the rectus muscle.

For the purpose of treating stricture of the œsophagus, particularly strictures situated in the lower thoracic portion, gastrostomy is the operation most frequently employed, and properly so. In fact, it may be called the normal method in all those cases in which operative interference is necessary because the stricture is not passable from above.

In these cases the treatment requires the establishment of a temporary fistula, with subsequent, usually retrograde, dilatation with bougies, the latter being generally followed by dilatation. The operation is urgently indicated in cases with marked inanition. The operation is usually performed in one stage, and not in two stages as formerly. Dilatation is carried out by slower and safer methods, and the principal danger of gastrotomy, infection of the abdominal cavity by the entrance of stomach contents, is prevented by commencing the treatment of the stricture only after the stomach has been securely united to the abdominal wall.

The annoyance of a large gastric fistula, and the interference with nutrition caused by the latter are so serious that at present gastric fistulae, intended for the treatment of strictures, are made very small, as in cases of carcinoma of the œsophagus. This method has only come to be employed within recent times. At present surgeons are able to suture firmly the stomach to the abdominal wall wherever it can be drawn into the abdominal incision without force in such a way that there is no danger of the former being torn away, and without making it necessary to have the stomach completely empty. At the same time methods have been sought for which would, in the first place, permit of exact closure of the fistula, also methods by which the fistula was formed in such a way that the latter would close spontaneously as soon as it was not maintained artificially, or could be closed by some minor operation (Paquelin cautery, or freshening the edges without opening the abdominal cavity). Experience has shown that in many cases after establishment of gastric fistula impermeable strictures become passable spontaneously, or are rendered dilatable from the mouth by simple rest. This expectant treatment is desirable in order to stimulate exhausted patients by proper nourishment and to give necessary rest for the œsophagus, which has been irritated and become swollen in the region of the stricture as a result of attempts to pass bougies.

Frequently it is possible after gastrostomy (at times four to six weeks, sometimes only after months) to pass a fine bougie or gut string into the stomach and to draw it out through the fistula. Occasionally this can also be done in the opposite direction from the stomach. As soon as this has been accomplished, subsequent dilatation of the stricture is assured by the method of dilatation. (v. Hacker.) The most effective method, introduced by the author in 1885, is that of leading drainage-tubes of increasing size by means of a string attached to a bougie. The drains are inserted into the stricture under some tension, and,

on contracting, produce dilatation of the latter. In dilating from the mouth to the gastric fistula, as in the reverse direction, those drains may be left in the stricture for several hours, provided the precaution is taken to allow only the string to occupy that portion of the œsophagus from the mouth to the cricoid cartilage on account of the danger of pressure-necrosis of the laryngeal cartilage. Frequently it is sufficient to perform dilatation daily for half an hour with drains of increasing size. Where dilatation is kept up for such a short time the drainage-tube may be left in place behind the larynx and drawn out through the mouth. This will be necessary where the stricture is situated in the cervical portion. In removing the tube a strong thread is drawn after it. This is allowed to remain in place between the mouth and the fistula and serves as a guide. In case of strictures situated lower down it is most practicable to have the tube reach from below the cricoid cartilage, through the entire œsophagus and a short distance beyond the fistula. It is less safe to allow the drainage-tube to extend only through the cardia, as far as the stomach, for if the drainage-tube is engaged in the fistula, the thread may be torn by drawing on it.

According to the author's method, a fine, solid rubber cord is first drawn after the string, and then continually larger drainage-tubes. The lumen of the smaller drainage-tube is held open with forceps, and the next larger tube inserted in order to avoid any sharp increase in calibre. v. Eiselsberg employs a tapering rubber tube. Such a tube will not always be obtainable, however, and should always be boiled after having been used, while clean drainage-tubes are always at hand.

Similar to dilatation with drainage-tubes drawn in by strings is the method introduced by Weinlechner, and later by Maydl and Frank. By this method bougies are drawn through the œsophagus with a string; also by drawing increasingly larger ivory olivary bougies (Kraske), a tape provided with knots of increasing size (Soldani), or gut strings (Socin). In cases in which it is not possible to pass bougies from the mouth immediately after gastrostomy, as in cases of injury of the stricture canal, it is advisable, according to Socin, to have the patient swallow a buckshot with a string attached, a method which was formerly employed for the purpose of introducing Jameson's or v. Bruns' dilators. Kraske had the patient swallow a string with a knot in it. The string is then drawn out through the fistula with the finger or a small hook, or pushed out of the stomach by filling the latter with fluid. If Henle's probe-shaped magnet is obtainable, an iron ball can be swallowed instead of a buckshot, and be "fished" out of the stomach with the magnet.

After waiting for some time, and if in spite of repeated attempts, it is impossible by any method to render the stricture permeable, it is wise to perform temporary œsophagostomy according to Billroth's method, and then to carry out dilatation from the œsophageal fistula to the gastric fistula, or occasionally in the reverse direction. This method

has produced very good results in the hands of Billroth, v. Hacker, v. Eiselsberg, Mikulicz, Bernays, Pretorius, etc.

The method of dilatation usually renders a stricture passable for the largest size bougies within from three to five weeks. Others, desiring to obtain quicker results or wishing to divide a valve-like or diaphragm-like stricture, have employed Abbe's method through a gastric fistula in connection with gastrotomy, either through the mouth or through an œsophageal fistula. According to the level at which the stricture was situated, a large bougie was passed into the stomach either from above or from the stomach, and while the former was firmly held against the stricture, the cicatricial tissue was sawn through by drawing the string backward and forward. Immediately afterward large bougies were passed.

If, after establishing a gastric or œsophageal fistula, it should still be impossible in spite of continued attempts to pass the stricture, and if a thin partition should be found between the finger inserted through the stomach, or through the œsophageal fistula as far as the stricture, and the bougie passed through the other fistula, attempts might be made to crush or penetrate gradually through the partition. This is most safely accomplished with a sharp metal sound pressed against the inserted finger with gradually increasing force.

If the stricture is impermeable and situated so high up that it can be reached by the finger passed through the œsophageal fistula, and if it is impossible to pass a bougie upward through the cardia from the gastric fistula, the abdominal cavity may be opened near the fistula (at the same time preserving the latter), and by passing the hand into the abdominal cavity and searching for the crura of the diaphragm in order to guide the bougie after it has been passed through the fistula, the bougie being readily felt through the wall of the stomach.

If after establishment of a gastric fistula all the above-mentioned methods fail to render the stricture passable, the gastric fistula should be enlarged by dividing the tissues within the limits of its adhesions with the abdominal parietes. In one case Fischer was unable, with his finger passed through the cardia, to touch a steel olivary bougie passed through the œsophageal fistula. He allowed the fistula to remain for the purpose of providing nourishment. Such cases are infrequent. Owing to the difficulty of reaching the lower portions of the œsophagus with the finger passed through the gastric fistula,<sup>1</sup> it would be advisable in such a rare case immediately to perform laparotomy and to divide the stomach, as well as the fistula, within the limits of the adhesions, and to enlarge the opening in the stomach, proceeding in the same way as in primary gastrotomy. If by this method it were possible to perform retrograde dilatation, the opening in the stomach might be entirely closed and the fistula established at

<sup>1</sup> The distance of the cardia from the abdominal incision can be approximately determined by taking the diameter of the body (spinous process to the ensiform cartilage) and subtracting the distance from the spinous process to the anterior surface of the vertebrae (9-10 cm. in adults).

some other part of the stomach, providing further dilatation through a fistula should be required. This procedure would render primary union of the stomach more certain.

The new methods of dilatation of strictures with the aid of gastrotomy or gastrostomy are frequently and incorrectly called retrograde dilatation through the stomach. Except in those cases in which the operation is performed at one stage (gastrotomy), no retrograde dilatation is carried out, but dilatation guided by a string, for in the author's opinion retrograde dilatation through the cardia cannot be safely carried out from a well closing gastric fistula unless a string has been previously passed to serve as a guide. In cases of tight stricture in which dilatation from the mouth was impossible, this method was successful after a gastric fistula had been established.

1. A stricture may become passable some time after gastrostomy has been performed, and can then be dilated from the mouth by the usual methods.

2. Retrograde dilatation may be carried out from the gastric fistula.

3. A stricture may be rendered passable by one or both of the above-mentioned methods, the string guide method employed, and by means of the string Abbe's method (internal œsophagotomy with a string), or one of the methods of dilatation (v. Hacker), may be carried out.

4. Where gastrostomy has not been successful, temporary œsophagotomy may be performed (Billroth) and the stricture rendered passable from the œsophageal to the gastric fistula, or in the reverse direction, the string drawn through, and Abbe's method or dilatation carried out.

The establishment of a gastric fistula for the purpose of dilatation treatment of benign strictures has been found serviceable not only in case of strictures situated near the cardia and the thoracic portion in general, but also in strictures situated in the upper thoracic portion (Socin), or in the cervical portion (v. Eiselsberg, Winslow).

The methods of gastrostomy employed are described in the surgery of the abdomen. The author will only point out here that for the purpose of treating strictures a method of forming a gastric fistula is to be chosen in which an actual lip fistula is not formed—*i. e.*, in which the mucous membrane is not sutured to the outer skin—and a method according to which the fistula leads into the stomach without forming an angle. The first condition is desirable in order that no complicated or plastic operation will be necessary to effect closure of the stricture; the second condition is necessary for the convenient passage of bougies. The least adaptable method is that of Szabanejew-Frank. By Witzel's method of forming a canal and the modifications of the latter (Marwedel, Kader) the canal gradually becomes straightened and dilatation can therefore be carried out. The author's method of simply forming a sphincter from the rectus, which is absolutely safe if performed in two stages, has proved itself practicable not only in his own hands, but also in the hands of others. (Billroth, v. Eiselsberg, Narath, Körte,

Herezel.) In cicatricial strictures it was possible by this method to close completely the fistula with a drainage-tube. Recently the author obtained the same result by combining the formation of a sphincter with Lucke's method, the operation being performed in one stage.

In all cases in which simple dilatation with bougies through the mouth is impossible or does not continue to produce improvement, it is advisable to proceed immediately to gastrostomy, acting on the principle that repeated passage of bougies in a long, tortuous, and partially ulcerated stricture is more dangerous than skilfully performed gastrostomy. After the latter operation attempts should be made to render the stricture passable, either with or without the formation of an œsophageal fistula, and after that dilatation should be carried out.

#### DILATATIONS OF THE ŒSOPHAGUS.

BY DR. G. LOTHEISSEN.

Diffuse dilatation of the œsophagus occurs above a stenosis. The latter may be due to some anatomical change or may exist independently of anatomical change, as in nervous or spasmodic stricture.

Dilatation of the œsophagus occasionally may occur above a stricture, but is rare, because as a result of obstruction the muscular layer becomes hypertrophied and dilatation only occurs when the hypertrophied muscle becomes insufficient as a result of fatty degeneration, for example. (Klebs.)

Dilatation takes place above cicatricial stricture; also in cases of carcinoma (of the cardia, for example, where the lowest portion of the œsophagus may be dilated and still show muscular hypertrophy). (Reher.) The widest part of such dilatations is immediately above the stenosis (congestive ectasis, Zenker). They gradually become smaller above. In these forms dilatation is of little practical significance as compared with the stricture.

Jaffé described a peculiar form of stenosis leading to diffuse dilatation. The cardia was flattened between the xiphoid process, which was bent inward in the form of a hook; and one of the lower thoracic vertebræ, in a patient with marked kyphoscoliosis, the portion of the œsophagus above the stenosis was cylindrically dilated, having an internal diameter of from 10 to 11 cm. In addition there occasionally occur enormous dilatations not due to anatomical change. These diffuse ectases, formerly called idiopathic, are as a rule accompanied by spasm of the cardia (cardiospasm of Mikulicz). In another group of cases there is atony of the œsophagus. Such dilatations are frequently spindle-shaped. They may extend from the larynx to the cardia. Their greatest width (up to 30 cm. in circumference, Luschka) is generally about the middle of the œsophagus, or the latter may assume an S-shaped curve in consequence of dilatation (Mass); under such circumstances the dilatation has more the form of a wide cylinder. Some of these dilatations have been observed at an early age (ten years,

Mackenzie), and may be congenital (Zenker has found them in the newly born). Luschka has described a special form of the lower portion of the œsophagus, situated above the hiatus of the œsophagus (pregastrium) and between the hiatus and the cardia (cardiac antrum).

Most diffuse dilatations are acquired. Some disturbance of innervation must be accepted as an important etiological factor. It may happen that the function of the longitudinal fibres, whose contraction causes normal dilatation, is impaired and that consequently there is spasm of the cardia. (Rolleston.) This condition seems hereditary in certain families. Kraus emphasizes the coexistence of two factors: 1, failure of inhibitory influences on the cardia (disease of the vagus nerve); and 2, permanent relaxation of some portion of the muscular layer of the œsophagus. Through the preponderance of one of these factors are obtained the two mentioned types of dilatation of the œsophagus.

Diffuse dilatation sometimes causes difficulty of swallowing without general disturbance. In the majority of cases, however, the patients suffer for years from difficulty in swallowing, repeated vomiting, or regurgitation of food immediately after eating or several hours later. (Mackenzie.) Occasionally there is rumination. At the same time there are increased secretion of saliva and a chronic catarrh; food being retained for a long time in the œsophagus undergoes decomposition, which may lead to fetor. Occasionally there is a sense of severe pressure in the thorax which disappears only after vomiting.

More than 70 cases of idiopathic ectasis have been published, the majority of which were recognized only at autopsy. The clinical diagnosis is rarely made with positiveness. The usual examination with bougies may demonstrate the existence of dilatation, as the bougie is capable of undergoing wider excursions than under normal conditions. Not infrequently it is impossible to advance the bougies as far as the stomach, so that stricture (cicatricial or carcinomatous) or diverticulum might be suspected. The condition of the regurgitated food would lead to the conclusion that it had not come from the stomach (absence of gastric juice, excess of lactic acid, the food being otherwise unchanged). The amount of the regurgitated food (occasionally a quart, Vervière) might lead to the conclusion that there was a diverticulum, for the reason that under ordinary conditions the capacity of the œsophagus is about 100–150 c.c. (Rumpel.)

On performing œsophagoscopy the tube glides down easily; the tip is capable of greater excursion than ordinarily. The folds of mucous membrane bulge more into the lumen of the tube, there are longitudinal folds as well as distinct transverse ruffling of the wall. (v. Hacker.)

Rumpel has suggested the following method for the differential diagnosis between diffuse dilatation and diverticulum of the œsophagus. If possible, a tube is passed into the stomach and a second tube into the dilatation. The stomach-tube has lateral openings.

If there is dilatation, fluid, preferably colored, poured into the tube in the diverticulum will return through the tube in the stomach. If, however, a diverticulum is present, fluid will return through the tube only in the diverticulum.

Exposure to the *x*-rays may show a picture of the dilatation if the œsophagus is filled with a 5 per cent. mixture of bismuth subnitrate. (Rumpel.)

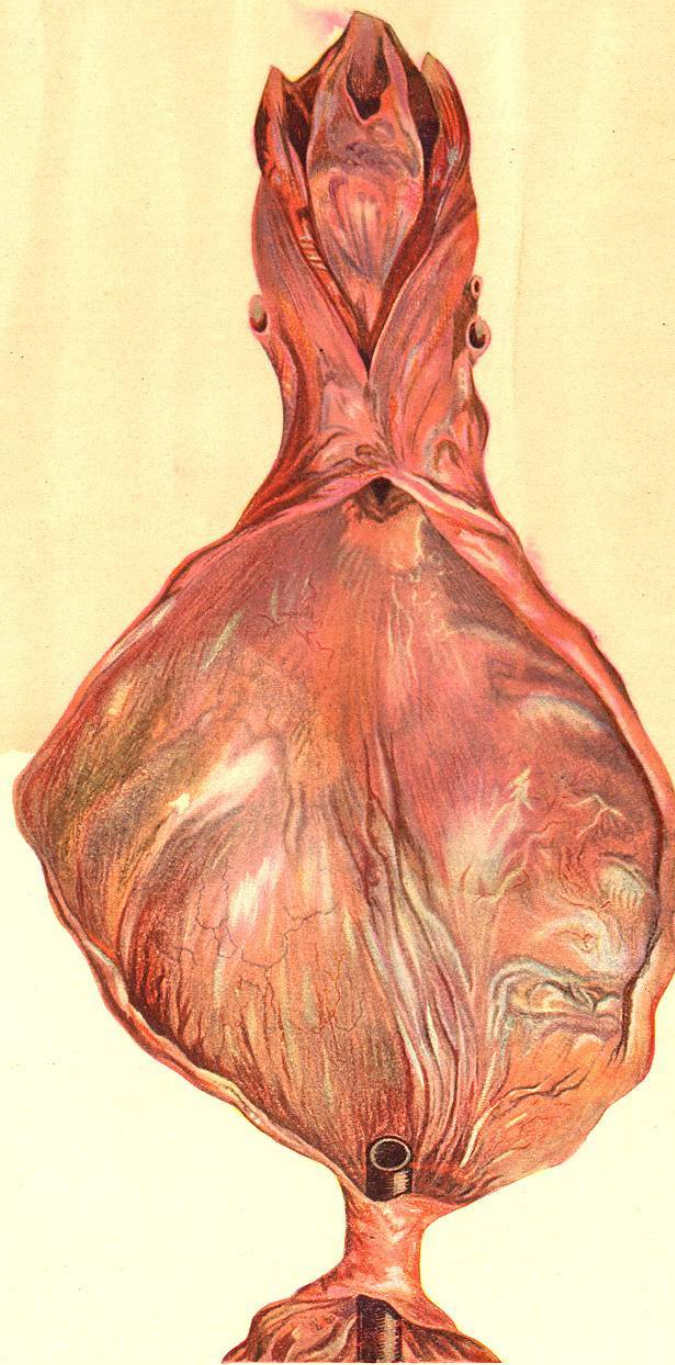
**Treatment.**—There is no satisfactory treatment for diffuse dilatation. If there is spasm of the cardia of nervous origin, an attempt may be made to apply electric currents to the lower portion of the œsophagus in order to produce contraction of the longitudinal fibres, and thus dilatation of the cardia. If the cardia is permeable for bougies, Symond's retention canula might be inserted, although the use of the latter has its disadvantages. Methodical irrigations may improve this condition, but will not cure it. (Fleiner.)

Feeding with the stomach-tube may improve the general condition and bring about an increase in weight (Rumpel), but as a rule it must be continued for life. Gastrostomy is probably the only method that can produce a cure. At present this is a safe operation which will make it possible to feed the patient; and where there is stenosis of the cardia, permit of dilatation of the latter.

#### DIVERTICULA OF THE ŒSOPHAGUS.

A diverticulum of the œsophagus is a dilatation limited to the wall of the œsophagus and having the shape of a blind pouch and varying in size. The important feature in a true diverticulum is the mucous membrane lining the sac. If no mucous membrane is present, pseudo-diverticulum, or, in analogy to aneurism, a spurious diverticulum (Bychowski) may be spoken of. Corresponding to Zucker's classification, surgeons distinguish "traction" and "pressure" diverticula, according to whether traction from without or pressure from within causes the dilatation. Pressure diverticula are divided into Zucker's pharyngo-œsophageal, "Grenzdivertikel," boundary diverticula (Rosenthal) and deep or œsophageal diverticula.

**Zucker's Pressure Diverticula.**—These diverticula possess practical significance, although they do not occur frequently (93 cases, Starch), owing to their situation and the accompanying manifestations. They are more frequent in males (about 76 per cent.), and are usually observed in advanced age (about forty-five years); that is to say, severe manifestations do not set in till that time. Sacculations observed in children were probably not cases of typical diverticula. They are constantly found in the cervical portion of the œsophagus—*i. e.*, the entrance of the diverticulum is situated exactly at the level of transition from the pharynx into the œsophagus, usually in the posterior wall, and generally a little to the left, but occasionally in the middle line, sometimes to the right, but always opposite the cricoid cartilage. If the diverticulum increases in size, it will occupy a posi-



Cardiospasm, with Secondary Dilatation of the Thoracic Portion of the Œsophagus. At Upper End of Dilatation a Carcinoma, with Perforation into Trachea.

tion at the side of the œsophagus, and hang down in this situation in the shape of a pear-shaped sac. It may attain the length of 13 cm. or more. Some have even extended into the thoracic cavity (5 cm. or more, Pfister). The mouth of the diverticulum may be as large as the body of the sac, but as a rule it is narrower, there being at the same time a short neck or pedicle.

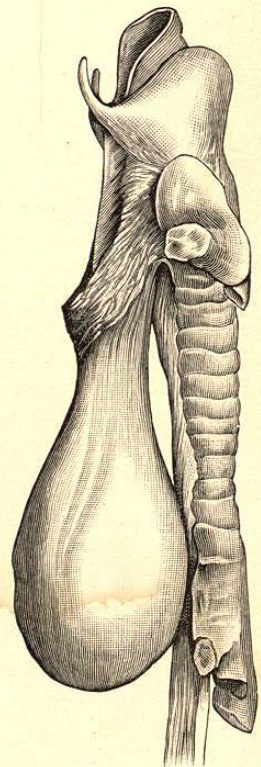
In one of König's cases the diverticulum was placed to the left of the vertebral column, extending forward in front of and past the œsophagus and trachea, toward the right, reaching as far as the vertebral column on that side.

In a number of cases diverticula have been observed to rise higher up, from the lateral wall of the pharynx. Zucker has separated these formations from true diverticula of the œsophagus. They are rare and bear no relation to the œsophagus.

Diverticula vary in size from that of a cherry to that of a child's head. As far as their anatomical structure is concerned, they generally possess a rather thick wall, and, as has been mentioned, are completely lined with mucous membrane, which is usually covered with squamous epithelium, although cylindrical epithelium is occasionally found. (König.) Muscular fibres are not always distributed throughout the whole sac, but frequently only about the œsophageal opening. A number of cases have been described, however, in which muscle-fibres were found in all portions. (Schwarzenbach, König, Kraske, (Bartelt), Billroth, v. Bergmann.) The mucous membrane lining the sac very frequently shows papillary hypertrophy; occasionally ulcerations are found, which are probably caused by retention of food in the sac (chronic œsophagitis).

The origin of diverticula has not been clearly determined. It has been assumed that pressure from within, caused by regurgitation of food, or in individual instances severe retching or habitual vomiting (Kocher), may cause the œsophageal wall to bulge out at a certain site, and that continued exercise of pressure causes the formation of a sacculation. This can be true only provided this particular site possesses less power of resistance than the rest of the œsophagus. In 1883 Laimer described a triangular area at the posterior wall of the extreme upper portion of the œsophagus, where for about 3 cm. the external longitudinal muscular layer is wanting. This corresponds exactly to the entrance of these diverticula. That

FIG. 30.



Pulsation diverticula of the œsophagus. (König.)

pressure in the œsophagus may occasionally be considerable is shown by the circumstance that occasionally it causes existing diverticula to increase in size and to extend further down.

Traumatism has frequently been suggested as an etiological factor—impaction of a cherry-stone (Ludlow), of a bone (Kühne), falling from a horse (Friebert). It has been pointed out that through struma or ossification of the laryngeal cartilages the passage of food is interfered with, and that consequently a dilatation of the opposite wall is produced. Circumscribed paralysis of muscles has also been considered as a cause. Others, again, have rejected these views, and have referred the origin of diverticula to disturbance in development. (König, v. Bergmann, Albrecht, Mixer.) Albrecht claimed that he found analogous formations in animals.

Probably the tendency is congenital (weakness of the triangular space). Dilatation through pressure depends upon various factors, some of which have been described.

The manifestations which characterize diverticula take place only when the latter have attained a certain size, and have resulted in the formation of a sac lying at the side of the œsophagus.

Patients with well-developed diverticula frequently refer the earliest manifestations ten, twenty, or thirty years previously. The latter vary in character. Occasionally in the beginning there is only a mucous expectoration or a sensation of pressure while eating solid food. (Billroth.) In other cases eructations after eating occur, and vomiting without much disturbance on the part of the patient, of small quantities of food recently swallowed, particularly dry and solid particles of food. Occasionally this phenomenon is accompanied by convulsions which cease only after eructation, or vomiting. Such patients are not infrequently treated a long time for stomach disorder.

The statement has been made that fluids are more liable to enter a diverticulum, while semifluid or solid food can more readily be swallowed; in some cases, however, the opposite is seen. (Butlin.)

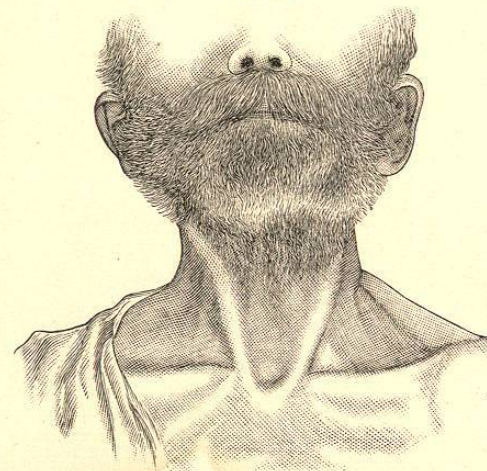
As long as a diverticulum is small, the first portions of food may always be caught, whereupon the rest of the food is swallowed without difficulty as soon as the diverticulum has become filled. As the diverticulum increases it may compress the œsophagus and thus cause severe disturbance. Sometimes it is still possible to swallow small amounts of food before the diverticulum becomes filled. In most cases, however, even this soon becomes impossible. The filled-up diverticulum causes a feeling of pressure in the neck and may produce congestion through compression of the neighboring vessels. (v. Hacker.) Occasionally a distinct swelling of the neck can be seen and felt, situated usually upon the left side.

If the diverticulum has become filled and the œsophagus is compressed, all the food entering the latter is immediately regurgitated. The patients can usually force food out of the diverticulum into the mouth by producing pressure on the respective side.

Sometimes evacuation of the diverticulum takes place involunta-

rily through contraction of the cervical muscles, particularly if there are numerous adhesions with the latter. If food is not expelled from

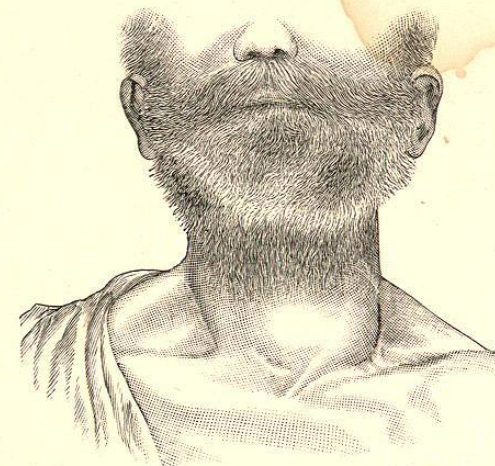
FIG. 31.



Pulsation diverticulum, empty. (Observed in Billroth's clinic.)

the mouth, but is swallowed, rumination takes place. After evacuation occasionally a small quantity of food may enter the œsophagus and the stomach. The majority of patients are obliged to hold the

FIG. 32



Pulsation diverticulum, filled. (Observed in Billroth's clinic.)

head in a certain position; other patients learn that by exercising a certain pressure on the neck it is possible to have food enter the œsophagus. But even so they frequently require hours for their meal.