Purse-string Method. The procedure in this method is the same as in the Bassini operation, with the exception that the canal is closed with a single purse-string suture passed in the following manner: A curved needle is introduced through Poupart's ligament and picks up the superficial fibres of the pectineus and its fascia, the falciform process, and finally emerges through Poupart's ligament a short distance from its point of entrance (Fig. 2638). When the canal is very large Bassini's method is preferable.

Gordon's Method. This method has lately been advocated by Bacon.[20] The incision commences 2 cm. above Poupart's ligament and 5 cm. from the pubic spine; it then passes parallel with the ligament to a point opposite the canal, where it turns down over the sac, thus exposing the aponeurosis of the external oblique and the sac. The sac is isolated, its contents are reduced, and then the sac is resected and sutured or ligated flush with the peritoneum. The aponeurosis of the external oblique is split along its fibres, thus opening the inguinal canal, the contents of which are then separated from its lower surface, exposing the deep part of Poupart's ligament.

The transversalis fascia forming the femoral sheath is then separated from the ligament, thus opening the femoral canal. All the subperitoneal fat and connective tissue are removed from this region, and the internal oblique is united with mattress sutures to the ligamentum Cooperi and the pectineus muscle in such a manner as to cause its lower margin to be everted.

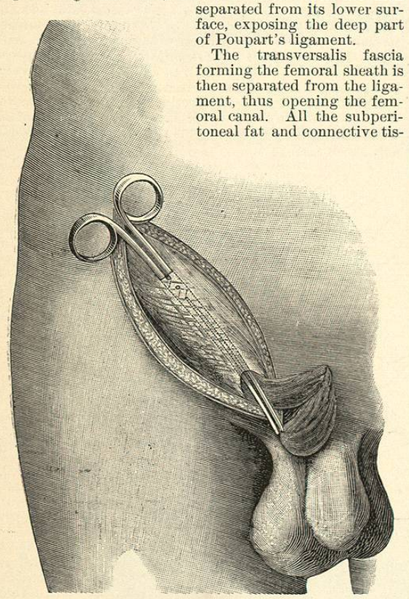

FIG. 2634.—Operation for the Radical Cure of Inguinal Hernia. Kocher's Method. Sac separated and end seized by forceps passed through the transverse incision (*a*) down the inguinal canal. (From "Bryant's Surgery." Copyright, 1901, by D. Appleton & Co.)

The canal is thus closed by muscular tissue. The wound in the external oblique is then sutured and this is followed by closure of the superficial wound.

Results of Operation for Femoral Hernia.—Gordon's operation is so recent that sufficient time for observation has not elapsed and too few cases have been treated to enable one to pass judgment upon it. The far simpler method of Bassini and the purse-string suture have, however, been so efficacious that it seems unnecessary to resort to any other. Bassini reports 54 cases, 41 traced, with no deaths and no relapses. Coley has operated in the same number of cases (by Bassini's and the purse-string methods), most of which have been traced, with no deaths and but one relapse in a Bassini operation in which suppuration occurred.

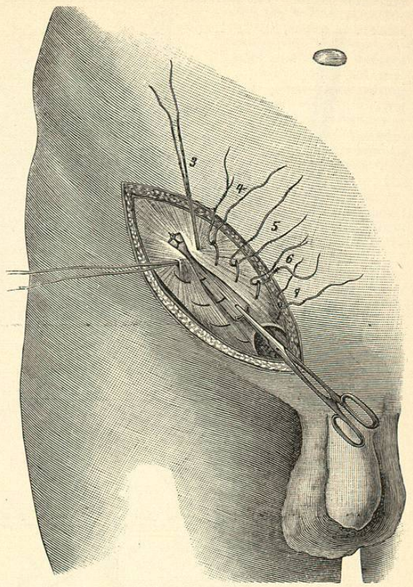

FIG. 2635.—Operation for the Radical Cure of Inguinal Hernia. Kocher's Method. Sac drawn downward on aponeurosis and sewed in place. (From "Bryant's Surgery." Copyright, 1901, by D. Appleton & Co.)

UMBILICAL HERNIA.—Umbilical herniæ are divided into three classes: 1. Congenital umbilical hernia. 2. Infantile umbilical hernia. 3. Adult umbilical hernia.

Congenital Umbilical Hernia or Hernia of the Cord.—This condition is very rare, occurring according to Lin-

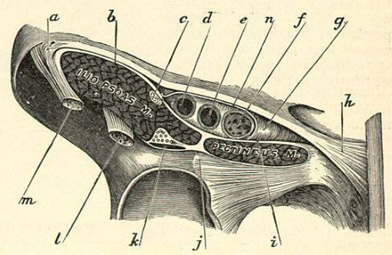

FIG. 2636.—Transverse Section below Poupart's Ligament. *a*, Anterior superior spine of the ilium; *b*, iliac fascia; *c*, anterior crural nerve; *d*, femoral artery; *e*, femoral vein; *f*, septum crurale; *g*, Gimbernat's ligament; *h*, spine of pubis; *i*, pectineal fascia; *j*, ilio-pectineal eminence; *k*, iliac bursa; *l*, rectus femoris muscle; *m*, sartorius muscle; *n*, transversalis fascia. (From "Bryant's Surgery." Copyright, 1901, by D. Appleton & Co.)

fors[21] once in 5,184 cases. In embryos of 10 mm., and that have not reached beyond the tenth week of development, a portion of the intestine is found in the cavity of the umbilical cord which is continuous with the body cavity. After that period the intestine usually recedes into the body cavity proper and the umbilicus is formed by the union of the visceral plates. However, if development of the abdominal wall be arrested, a varying amount of the viscera may be found in the cord at birth. The term congenital umbilical hernia is erroneous, since no umbilicus has been formed.

The wall of the hernia consists of membrane derived from the same layers that form the amnion. The contents may be a varying amount of intestine alone, the liver alone, or the liver, stomach, spleen, and intestine, *i.e.*, complete eventration. In the latter variety the wall nearly always ruptures at birth and death rapidly ensues. In cases in which the contents can be reduced into the abdominal cavity and the cavity closed, operation gives better results than palliative measures. Of 90 cases collected by H. E. Safford,[22] 64 were treated by laparotomy and suture with 65.6 per cent. recoveries; 1 case by simple ligature, with recovery; 3 cases by percutaneous ligature, with 1 recovery; 5 cases by Olshausen's method, with 100 per cent. of recoveries. Of 15 cases treated expectantly, 47 per cent. recovered.

Olshausen's method consists in separation of the skin around the sac, removal of Wharton's jelly, reduction of the hernia *en masse* without opening the sac, and suture of the skin.

Infantile Umbilical Hernia.—This form occurs in infancy and childhood and is due to weakness in the umbilical cicatrix. Berger[23] places the limit between it and adult umbilical hernia at fifteen years. It is about equally common in males and females, the ratio being 1 to 1.6 according to the statistics of the Hospital for the Ruptured and Crippled. According to Berger[23] it forms 22.42 per cent. of all herniæ occurring in male children and 65.34 per cent. of all herniæ in female children under fifteen years of age. This variety is always reducible and is quite amenable to treatment by a simple pad or truss and does not require operation.

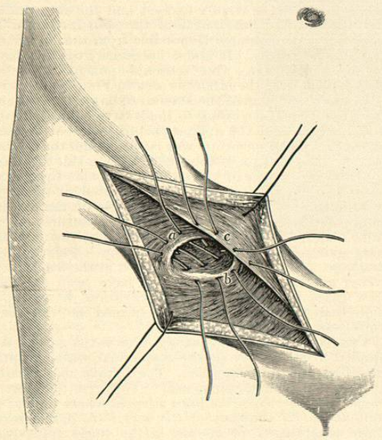

FIG. 2637.—Operation for the Radical Cure of Femoral Hernia, Bassini's Method. *a*, Falciform process; *b*, pubic portion of fascia lata; *c*, Poupart's ligament. (From "Bryant's Surgery." Copyright, 1901, by D. Appleton & Co.)

Adult Umbilical Hernia.—This variety is much more common in females than in males, constituting, according to Berger, 22.16 per cent. of all herniæ in females and 2.5 per cent. of all herniæ in males over fifteen years of age.

Its greatest frequency is during the child-bearing period, and it is the most common of all herniæ in women at the age of forty years.

Two sub-varieties may be recognized, namely, those occurring without diastasis and those accompanied by diastasis of the recti. The first form embraces the greater

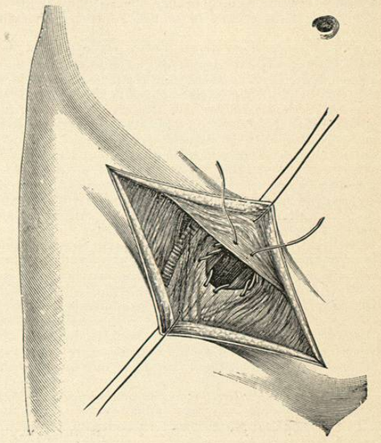

FIG. 2638.—Operation for the Radical Cure of Femoral Hernia. Purse-string suture, Cushing's Method. (From "Bryant's Surgery." Copyright, 1901, by D. Appleton & Co.)

number of cases occurring in males; the hernia in this case is usually small. The second variety is more common in women, and the tumor may reach an enormous size.

The first form, that occurring without diastasis of the recti, resembles infantile hernia in both symptoms and treatment and rarely requires operation.

Hernia with diastasis is more serious and the symptoms are often most distressing. The hernia is apparently due to the progressive stretching of the abdominal wall from internal pressure or from strains. The umbilicus being the weakest point gives way and the most marked protrusion occurs at this point, although the protrusion may be diffuse and take in a varying amount of the linea alba.

The *coverings* of the sac consist of skin and peritoneum, little or none of the intervening fibrous tissue remaining between them.

The *contents* of the sac consist at first usually only of omentum which soon becomes adherent and irreducible. The transverse colon is found in the sac more commonly than any other part of the intestine.

Symptoms are due to the size of the hernia and to complications, such as adhesions, obstruction, etc. The size of the hernia is an inconvenience and it may ulcerate on account of the poor nutrition of its coverings. It may cause gastric or intestinal symptoms from the inclusion of large amounts of viscera and from the dragging of adhesions. Being commonly associated with loose and pendulous abdominal walls, it is often accompanied by the symptoms of enteroptosis. Pain from adhesions and attacks of local peritonitis are common. Strangulation occurs about as frequently in umbilical as in other herniæ, but the mortality from strangulated umbilical hernia is greater. In gangrenous hernia, according to Gibson,[8]

the mortality of umbilical hernia is 67 per cent., of inguinal hernia 26 per cent., and of femoral hernia 37 per cent.

Treatment.—Small reducible umbilical herniæ are best treated by truss. Many of the larger ones can be helped by a well-fitting abdominal support when a pad cannot be worn on account of the irreducibility of the contents.

Many cases of hernia in adults are not suitable for operation inasmuch as this is difficult and often prolonged by adhesions, etc., and because the patients, who are, as a rule, obese women in middle life, bear operations poorly.

In younger women of good fibre, although fat, especially if the protrusion is not too large, operation should be performed, because the hernia tends to increase in size and with the increase in size come the distressing symptoms and complications, and the chance for complete radical cure diminishes. Aside from the risk of operation (the mortality is about 5 per cent. in irreducible cases), the success in regard to permanent cures has not been great. According to Berger,[23] in 30 per cent. of large herniæ and 15 to 20 per cent. of herniæ of moderate size relapse occurs, while in small herniæ the relapses are practically *nil*. In cases in which suppuration occurred, the percentage of relapses was 60.

As would be expected from such poor results, a number of methods of radical cure have been devised. These methods may be classified according to the method of repairing the defect in the abdominal wall. In considering operative methods it must be remembered that in cases of diastasis of the recti the entire abdominal wall becomes thinned and stretched as well as the linea alba, so that the recti muscles may become more than twice their normal width and less than half their normal thickness.

Lineal Approximation of Fascia or Fascia and Muscle (Condamin,[24] Socin, Sanger,[25] Gersuny [26]). After excision of the sac and reduction of its contents, the abdominal wall is sutured layer by layer. In small herniæ the sheaths of the recti may be split and the muscles themselves approximated as well as their sheaths (Socin, Sanger). This method is unsuitable in hernia with diastasis of the recti.

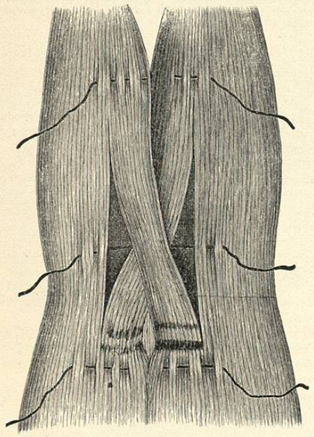

FIG. 2639.—Operation for the Radical Cure of Umbilical Hernia, Dauriac's Method. Muscular segments transferred and united, and sutures laid for closure. (From "Bryant's Surgery." Copyright, 1901, by D. Appleton & Co.)

Interlacing of the Recti (Bacon,[27] Dauriac [28]). In order to fill up the hiatus present after excision of the sac, the inner portions of the recti are split off, and having been cut free at one end are transplanted to the opposite side, thus producing an interchange of portions of the recti following the figure of a cross (Fig. 2639). The chief objection to this method is the impairment of innervation and nutrition in the transplanted muscle.

Involution of Abdominal Wall (Lucas Championnière [29]). The margins of the wound are turned in, thus bringing in apposition the ventral surfaces of the aponeurosis, and retained by means of a series of sutures resembling the Lembert suture. This method is applicable only to cases in which the abdominal walls are very lax.

Flap Operation (Noble,[30] Diakonoff and Starkoff,[31] Heinrich,[32] Hagen,[33] Ferguson [34]). A flap is cut from the ventral sheath of one rectus muscle and is carried across and united to the sheath of the opposite muscle; or a flap is taken from each sheath, the two being joined so as to close the hernial opening. The margins of the flaps may be united or the flaps may be lapped. The flaps are cut so that their attached borders are at the mesal borders of the recti, and when turned in and united their ventral surfaces become dorsal. The chief objection is the lack of nutrition of these flaps.

Lapping of the Abdominal Wall (Mayo,[36] Piccoli,[36] Sapiejko,[37] Blake [38]). This method is particularly adapted to cases with diastasis of the recti and pendulous abdominal walls. It is also suitable to protrusions in the linea alba elsewhere than at the umbilicus.

It consists in the excision of a large elliptical area of skin and fat in either a vertical or a transverse direction, down to and exposing, on one side at least, very completely, the sheaths of the recti. In typical operations done by the writer the incision has included an area from 25 to 40 cm. in length and 15 to 20 cm. in width. The sac is partially or wholly excised and the linea alba is divided for the whole length of the skin incision. The peritoneum is separated if possible from the dorsal surface of one rectus. It is not necessarily opened except at the hernial sac. One musculo-aponeurotic wall is then lapped over the other, as seen in Fig. 2640.

In the writer's cases the amount of lapping has varied from 4 to 10 cm. according to the laxity of the abdominal wall. In one case the greater part of the sac with adherent intestine and omentum was lapped under the opposite rectus. The margin of the underlapping side is sutured to the deep surface of the overlapping side by mattress sutures of chromicized gut which are tied on the superficial surface of the latter. The margin of the overlapping side is tacked with interrupted sutures of the same material to the superficial surface of the underlapping side. The skin wound is then closed without drainage. The results by this method in the hands of the writer and as reported by others have been excellent. Few cases have been under observation, however, for more than two years. Mayo has lapped the walls transversely in some of his cases.

VENTRAL HERNIA.—Ventral hernia is the general term applied to all herniæ of the abdominal wall excepting umbilical and groin herniæ. The herniæ may occur at any part of the abdominal wall. The term therefore includes: (1) Hernia in the linea alba elsewhere than at the umbilicus; (2) diastasis of the recti; (3) hernia in the lineæ semilunares; (4) hernia in the lineæ transversæ; (5) lumbar hernia; (6) traumatic hernia.

Hernia in the Linea Alba.—These herniæ, leaving out umbilical herniæ and those due to diastasis of the recti, occur four times as frequently in males as in females (Macready). They are rare in early life, and most frequent at middle age.

Two varieties occur: 1. Herniæ above the umbilicus—epigastric hernia. 2. Herniæ below the umbilicus.

Epigastric herniæ are usually small and may be multiple and are situated at any point between the xiphoid and umbilicus. They are protrusions through the gaps which are not uncommon between the decussating fibres of the linea alba in this region. They may consist only

of properitoneal fat or there may be a well-defined sac with omental or intestinal contents. Symptoms are rarely present. Treatment is indicated when there is impulse or increase in size. They may be retained by truss, but operation is better. The aperture may be closed transversely or vertically.

Herniæ of the linea alba below the umbilicus are often confused with diastasis of the recti. They occur within 5 cm. of the umbilicus, as a rule. They may acquire considerable size. They are best treated by a truss such as is used for umbilical hernia or by operation.

Diastasis of the Recti.—This occurs in childhood and at middle life. In children it occurs as a bulging of the linea alba above the umbilicus, and disappears with the growth of the child.

In adults it occurs practically only in women who have borne children, at or before middle life. It is usually most pronounced below the umbilicus although the whole linea alba suffers. It may be so pronounced that there remains only a thin pendulous bag enclosing a large part of the intestines and sometimes the gravid uterus.

The treatment is by means of an abdominal support. If operation is feasible, that of lapping the abdominal wall (see Umbilical Hernia) will be found peculiarly adapted to these cases.

Hernia in the Lineæ Semilunares.—This is a rare form occurring usually at the level of the semilunar fold of Douglas. About twenty-three cases have been observed. The protruding mass occasionally penetrates only a part of the abdominal wall, resulting in a "masked hernia."

According to some writers direct inguinal herniæ are herniæ of the linea semilunaris, but the writer cannot concur in this, since in these cases the contents of the hernia push forward the transversalis fascia and escape below the insertion of the transversalis and internal oblique muscles.

Hernia in the Lineæ Transversæ.—This is very rare, only seven cases having been oberved at the London Truss Society in sixteen years (Macready).

Lumbar Hernia.—Twenty-six cases of this variety have been collected by Macready, and one has been observed at the Hospital for the Ruptured and Crippled. They occur at or near the tips of the eleventh and twelfth ribs, or at Petit's triangle, between the origin of the latissimus dorsi and that of the external oblique from the crest of the ilium. They occur more frequently in adults than in children and are usually reducible. In six of Macready's cases there was strangulation.

Traumatic Ventral Hernia.—This term includes hernia occurring through scars of accidental or laparotomy wounds. Not infrequently bulgings of the abdominal wall occur at a distance from a wound, which are due to destruction of the innervation of the muscle. Those following laparotomy are more frequent after lateral wounds than after wounds in the median line. They follow most frequently wounds that have healed by granulation, as for instance suppurating appendicitis wounds. Long wounds are more apt to be weak than short ones. The so-called "through-and-through suture" is responsible for many. More careful methods of making and closing abdominal wounds have lessened to a marked degree the frequency of this distressing condition which is a blot upon the page of abdominal surgery.

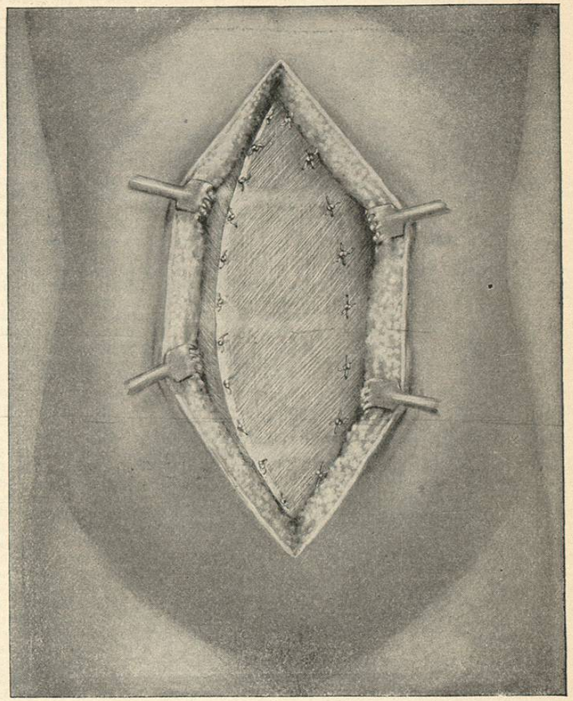

FIG. 2640.—Operation for the Radical Cure of Umbilical Hernia. Method by overlapping of abdominal wall. The right rectus muscle is lapped in front of the left.

The treatment is largely prophylactic and consists in fitting an abdominal support to all weak laparotomy wounds. Most herniæ of this variety are best treated by operation. The muscular and aponeurotic layers should be carefully isolated and separately sutured. The sac may be resected and the peritoneum sutured, or in some cases the peritoneum may not have to be opened. Troublesome adhesions are usually present in those cases in which there has been intra-abdominal drainage for suppurative conditions.

In cases in which the gap was very large, obturators of silver wire netting have been introduced (Phelps [39]).

OBTURATOR HERNIA.—This rare form of hernia passes through the obturator canal, which opens at the mesal and anterior part of the obturator membrane for the passage of the obturator vessels and nerve. The vessels and nerve as a rule lie on the dorso-lateral aspect of the sac.

The protrusion has for its coverings the peritoneum of the upper part of the pelvis or the broad ligament, the subperitoneal fat, and the deep pelvic fascia covering the obturator internus muscle. It may pass beneath the

fibres of the obturator externus or take a more superficial course beneath the adductor brevis and pectineus muscles. It is accessible to palpation from the inner aspect of the thigh behind the adductor longus. The contents of the sac are always intestine.

This form of hernia occurs more frequently in women than in men, in the proportion of ninety-three to seven. It occurs in advanced life, the average age being over sixty (Macready).

Symptoms are not as a rule marked until strangulation supervenes. Many herniæ probably become strangulated as soon as protruded. Pain in the course of the obturator nerve has been noticed in forty-two per cent. of the cases. After strangulation tenderness and pain on movement of the thigh become marked. The tumor is not so easily seen as palpated. The neck can often be felt by means of vaginal or rectal examination. The size is usually small, although cases have been seen in which the hernia was the size of an orange.

Treatment.—As mechanical treatment is impossible, all cases should be operated on unless age or disease contraindicates. Most cases are not recognized until strangulation has occurred. The mortality in strangulated cases is high—84.4 per cent. (Macready).

The protrusion can be reached from without by an incision along the border of the adductor longus and between it and the femoral vein. The pectineus and adductor brevis are thus separated, exposing the sac. Or better, especially in strangulated cases, it can be approached by the abdominal route. This allows of better treatment of the intestine, which is important since the average duration of strangulation before operation is long (seven days, according to Macready).

Ischiatic Hernia.—The few instances of this hernia have been imperfectly described. The protrusion escapes at the great sacro-sciatic foramen either above or below the pyriformis muscle. Of seventeen cases collected by Macready the hernia appeared in seven in infancy or at birth. The sexes seem to be equally affected. The contents may consist of intestine, omentum, or some of the pelvic organs as the ovary or bladder. The hernia is usually small, but may extend into the thigh below the glutei or pass over the trochanter toward the groin.

It may be confounded with cysts, abscesses, new growths, or hæmatoma.

Treatment.—The abdominal route or a combined operation would probably be the best way of attacking this variety.

Hernia of the Pelvic Outlet.—This group comprises several varieties in which the abdominal contents escape through the floor of the pelvis. They are much more common in the female. In the male the hernia is into the ischio-rectal fossa or the perineum. In the female it may be into the ischio-rectal fossa, the vagina, or the labium majus. They are named from their superficial location, *ischio-rectal*, *perineal*, *vaginal*, and *pudendal* or *labial herniæ*. Very few have been dissected, so their deep relations are not understood. In some cases the protrusion has occurred at the recto-vesical pouch and in others at the pouch of Douglas. These herniæ are usually small, but may reach enormous proportions containing nearly the whole of the abdominal contents. As a rule they are easy of diagnosis, but a vaginal hernia may be mistaken for a fibroid, polypus, cystocele, or abscess. They seldom become strangulated. Many cases can be treated with a pessary or special truss, although some surgeons advise operation in all cases.

Varieties Depending upon Nature of Contents.—*Vesical Hernia.* The bladder may be protruded through a hernial opening. The condition is four times more common in inguinal than in femoral hernia, and very rare in other varieties of hernia, although it has been observed in ventral and in pelvic herniæ. It is most common in elderly males.

Laxity of the tissues, the pull of the hernia on the peritoneum, and distention of the bladder have been advanced as causes.

Three anatomical varieties are recognized: 1. Extraperitoneal, in which the bladder protrudes alongside of the sac of an ordinary hernia or independent of any sac. 2. Intraperitoneal, in which the bladder appears in the sac covered with peritoneum. 3. Paraperitoneal, in which a portion of bladder only is covered with the peritoneum of the sac. The latter form is the most common.

Of 192 cases collected by Cheesman[40] up to 1901, symptoms were noted in 30. The most constant symptom is the presence of a hernial tumor which disappears on micturition, or pressure upon which causes a desire to urinate or even expels urine from the urethra.

The chief importance of the condition lies in the danger of wounding the bladder in an operation for radical cure. Of the 192 cases quoted, in 47 the bladder was recognized during operation and avoided, and in 93 cases it was wounded, chiefly unintentionally. The presence of the bladder may be suspected if there be an undue amount of fat at the neck of the sac, or if muscle fibres are seen. It may be identified by the passage of a sound in the bladder or by a feeling as of two surfaces rubbing together produced by grasping the mass.

Treatment.—If the bladder is wounded it should be sutured with catgut, preferably in two rows. Catheterization should be frequently performed or a catheter may be left in the urethra for two or three days. The wound should be drained, and if no leakage occurs, the final steps of the radical cure can be completed in a few days. Fifty-five of the ninety-three cases collected by Cheesman were treated by suture, with a mortality of 20 per cent. There was a total mortality of 25 in the 93 cases, but Cheesman attributes the fatal result in 9 cases only to the bladder injury *per se*, a mortality of about 10 per cent.

Hernia of the Large Intestine.—The sigmoid flexure, cæcum, or a portion of the transverse colon may be found in the sac of a hernia.

Especial interest is centred in the cases in which the sigmoid or cæcum is found in the sac of an inguinal or femoral hernia. When the protruded part has a free mesentery the cases do not differ materially from other enteroceles, but in a certain number the bowel is only partially covered with peritoneum, so that a portion of gut is outside of the sac. This condition is known as *slipped* or *sliding hernia; hernies par glissement* of the French.

According to Coley,[18] sliding herniæ occur as often in children as in adults, although the general belief is that they are more common in middle-aged or elderly males. However, statistics on this point as yet are insufficient. The sliding form is more common in inguinal hernia and when the protrusion is on the right side.

Unless the condition is recognized during the operation the intestine is very liable to be injured. Furthermore reduction is often difficult. The writer has found in his experience that the gut is generally loosely attached to the abdominal wall and can be pushed back *en masse*. Attempts to fashion a peritoneal coat for the bowel should not be made. The redundant sac should be sutured. It will rarely or never be necessary to resect the bowel as has been done by some.

Relapses are more common in these than in other forms of inguinal hernia, for the reasons that the neck of the protrusion is generally very large, and that it cannot be tied off flush with the abdominal wall. Transplantation of the rectus should help in these cases.

Hernia of the Appendix Vermiformis.—The appendix is not uncommonly found in right inguinal or femoral hernia. It may occur alone in the sac, more commonly in femoral hernia. The cases of especial interest are those in which the appendix becomes inflamed (appendicitis in a hernial sac). These cases simulate strangulation and can be differentiated only by the absence of the signs of obstruction. The condition is probably more common than the number of reported cases, sixteen only,[41] would indicate.

Hernia of the Ovary.—On account of error in development the ovary may descend alongside the canal of Nuck into the inguinal canal or even the labium. This condition, *ectopia of the ovary*, is found more commonly in young children, and there is reason to believe that in many cases the organ returns at or before puberty to its normal position. According to Macready,[1] hernia of the ovary occurs in 1.2 per cent. of inguinal herniæ in the female. When there is double ectopia the uterus and tubes are as a rule defective in development, and they may be so in single ectopia. In some cases the tube and even the uterus may be drawn into the sac. Associated with this condition there may or may not be a hernia of the intestine, either congenital into the open canal of Nuck, or into another sac. In most cases the canal of Nuck is open.

In some cases the ovary is reducible and the hernia can then be treated by truss. Other cases should be treated by operation, the ovary being excised or, if its connections can be preserved, returned to the abdomen.

Cases in which the ovary is found with other viscera in otherwise ordinary herniæ are of no particular interest.

Diaphragmatic Hernia.—A protrusion of the abdominal viscera may take place through a wound or through portions of the diaphragm that are deficient. The places where the muscular fibres of the diaphragm are normally deficient are "Larrey's space" between the costal and sternal attachments, and on either side at the lateral portions of the external arched ligaments. A hernia may occur through the œsophageal opening. Finally there may be a congenital defect in the diaphragm. These herniæ are classed as true when the peritoneal sac is present and as false when the viscera lie free in the pleural cavity. The latter form is more common, since the hernia is generally due to trauma.

The protrusion usually occurs on the left side on account of the position of the liver. Varying amounts of the abdominal contents may escape into the thorax. The stomach is the most commonly protruded, although any of the viscera with the exception of the genito-urinary organs may be displaced into the thorax.

The symptoms may be those of pneumothorax, the heart may be displaced, there may be marked interference with respiration, and there may be symptoms of strangulation.

Mechanical Treatment.—The mechanical treatment of hernia consists in the application of a truss or apparatus to the protrusion. With few exceptions this treatment can be applied only to reducible hernia. Special forms of apparatus have been devised for some forms of

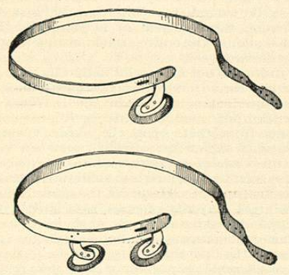

Fig. 2641.—Single and Double Knight Trusses.

reducible hernia in which operation is contraindicated; such, for instance, is the hinged cup truss for irreducible inguinal hernia.

For inguinal and femoral hernia three principal varieties of truss are used, namely the "cross body" or Knight truss (Fig. 2641), the frame or Hood truss (Fig. 2642), and the "same side" or French truss.

The chief desiderata in a truss are perfect fit, so that pressure is evenly made on all parts of the pelvis which it comes in contact with; a good spring, the best material being steel, as it combines lightness and durability;

Fig. 2642.—Frame Truss.

and a pad so arranged as to make pressure at the point of exit of the hernia, *i.e.*, over the internal ring in inguinal hernia, and not on the pubic bone.

The pad is best made of some smooth non-absorbent material as celluloid, hard-rubber, or wood. Sometimes a pad of wood covered with leather is serviceable.

When the pressure of a hard pad is unbearable, as it sometimes is in large herniæ, the elastic water pad can be used.

In adults trusses may be removed at night, as a cure is rarely attainable, but in children, in whom the descent of the hernia would preclude all chance for a cure, the truss should be worn day and night.

It is impossible in so brief an article to give the indications for the use of different trusses, and the methods of application. These points are largely learned by practical experience.

For umbilical hernia special forms of truss have been devised, but for most cases the best apparatus is a well-fitting abdominal support with a pad of suitable size to control the protrusion and of a thickness equal to that of the subcutaneous fat.

For umbilical hernia in children a broad strap of zinc oxide rubber plaster with a wooden button over the hernia makes a very efficient apparatus.

Results of Mechanical Treatment.—Inguinal Hernia. According to Coley by far the greater majority of cures are obtained in the first year of life. The best results are obtained with the spring truss in infancy, it being far superior to the "worsted" or "skein" truss.

In children cures are more often obtained in girls than in boys, the reverse being true in adults. About two-thirds of the cases of inguinal hernia can be cured in childhood. Cures are seldom attained in patients over twenty years of age.

Femoral Hernia is practically incurable by mechanical means.

Umbilical Hernia. In the infantile form a cure is nearly always obtained. In adults the most that can be hoped for is limitation of the size of the protrusion.

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HEROIN, diacetyl-morphine $[C_{17}H_{17}.(CH_3CO)_2.NO_3]$, is one of the group of morphine compounds to which belong codeine, dionin, and peronin. It occurs as an odorless and slightly bitter, white, crystalline powder, insoluble in water, and soluble in dilute acids. The hydrochloride, the salt generally used, is freely soluble in water and alcohol, insoluble in ether, and incompatible with alkalies.

Experiments show that heroin is not absorbed by the unbroken skin, and has but slight effect on mucous membranes. It tends to cause dryness of the throat and slight irritation of the gastro-intestinal tract as manifested by nausea, vomiting, and diarrhœa. These effects are, however, uncommon. In therapeutic doses the circulation is unaffected, though heart failure may follow a large dose. The main action of the drug is upon the respiratory organs, as it tends to diminish bronchial secretion, while it slows and increases the depth and strength of respiration. Dreser demonstrated that a smaller amount of oxygen was used by the system and less carbon dioxide eliminated; in other words, that metabolic processes were retarded. On account of this diminished tissue-activity there is a slight temporary lowering of body-temperature. In very few cases has any hypnotic or analgesic effect been noted. Heroin is a very powerful remedy, the maximum dose being one-twentieth that of codeine. Observers agree that the dose of 0.01 gm. (gr. $\frac{1}{6}$) should not be exceeded. Though not very common, cases with unpleasant sequelæ are met with by every user of the drug. Therapeutic doses have been followed by dryness and irritation of the pharynx, nausea, vomiting, constipation, diarrhœa, languor, and, rarely, excitement or delirium. A case of the writer's always became greatly excited after a dose of morphine or heroin, but never after codeine. Some writers advise adding potassium iodide to prevent dryness of the throat, and cascara or calomel for the constipation. A dose of 0.015 gm (gr. $\frac{1}{4}$) given by mistake to an asthmatic patient was followed by prostration, cyanosis, amaurosis, restlessness, pulse of 40, feeble heart action, spasm of the legs, persistent nausea, subnormal temperature, and a semi-comatose condition.

Among the large number of published reports most authorities agree that heroin is valuable in the treatment of bronchitis, bronchial asthma, pulmonary tuberculosis, and whooping-cough, while opinions differ as to its efficacy in neuralgia, angina pectoris, cardiac dyspnœa, etc. The writer used it in over one hundred cases of tuberculosis, and found it of distinct use, but inferior to codeine in allaying the cough, irritability, and pain, and in promoting sleep. Heroin had little, if any, effect on the pain, dyspnœa, or night sweats. Loewenthal employs it in infantile diarrhœa and colic, the maximum dose for a child of one month being 0.0002 gm. (gr. $\frac{1}{3000}$), of six months 0.00027 gm. (gr. $\frac{1}{2220}$), and of five years 0.0024 gm. (gr. $\frac{1}{275}$). Heroin has not proven of any special value in diabetes, and so far as known does not create a drug habit. Indeed it is recommended as a substitute for morphine on the withdrawal of the latter drug for morphinism. *W. A. Bastedo.*

HERPES.—The term herpes (from ἕρπειν, to creep), formerly employed to designate a large number of diseases of the skin of varying etiology, is restricted at the present time to a class of affections whose distinguishing clinical feature is a grouped vesicular eruption seated upon an inflamed and slightly swollen base. If the term is used in this restricted sense there are practically but two varieties of the disease, viz., simple herpes, of which there are a number of regional forms which differ but little from one another in their clinical characters; and herpes zoster, which clinically and etiologically is quite distinct from the first-named variety. The herpes iris of some authors properly belongs to erythema multiforme; herpes gestationis is one of the forms of the dermatitis herpetiformis of Duhring; while the herpes circinatus and herpes tonsurans of some continental authors are parasitic affections, much more frequently characterized by erythematous and squamous eruptions than by vesicular lesions.

The appearance of the herpetic eruption is preceded for a variable period, usually short, by a sensation of burning, pricking, or slight itching; after a few hours an erythematous, slightly swollen patch appears upon which small papules arise which are speedily transformed into a group of vesicles with clear serous contents, each group containing from three or four to a dozen or more lesions. The vesicles, at first discrete, later become more or less confluent through increase in size, often forming small blebs. After from twenty-four to forty-eight hours the contents of the vesicles become cloudy, then purulent, and yellow or brown crusts form, which after a week or ten days fall off, leaving a slightly reddened patch which lasts but a few days and disappears without leaving any trace of its existence.

Herpes Simplex.—In the great majority of cases the eruption of simple herpes is situated upon the face, usually the lower half; hence it is also spoken of as facial herpes. The parts of the face most frequently attacked are, in the order of frequency, the lips, the lower oftener than the upper lip, the cheeks, and the alæ of the nose. It sometimes occurs upon the external ear and still less frequently upon other parts of the cutaneous surface. It usually begins quite abruptly with a sensation of heat or itching; the skin over a limited area becomes red and slightly swollen, and upon this area a group of small papules appear which in a short time become clear vesicles. The vesicles, discrete in the beginning, enlarge slightly for a short time after their appearance and frequently coalesce, forming blebs that vary in size from that of a pea to that of a dime; but when the lesions are very small and few in number, they usually remain discrete. At the end of a day or two the contents of the vesicles become purulent; they then dry up, forming yellow or brown crusts, which fall off in a few days more, leaving slightly red, or occasionally transiently pigmented stains, the entire attack lasting from four or five days to two weeks.

The eruption is not always limited to the skin, but may appear upon the adjoining mucous membranes, even the larynx in rare instances being invaded. When the eruption occurs upon mucous surfaces it presents marked differences from that upon the skin. Owing to the moisture with which the affected parts are constantly bathed, the vesicles appear as white opaque elevations which are soon transformed into shallow erosions through spontaneous rupture. Herpes of the mucous membranes is, in the great majority of cases, associated with similar lesions upon the skin, although pharyngeal herpes may occur alone; the mucous membranes attacked being usually those of the lips, the cheeks, and the pharynx.

In a considerable proportion of cases the appearance of the eruption is preceded or accompanied by sensations of chilliness and some elevation of temperature; hence the popular terms "cold sore," "fever blister," applied to these eruptions.

In many individuals there is a marked tendency to recurrences, and this continues for years, the eruption appearing with the slightest derangement of the general health, or following slight irritations of the skin.

Although, as a rule, there are usually but two or three groups of vesicles, and often but one, each containing a moderate number of lesions, it happens in rare instances

that the eruption is much more extensive, covering, it may be, almost the entire cutaneous surface. Such extensive cases have been most frequently reported by French observers, Rendu having only recently described a case of generalized herpes produced by the ingestion of uncooked shell-fish. It seems to me, however, that such eruptions are very closely allied to, if not actually examples of, bullous erythema multiforme, rather than true herpes.

Facial herpes frequently occurs in febrile diseases of various kinds, such as pneumonia, in which it is quite common, in typhoid fever, in the malarial fevers, and in cerebro-spinal meningitis, a favorable prognostic significance being attributed to it. In the malarial fevers it may occur with each febrile paroxysm, or in exceptional cases it may replace it, as has been noted by several writers.

Under the name herpetic fever, various authors have from time to time described an endemic affection in which, after marked constitutional disturbances, such as chills and elevation of temperature, an herpetic eruption appears upon the face or other parts of the cutaneous surface. A remarkable endemic of this kind has been reported by Savage in which, in an institution for boys, thirty-nine cases of herpes occurred. In this outbreak the eruption was preceded by chills, nausea, and elevation of temperature varying from 102° to 104.5° F., and was accompanied by sore throat and swollen glands, the attack lasting four days.

Herpes Genitalis.—The genital organs of both sexes are frequently the seat of herpes, the eruption occurring, in men, upon the margin of the prepuce or upon its inner mucous surface (herpes præputialis, herpes progenitalis), upon the glans, and, much less frequently, upon the skin of the shaft of the penis; in women the parts affected are the vulva, the mucous surfaces of the labia majora, the labia minora, the clitoris and the prepuce, and the mucous membrane about the meatus urinarius. The appearance of the eruption is preceded by more or less burning or stinging, which is shortly followed by redness, œdema, and the formation of groups of vesicles which are usually quite small. When the skin surfaces are attacked the vesicles after a day or two dry up into brownish crusts which fall at the end of a week, leaving a slightly reddened, or, it may be, pigmented patch. When the eruption occurs upon the mucous surfaces, as the inner side of the prepuce, the glans, or the labia minora, the vesicles rupture almost immediately, forming shallow erosions, the bottoms of which are often covered with a whitish or gray membrane. Occasionally the eruption appears in successive crops separated by intervals of some hours or a day or two, thus prolonging the attack greatly. Fournier has observed a case in which the disease was thus prolonged for five weeks; but this is altogether exceptional. When the affected parts are irritated by violence or by the application of caustics, as not infrequently happens, the inflammation may be considerable and may be attended by marked induration of the base of the vesicles; this induration being especially apt to occur upon the glans in the region of the sulcus. In such cases the glands in the groin may be noticeably swollen. In rare cases the eruption occurs upon the urethral mucous membrane, giving rise to ardor urinæ and, in the male, to a serous discharge. Although, as a rule, subjective symptoms are limited to slight burning or itching, it occasionally happens that the pain is severe, even neuralgic in character.

In women the eruption is sometimes quite extensive, covering the cutaneous surface of the vulva, and the labia majora and minora with numerous groups of vesicles and erosions, and at times extending down upon the inner surface of the thighs. The pain and burning in such cases are severe, and with the marked swelling which is commonly present walking is difficult and at times impossible. Superficial ulceration may occur with the formation of vegetations, producing an appearance much like that of a syphilitic mucous patch; indeed, according to Fournier, it is sometimes impossible to make a positive differential diagnosis until after the lapse of a considerable period of time.

Of all the forms of herpes the genital is most apt to recur, the interval between the attacks varying from a few weeks to several months. In a considerable proportion of cases each coitus in the male and each menstrual period in the female is followed by an attack, the recurrences continuing for years. On the other hand there may be but a single attack.

Simple herpes is in many cases, no doubt, a local manifestation of a general toxæmia. Its frequent association with such general diseases as pneumonia, typhoid and the malarial fevers, epidemic cerebro-spinal meningitis, and other maladies of an infectious nature, lends strong support to such a view of its etiology. In a considerable proportion of cases, however, it must be regarded as due to local conditions associated with a special predisposition. In genital herpes excessive irritations and congestions, physiological or pathological, such as coitus and the menstrual period, play important rôles in the production of the affection. Uncleanliness and previous venereal disease are potent etiological factors. As Unna and Fournier have pointed out, prostitutes are especially liable to suffer from herpes of the genitalia.

The herpetic eruption is the result of a peripheral neuritis of an acute transitory character, the consequence of a direct or reflex irritation of the terminal nerve branches distributed to the skin. Unna, who had the opportunity to examine lesions from three cases of genital herpes, found a fibrinous inflammation of the epidermis, the primary changes affecting the more superficial prickle cells. The entire epidermis was lifted from the papillary layer of the corium, forming a blister whose walls and contents had undergone coagulation necrosis. Beneath the vesicle the entire cutis was œdematous and the blood and lymph vessels were markedly dilated. A striking histopathological difference between the vesicle of simple herpes and that of herpes zoster is the absence of the so-called "ballooning" of the epithelial cells in the former.

The *diagnosis* of simple herpes is usually made without the slightest difficulty. The purely vesicular character of the lesions, the grouped arrangement of the eruption, its localization upon the face, in most cases about the mouth, or upon the genitalia, and the acute course of the disease are features so characteristic that there is little chance for error. When, however, the eruption is seated upon the mucous membranes, particularly those of the genitalia, the erosions which follow the vesicles may be mistaken for venereal ulcers or the initial lesion of syphilis. The herpetic lesion is superficial and does not tend to extend like the chancroid; it exudes an abundance of serum instead of pus, which, as Leloir has pointed out, may be much increased by squeezing the lesion between the thumb and finger; its borders are apt to present a festooned or polycyclic outline; and lastly, there are often groups of well-defined vesicles in the neighborhood. It is to be distinguished from the initial lesion of syphilis by its brief duration and the absence of the peculiar induration characteristic of the chancre. It should not be forgotten, however, that the herpetic lesion, under the influence of irritants, may present an indurated base much like that seen in the chancre, and that in such cases there may be swelling of the inguinal glands. Fournier has called attention to the fact that the chancre may be preceded by herpes; and it is always wise, in view of the very serious results which may follow an error in diagnosis, to be very guarded in expressing an opinion in doubtful cases until sufficient time has elapsed to make the diagnosis certain.

In the *treatment* of simple herpes all irritant applications should be avoided. Frequent applications of ninety-five-per-cent. alcohol in the early stages of the eruption will sometimes partially abort it. If there is marked burning, a saturated aqueous solution of boric acid will be found very useful in relieving this symptom; or a solution of resorcin, from eight to ten grains to the ounce of water, may be even more effective. A lotion