

Her pain increased until it became torturing, and for days before the operation it was necessary to keep her continuously under the effects of morphin or codein. No change of any moment occurred in her focal symptoms after the above recorded notes.

Operation.—The operation was performed by Dr. Frazier, Oct. 14, 1903, under ether anesthesia. A musculocutaneous flap together with the periosteum was reflected and an opening was made in the skull with the chisel and enlarged with Rongeur forceps. Nothing abnormal as regards pulsation nor consistency of the left lateral lobe of the cerebellum was noted. The dural flap was reflected; at one point this flap was adherent to the underlying brain. Cerebellar tissue bulged only moderately through the wound. On exploring with the index finger in the region of the cerebellopontile angle some adhesions were separated on the lateral aspect of the cerebellum. This was followed by a gush of fluid which had evidently been walled off by adhesions. After the evacuation of the cyst the bulging subsided immediately and with a brain retractor it was possible to inspect the region of the cerebellopontile angle and to demonstrate to those present at the operation, the fifth, seventh and eighth cranial nerves. It was noted on the blood pressure chart that when the dura was opened the blood pressure dropped thirty points and that on introducing gauze packing or on compressing the brain with the retractor that the blood pressure rose forty points. The patient's condition was not depressed to any considerable degree by the operation; on her return to bed the pulse was 145; respirations were 40, and blood pressure was 115.

The interesting feature of the case was the ease with which the cranial nerves were exposed after the cyst had been evacuated.

The patient reacted well after the operation and passed a fairly comfortable night. There was very profuse oozing of blood and cerebrospinal fluid, necessitating frequent reinforcement of dressing. The patient was much nauseated, vomiting curds of milk and bile-stained fluid. She complained of pain in her temples. An incomplete examination showed that sensation was present on both sides of the face and no inequality of pupils was noted. On October 15 the wound was dressed and found in good condition; the drainage was removed, there was a free flow of cerebrospinal fluid.

Subsequent History.—An examination by Dr. Mills and Dr. Spiller on October 15 resulted as follows: No cutaneous anesthesia was present on either side; not even any hypesthesia on the left. There was no great impairment of the motor division of the fifth nerve, the masseter and pterygoid muscles being tested. Complete paralysis in the muscles supplied by both the upper and lower branches of the seventh nerve was present. She was completely deaf in the left ear. Slight paralysis in the right upper extremity was noticed. Astereognosis or pseudoastereognosis was present in the right hand. Anesthesia for both touch and pain and hyperesthesia were absent. She had had no pain in the face or head since the operation and had required no anodynes.

October 19: The wound was again dressed and the stitches were removed; the wound was healed, with the exception of one angle; a small piece of gauze was inserted for drainage. The patient's general condition had been very good. Her pupils were normal.

October 24: The surgical condition was entirely satisfactory; the wound was healed, with the exception of one spot, which was rapidly granulating. The patient's general condition had rapidly improved since last noted. She was regaining strength, had been sitting up and was quite comfortable.

October 29: Patient was discharged, the surgical condition left nothing to be desired; the wound was completely healed; there was no bulging of the flap, no signs of inflammation or edema of the scalp. She had not had any pain in the head or ears; the only discomfort had been some irritation of the conjunctiva of the left eye, which was probably due to facial palsy.

Results.—When the patient was last heard from two years after the operation, the relief from headache and neuralgia continued, although, as previously stated, the pain for some time before the operation was of the most intense character. In other respects her general condition has been good. She

still continues to be partially paralyzed, with astereognosis and sensory changes on the right side and still has paralysis in the distribution of the left seventh nerve. It is altogether probable that a lesion of some sort is still present; not improbably she has more than one lesion, as the symptoms point both to the pons and to the left parietal lobe. The case is especially interesting as showing how in some cases the cerebellopontile angle can be exposed and how pain and other symptoms of brain tumor are sometimes relieved even when full success is not obtained.

(To be continued.)

FEMORAL HERNIOTOMY.*

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The subject of herniotomy for inguinal, umbilical and ventral hernia seems to have come to a practical conclusion by the universal acceptance of the different principles embodied in the methods in inguinal herniotomy introduced by Bassini and further developed by Andrews, Ferguson and Coley; the method of Mayo for umbilical hernia; the method of anatomic dissection and union of corresponding layers in cases of postoperative ventral hernia and hernia of the linea alba.

TREATMENT OF FEMORAL HERNIA.

It is in femoral hernia that the methods still differ greatly. As a matter of convenience to the reader I have added a short summary of the most important ones of these various methods.

The object of this paper is to introduce into the treatment of femoral hernia a principle which has for many years been universally recognized in surgery and which has, it seems, been employed by only a few surgeons in the treatment of femoral hernia.

It is a well-known fact that it is practically impossible to keep a circular opening in any part of the body from closing spontaneously unless it be lined with a mucous or serous membrane. The anatomic relations at the femoral canal are such as to form ordinarily a definite circular opening.

LITERATURE OF THE SUBJECT.

As early as 1879 Socin¹ speaks of six of these cases which apparently were permanently cured by simply removing the hernial sac and fat and suturing the skin, thus making use of the principle which I have mentioned. Since that time I find in the literature a number of interesting articles written by Anderegg, Lesirink, Munsinger, Julliard and Biedel in which this principle was employed in a measure, but no one seems to have attributed the success of this operation in obtaining a radical cure for femoral hernia to the principle I have mentioned.

Singularly enough surgeons seem to have had perfectly satisfactory results by doing nothing further than thoroughly to dissect, ligate and remove the sac, the preperitoneal fat, and to suture the skin until the method of operating for inguinal hernia was introduced by Bassini. Subsequent literature shows that surgeons, writing on the subject of femoral hernia, reason from the conditions present in inguinal hernia, although anatomically these conditions are entirely different and,

* Read in the Section on Surgery and Anatomy of the American Medical Association, at the Fifty-seventh Annual Session, June, 1906.
1. Langenbeck's Arch., vol. xxiv.

therefore, the conclusions arrived at must necessarily be faulty. As a result of this fact a number of methods have been introduced, most of them resulting in a distortion of this opening, and each of these producing a considerable number of recurrences.

AUTHOR'S METHOD.

The femoral canal is bounded anteriorly by the transversalis fascia, Poupart's ligament and the falciform process of the fascia lata; posteriorly by the iliac fascia, covering the pubic portion of the fascia lata; externally the fibrous septum separating it from the femoral vein; internally the junction of the processes of the transversalis and iliac fasciæ forming the femoral sheath lying against the outer edge of Gimbernat's ligament. The femoral opening is lined with the serous membrane comprising the hernial sac which is an outfolding of the peritoneum.

In order to change this into an unlined circular opening which must necessarily close spontaneously all that it is necessary to do is carefully to dissect out the hernial sac quite up into the peritoneal cavity beyond the inner surface of the femoral ring, ligate it high up, cut it off and permit the stump to withdraw within the peritoneal cavity. Removing all the fat contained in the femoral canal and simply closing the skin wound completes the operation for femoral hernia. This method is applicable to all simple femoral herniæ in which an actual femoral ring exists.

Occasionally there is a case in which the hernia is of traumatic origin and the opening is formed by the tearing of one edge of the ring, so that the opening is no longer regular and circular. A similar condition may also be due to a congenital deformity. Such an opening may not close spontaneously; in such cases there can be no indication for using this method. Neither is the method applicable to operations for strangulated hernia in which the femoral ring has to be cut to permit reduction.

RESULTS AND DISCUSSION.

I have used this method constantly during a period of fourteen years and am convinced that, barring unusual accidents, recurrences are out of the question if the operation is performed in this manner. I have been able to get definite reports and to examine 30 cases of femoral hernia contained in the following table. None of these operations was followed by recurrence. This number contains only a part of the patients operated, because it was not possible to get information from many of the patients of foreign birth, who do not read or write the English language and who change their residence so often that it is difficult to follow them, but there can be no doubt that the results in these cases correspond to those in which I was able to obtain information.

I have written a letter to each one of the patients on whom I operated for femoral hernia at the Augustana Hospital during the past fourteen years; 56 cases in all. Of these letters thirty-one were answered, twelve were returned through the mail, and thirteen have not been heard from.

Giving all of the answers of those that have responded will, I believe, give a fair idea of the ultimate result in these cases. I have not written to patients operated on in the other hospitals, because the number at the Augustana Hospital seemed sufficient to draw conclusions from. A greater proportion of my English-speaking pa-

tients go to this hospital than to my public clinic. I was, therefore, more certain to obtain information from the Augustana Hospital patients than from those operated in the other institutions.

It may be claimed that, if a hernial protrusion has occurred, it will occur again unless some mechanical means be employed for the closure of the femoral opening. A study of the histories of these cases shows that the original cause of the hernia can always be found in some abnormal intra-abdominal pressure of a temporary nature, or in the presence of peritoneal fat in the femoral canal. Severe gaseous distension of the intestines during childhood; whooping-cough; severe cough due to bronchitis recurring every winter; heavy lifting in young girls in the capacity of servants, before they were fully grown; pregnancy; large intra-abdominal tumors; severe sudden strains like lifting a heavy burden or being thrown from a bicycle or a moving carriage, and the presence of preperitoneal fat in the femoral canal are the most common causes. All of these immediate causes can be guarded against, and in this way a recurrence is not likely to occur.

Case 7 will serve as an excellent illustration of the permanency of the closure of the femoral ring when the operation is performed in this manner. The patient was married two years after I performed the operation for hernia. After bearing her first child she noticed a femoral hernia on the opposite side, while the canal on the side operated on remained firmly closed.

Case 8 also serves as an illustration. The patient acquired an incipient inguinal hernia during a period when she did a great deal of heavy lifting. The femoral canal operated remained perfectly closed.

Case 6 is also interesting, because it illustrates the same fact. The patient recovered fully from her herniotomy and remained so until two years later, when she suffered from an intestinal obstruction. A band extending from the mesentery of the ileum to the cecum at the base of the appendix had evidently existed for a long time, there being an indefinite history of peritonitis due to appendicitis several years before the patient came to the hospital for herniotomy. Two days before the patient entered the hospital a portion of the ileum had slipped under this band and had become strangulated. The patient was brought to the hospital with an enormously distended abdomen. She was operated on and recovered. The scar at the seat of the original hernia was stretched together with all the tissues of the abdominal wall, but this did not suffice to cause a recurrence of the hernia.

In cases in which the femoral ring has been artificially closed there is always a distortion of the circular opening unless this closure be according to the method advised by Cushing, Marcy or Kuester consisting in a circular suture which does not interfere with the arrangement of the femoral ring.

The method devised by Kocher, consisting in suturing the pectineal fascia over the opening, and the method advised by Lucus Champonierre, which is very similar, are also relatively harmless. The study of the literature shows that the method of closing the opening by distorting the femoral canal will result in keeping it open in a considerable proportion of cases, some of these producing as high as 18 to 20 per cent. of recurrences. These facts seem to indicate that in this definite class of cases of femoral hernia the principle mentioned above should be employed.

PRINCIPAL FEATURES OF METHODS.

In order to sum up this subject somewhat comprehensively in the brief space in which this paper must be limited, it has seemed proper to mention the principal features of the most important methods which have been practiced in a considerable number of cases of femoral hernia.

1. Ligation and extirpation of sac: Socin, Anderegg, Leisrink, Munzinger, Julliard and Riedel.
2. Suturing of Poupart's ligament to pectineal fascia: DeGarmo, Mocher, v. Frey, Berger, Czerny and Schede.
3. Two rows of sutures of Poupart's ligament to pectineal fascia by Bassini.
4. Two rows of sutures attaching falciform to pectineal fascia by Champonierre.
5. Purse string sutures: Cushing.
6. Purse string sutures and pad made by doubling sac: Curtis, MacEwen, Tricome, Coley, Reffa and Fortunat.
7. Purse string suture in several tiers: Kuester.
8. Closing femoral opening by muscular aponeurosis flap: Salzer and Dawborn.
9. Closing femoral opening by periosteal flap: Trendelenburg.
10. Closing femoral opening by decalcified bone: Thiriar.
11. Closing femoral opening by ball of catgut: Schwarz.
12. Cutting through periosteum of ramus; three holes bored through bone; silk suture to Poupart's ligament: Hammersfahr.
13. MacEwen's method of making pad from sac combined with attaching Poupart's ligament to bone with mattress sutures: Nicoll.
14. And suturing Poupart's ligament to bone: Mikulicz.
15. Fastening Poupart's ligament to ramus with staple: Roux.
16. Passing a ligature through obturator foramen to tie down Poupart's ligament: Cavazzani.
17. Cutting Poupart's ligament from its moorings and sewing it to ramus: Fabricius and Delageniere.
18. Changing femoral into inguinal hernia: Ruggi.
19. Fastening conjoined tendon to ramus: Lotheisen, Codivilla and Parry.
20. Cutting entirely through Poupart's ligament just to the inside of the femoral vessels and making a triangular flap which is sutured to the periosteum of the horizontal ramus of the os pubis.

These methods may be classified in four groups:

1. Those in which the sac has been removed high up.
2. Those in which it has been utilized to form a pad.
3. Those in which the femoral canal has been left in the form of a circular opening.
4. Those in which it has been distorted either by cutting or suturing.

It seems reasonable to affirm that every method which does not contain the third of these characteristics must be considered bad from a surgical standpoint.

PROCEDURE OF DIFFERENT METHODS.

In order to make comparison convenient I have tabulated the various steps which are followed by surgeons of the greatest experience who practice the various methods which have been employed in the largest number of operations for the relief of femoral hernia.

I. SOCIN'S METHOD.

1. Skin incision a little below and parallel with Poupart's ligament.
2. Freeing of sac high up into abdominal cavity.
3. Removal of all fat and loose tissue.
4. Pulling down sac by assistant.
5. Ligating and cutting off sac high up.
6. Having stump slip into peritoneal cavity.
7. Suturing of skin incision.

II. CUSHING'S METHOD.

1. Free sac well beyond its neck, transfix it, tie it off as high as possible to avoid a funicular process.

2. Introduce a purse string suture of chromicized catgut through Poupart's ligament, the pectineal fascia and muscle, then outward through fascia lata covering femoral vessels and finally up through Poupart's ligament again coming out one-half inch from where suture was started.
3. Tie the suture and obliterate femoral canal.
4. Suture skin incision.

III. COLEY'S METHOD.

1. Thoroughly free sac well beyond neck.
2. High ligation of sac.
3. Suture is introduced through Poupart's ligament or the inner portion of the canal or crural arch, thence downward into the pectineal muscle or floor of canal, outward through fascia lata overlying the femoral vein and upward through Poupart's ligament or roof of canal, emerging about three-fourths of an inch from point of introduction.
4. On tying suture the floor of canal is brought in apposition with roof of canal and the femoral opening is obliterated.
5. Close superficial fascia with catgut or fine tendon and the skin with horse hair.

IV. CURTIS' METHOD FOR CLOSING THE CANAL AFTER THE SAC HAS BEEN REMOVED.

1. Three superimposed circular purse string sutures of catgut are introduced.
2. The first at the internal femoral opening.
3. The second one-third of an inch outside of this.
4. The third at the external surface of canal.
5. This method is not suitable for large hernie.

V. LOTHEISEN'S METHOD.

1. Incision parallel to Poupart's ligament and a little above same dividing fibers of external oblique and extending into external inguinal ring.
2. Expose neck of sac by entering between Poupart's ligament and the internal oblique.
3. Dislocate sac by pulling same, if small, into opening above Poupart's ligament.
4. In large hernia, dislocate the skin at the lower edge of the original incision, expose the external surface of the sac, incise sac and finally dislocate the stump of the sac in manner previously described for small hernia.
5. Suture edge of transversalis and internal oblique muscles to Cooper's ligament.
6. Suture the incisions in the aponeurosis and skin separately.

VI. NICOLL'S METHOD. (A)

1. Expose sac and clear from surrounding tissue, making the incision vertical or transverse.
2. Open sac longitudinally in middle line and clear contents.
3. Separate neck of sac for one inch around abdominal aspect of ring.
4. Bisect sac longitudinally from fundus to neck.
5. Make an aperture in one-half near the neck.
6. Interlock the halves by putting the other through one of the apertures.
7. Reduce whole sac through the femoral ring by detaching its neck from the abdominal aspect of the ring.

B—Closure of femoral ring by use of the pubic ramus.

1. Carry an incision (bone deep) from femoral vein along the pubic ramus to the region of the pubic spine.
2. Detach the periosteum to a limited extent and retract it.
3. Drill one or two holes in the bone near its upper edge one-half inch to one inch apart.
4. Pass loops of strong catgut through the apertures.
5. Divide the loop of ligature. Thread one end in a curved surgical needle and pass a mattress suture through Poupart's ligament. Repeat with second end, carrying it through Poupart's ligament at a higher level, avoiding the deep epigastric artery, and the spermatic cord above in males.
6. By means of probe withdraw both ligaments through the second drill hole in the bone.

7. Tie the ends of each loop separately over the front of the bone, thus drawing Poupart's ligament down to the posterior-superior surface of the bone and fixing it firmly in contact with that surface, constituting in effect an extension outward of Gimbernat's ligament and absolutely closing the ring.
8. Complete the operation with interrupted catgut sutures by uniting the detached margin of the pectineal origin and the pubic portion of the fascia lata to the "anchored" Poupart's ligament.

AUTHOR'S CASES TABULATED.

No.	Hosp. No.	Age and Sex.	Diagnosis.	Date of Operation.	Date of Re-examination.	Result.
1	858	30, F.	R. F. hernia.	March 21, 1892.	May 10, 1906.	Operation a perfect success. General health greatly improved.
2	2850	61, F.	R. F. hernia.	May 6, 1896.	May 13, 1906.	Operation complete success.
3	4307	41, F.	L. F. hernia.	Oct. 29, 1897.	May 16, 1906.	Perfect result.
4	5115	59, M.	R. F. hernia.	July 6, 1898.	May 23, 1906.	Has had no trouble since operation.
5	6615	56, F.	R. F. hernia.	Sept. 18, 1899.	May 13, 1906.	Perfect recovery; patient in perfect health.
6	6301	33, F.	R. F. hernia.	Nov. 5, 1899.	May 11, 1906.	A slight stretching of scar tissue following enormous abdominal distention due to intestinal obstruction caused by a band of adhesions across the ileum, but no recurrences.
7	7522	22, F.	L. F. hernia.	April 23, 1900.	May 22, 1906.	Left femoral hernia cured by operation, but a R. F. hernia developed after birth of first child.
8	8162	38, F.	L. F. omental hernia; incarcerated.	Sept. 26, 1900.	May 13, 1906.	Examined patient personally. Found inguinal hernia produced by extremely hard labor four years after operation for femoral hernia. No recurrence.
9	8249	38, F.	L. F. hernia.	Oct. 17, 1900.	May 15, 1906.	Result of operation perfect.
10	8591	27, F.	R. F. hernia.	Jan. 11, 1901.	May 16, 1906.	Operation a perfect success. General health greatly improved.
11	9040	31, F.	L. F. hernia.	April 22, 1901.	May 14, 1906.	Success of operation perfect. Absolutely no pain or discomfort following recovery.
12	9276	46, F.	R. F. hernia.	June 12, 1901.	May 18, 1906.	Recovered perfectly from the operation for the hernia; is at present having some pain, due to uterine trouble.
13	9462	42, F.	R. F. hernia.	July 26, 1901.	May 14, 1906.	Perfectly recovered.
14	10511	58, F.	L. F. hernia.	March 24, 1902.	May 13, 1906.	Operation successful; patient's general health improved.
15	10918	66, F.	L. F. hernia.	June 20, 1902.	May 10, 1906.	Recovery perfect; general health improved.
16	11447	42, F.	R. F. hernia.	Oct. 1, 1902.	May 21, 1906.	Operation successful.
17	11950	58, M.	Incarcerated hernia.	Jan. 9, 1903.	June 13, 1906.	Recovered perfectly.
18	12176	42, F.	R. F. hernia.	Feb. 20, 1903.	May 14, 1906.	Operation successful; patient in perfect health.
19	12301	41, F.	L. F. hernia.	March 16, 1903.	May 23, 1906.	Operation a success; patient felt slight soreness for three months after operation but has been perfectly comfortable since.
20	12457	49, F.	R. F. hernia strangulated.	April 15, 1903.	May 20, 1906.	Operation successful.
21	12739	34, F.	L. F. hernia.	June 8, 1903.	May 14, 1906.	Operation successful.
22	14300	30, F.	L. F. hernia.	April 22, 1904.	May 16, 1906.	Patient recovered perfectly from hernia operation.
23	14392	44, M.	L. F. hernia.	May 11, 1904.	May 26, 1906.	Operation perfectly successful.
24	14447	45, F.	R. and L. hernia strangulated.	May 21, 1904.	May 10, 1906.	Recovery perfect; patient in perfect health.
25	14899	47, M.	R. and F. hernia strangulated.	Aug. 17, 1904.	May 15, 1906.	Patient well; no return of trouble.
26	15350	32, M.	R. F. hernia strangulated.	May 17, 1905.	May 14, 1906.	Operation successful.
27	15798	42, F.	L. F. hernia.	Feb. 27, 1905.	May 22, 1906.	Operation successful; patient constipated since operation, and not before.
28	15820	46, F.	R. and L. F. hernia.	March 6, 1905.	May 19, 1906.	Completely cured.
29	17528	55, M.	E. Ing. and F. hernia.	Dec. 13, 1905.	May 18, 1906.	Cure perfect; improved in health after operation.
30	16314	31, F.	R. F. hernia.	May 51, 1905.	May 18, 1906.	Perfectly well.

VII. DEGARMO'S METHOD.

1. Incision 2 to 3 inches long and parallel with and to inner side of femoral vessels.
2. Sac appears in the wound when the skin and superior fascia are incised.
3. Lift out mass by thumb forceps and blunt dissection.
4. Put traction on sac and ligate same and then it will retract within the abdominal cavity, leaving the femoral canal free from foreign tissue.
5. Open sac and carefully ligate adherent omentum and break up adhesions in case of adherent intestines.
6. Pass needle with strong catgut No. 2, through neck of sac and tie a second time.
7. Examine stump for bleeding vessels and not until then should the ends of the ligature be cut.
8. Close opening by pressing end of finger firmly into femoral opening under Poupart's ligament and passing a strong blunt needle through the ligament on the finger point.
9. Press the finger against ramus of pubes and see that vessels are out of the way, then pass point of needle fully down to the periosteum of pubic bone, taking up all tissues over it.
10. This constitutes the first stitch, but should not be tied until the others are placed in the same manner every one-fourth inch, until near the spine of pubes.
11. Now tie down and cut closely and close the fascia by plain catgut and the skin with buried catgut sutures to prevent any pocket formation.

VIII. HAMMESFAHR'S METHOD.

1. Resect femoral sac and reduce stump.
2. Drill three holes in upper margin of ramus from the slant upward so that the inner opening is close beneath the edge of the crest.
3. Pass strong silk around Poupart's ligament and then through the holes and tie them firmly.

It is, of course, impossible to review the extensive literature on this subject completely within the limits of this paper, but the references made above will, I think, serve for comparison. If the principle mentioned at the beginning of this paper is applicable to this condition, there can be no doubt that Socin's method is the only one which has value in the treatment of this definite class of cases. The accompanying table of my cases seems to support this view conclusively.

FIVE YEARS' EXPERIENCE WITH AN ORIGINAL FILIGREE INTENDED TO PREVENT AND TO CURE ABDOMINAL HERNIÆ.*

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My use of the various filigrees in twenty-two cases has led to certain definite conclusions with reference to the mechanical side of the question.

1. A scar, no matter how thin, if prevented from stretching by embedded wires, constitutes a reliable, integral portion of the abdominal wall.
2. A ready-made filigree answers all possible requirements; hence, the construction of one in the wound constitutes an unnecessary prolongation of the operation.
3. Since scars tend to stretch laterally, the filigree need be made up of only cross wires, held together in the middle by one single-twisted strand, following the direction of the suture line.¹

* Read in the Section on Surgery and Anatomy of the American Medical Association, at the Fifty-seventh Annual Session, June, 1906.

1. This arrangement, which I described in the *Annals of Surgery*, July, 1903, furnishes a network so supple that no resistance is offered to the natural pliability of the tissues. Only a single strand of No. 30 silver wire is used in weaving, hence, there are no sharp ends anywhere, while at the periphery are simply disconnected loops, into which scar tissue must grow.