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Frank Hartley

A

TREATISE ON HERNIA:

WITH

A NEW PROCESS FOR ITS RADICAL CURE,

AND

ORIGINAL CONTRIBUTIONS TO OPERATIVE SURGERY,

AND

NEW SURGICAL INSTRUMENTS.

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PREFACE.

The following work is upon a subject which, perhaps, more frequently than any other in surgery, demands prompt action, anatomical knowledge, and surgical skill. The number of sufferers from hernia is immensely large, and too often the inadequate knowledge of their attending physicians leads them to the nets of the charlatans who advertise trusses and bandages.

Even able men have hesitated at performing operations for the radical cure of rupture, so frequently has disappointment followed this procedure. The author believes he explains one in this volume which will be found to present the minimum of risk, and to proffer a large probability of success, as the statistics given will demonstrate.

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TABLE OF ILLUSTRATIONS.

HERNIA—RUPTURE.

The word Hernia comes from ερνος, and means a protrusion—a branch, and has been used by writers on Pathology in a general sense, to mean *only protrusion of the contents of a cavity through its walls:* as, Hernia Cerebri—the protrusion of the brain through the dura mater and cranial wall; Hernia Pulmonalis—the protrusion of the lung through the walls of the chest; HERNIA ABDOMINALIS—the *protrusion of any of the viscera in the abdominal cavity through any of its natural openings, or through a rupture in its solid superficial walls;* then we have Hernia Vesicis—*hernia of the bladder*—where the internal coat is pushed through the muscular coat, and pressed on the perineum or other surroundings of the bladder; Hernia Sclerotici—protrusion of the contents of the ball through the sclerotic coat of the eye. Some apply the use of this word to aneurisms and the accumulation of fluids in the knee, making protrusions through the serous sac; also to hemorrhages into cavities protruding and pressing through its walls.

Hernial protrusions may be covered with skin and superficial fascia, also by the serous tissue; or they may protrude through a clean cut, or a gunshot wound, without any covering. Most usually they have the serous coat, the superficial fascia, and the skin for their coverings, with other layers peculiar to special Hernias (I use hernias here in the plural, instead of ruptures, as rupture does not mean hernia, and is not a good synonym).

HERNIA ABDOMINALIS—*Abdominal Hernia.* This is the genus or class we shall treat of, as the other classes do not necessarily come under observation to illustrate this class; they have but a few symptoms in common, and they are comparatively rare and not often met with; besides, they are usually produced by incised, punctured, or gunshot wounds, and rarely by pressure from *within*, or compression of the external walls on their contents.

Abdominal Hernia is divided into many *varieties* and *sub-varieties*, to more particularly define its *position*, its *contents*, its *mobility*, its *stage and line of progress, time of protrusion*, whether before or after birth, *causes*, whether traumatic or idiopathic.

General Symptoms.—There is always a tumor in the region where the Hernia comes out, of variable size, from that of a knuckle to that of a man's head. This tumor is usually reducible —can be pushed back into the cavity from which it came—but will return when left to the muscular action of the parts, except when it becomes strangulated or impacted, that is, incarcerated, as we will show when we come to speak of strangulated hernia. When strangulated it cannot be easily reduced; or it may be irreducible without strangulation, by adhesion to the walls of the sac. Its contents vary. When the intestines are protruded, the tumor is soft and gaseous, and will sometimes produce a gurgling or crackling sound. When the tumor contains omentum, it is more solid and of a doughy feeling, and not so easily reduced. When the spleen, liver, or kidneys are protruded, it is nearly solid, at least quite firm in comparison with the other varieties.

General Causes.—These tumors are produced in some instances suddenly, by FALLS, by KICKS FROM HORSES, COWS, AND OTHER ANIMALS, by *punches* from *horns* of *cattle*, by the *handles* of *ploughs*, and *spikes* of *machinery*, by *muscular pressure*, as by jumping, falling, and GRADUALLY, ALMOST IMPERCEPTIBLY, by *riding*, *coughing*, *crying*, *laughing*, *defecating*, *throes* of *parturition*, *cramps* and *strainings in urinating* in strictures of the urethra and stone in the bladder, in playing on wind instruments, from dilatations by worms, by ovarian tumors, pregnancy, and tight lacing.

Special Symptoms.—When the protrusion is produced suddenly, there is great *pain* and *soreness* in the tumor, *heat*, *redness*, *swelling*, and *great tension*. When these symptoms are not soon relieved, the contents become strangulated, and mortification takes place rapidly, attended with hiccough, stercoraceous vomiting, cold clammy sweats, with quick and feeble pulse, and lastly, shock and *death*. The progress of these symptoms depends upon the tightness of the stricture. If the strangulation is complete, so no blood can flow into or out of the tumor, sphacelation will take place in twenty-four hours, and some say in six. But, if not tight enough to prevent the passage of the fæces, it may not produce impaction, and the bowels may be moved, and there will remain an irreducible hernia, that may stand for years and not produce serious results, but the patient's life is in danger at all times from impaction and strangulation. Hernia may form almost imperceptibly to a

patient, producing no appreciable pain and but little soreness. This soreness may be occasionally felt on riding a trotting horse, climbing a tree, or lifting a weight, and pass off until some other muscular pressure may force it out. In some situations, as in the inguinal ring, or the femoral ring, a small knuckle of omentum or intestine may be pressed partly out, and become strangulated in its course without producing a perceptible tumor, and may often be taken for an inflamed gland or an incipient bubo. These cases must be carefully watched, and a close and careful examination made, for while an inflamed bubo is comparatively of little importance, these cases are extremely dangerous, and soon result in all the painful phenomena just described.

PROPORTION OF HERNIAS TO NUMBER OF INHABITANTS.

Table showing the number of exemptions from the various forms of Hernia, compiled from the report of Provost Marshal J. B. Fry, from the examinations of 605,045 drafted men during the late war:—

VARIETIES.	No. Exempted.	Ratio per 1000.
Hernia	2,705	4.47
Hernia Ventral	310	.51
Hernia Umbilical	123	.20
Hernia Inguinal	13,994	23.13
Hernia Femoral	500	.83
Total	17,632	29.14

Table showing the proportion of deaths from Hernia to deaths from all other causes reported in the U. S. Census for 1850, 1860, and 1870:—

Census.	Whole No. of deaths.	Deaths from Hernia.	Ratio per Thousand.
1850	271,890	241	1.132⅓
1860	394,153	360	1.094⅔
1870	492,263	638	.771½
Total	1,158,306	1239	.999 +

The number of deaths from Hernia, to the entire number of deaths in the United States, is one in 771½, or, in the entire population, one in 60,432½. According to the census of 1870, entire population, 38,555,983; entire deaths, 402,263. Males, 465; females, 173; total, 638. Ratio per 1000, 1.65. *The deaths* from hernia to the entire deaths at the same period, were, male and female, 638; total, 302,263. Ratio, to 1000, 1.585. The census also shows that the greatest number of males die in the months of January (42), April (51), June (17), July (27), September (17), October (37), November (42), December (37). Females—*Highest*, January (33), June (17), July (18); *lowest*, January (11), February (8), May (12), December (11).

These data show, to one familiar with the industry of the United States, that in the months for rolling logs and clearing up of lands we have the greatest number of deaths in males, and when cultivating and gathering of crops, the least; while in the female, during the winter months, when she is confined to the house, she is less liable; and in the summer and fall months, when she assists in gathering the crops, she is most liable; but it will be seen that, as we before stated, the ratio is about 1 in 2687, or in the proportion of 465 to 173, being 000.75 per one thousand of all female deaths in 1870. This ratio of mortality would give 6380 deaths from hernia every ten years. *This would reduce the ratio of a man's life who is laboring under hernia to thirty-six years, from the average of forty-two, in the United States.*

GRAVITY OF THE DISEASE.

Hernia, whether considered in its mortality or the results of its treatment, may be pronounced one of the *gravest of lesions* the surgeon has to contend with, requiring anatomical knowledge to diagnose, and great skill and operative tact to treat its various complications.

CLASSIFICATION OF ABDOMINAL HERNIA.

Time of Rupture—Whether before or after birth.

1. *Congenital*—Occurring in fœtus before birth.
2. *Non-Congenital*—Occurring after birth.

ITS STAGE AND LINE OF PROGRESS.

1. *Incomplete*—Where the tumor is lodged in the walls and has not made its exit.
2. *Complete*—Where the tumor has passed through the walls of the abdomen.

DIRECTION OF THE PROTRUSION.

1. *Oblique*—Where the hernia passes obliquely through the walls of the abdominal cavity, as oblique inguinal hernia.
2. *Direct*—Where it passes directly out at one ring or through a straight rupture, as direct inguinal hernia.

POSITIONS IN THE ABDOMINAL REGION.

These are made plain by the accompanying diagrams (Plate I, Figures 1 and 2).

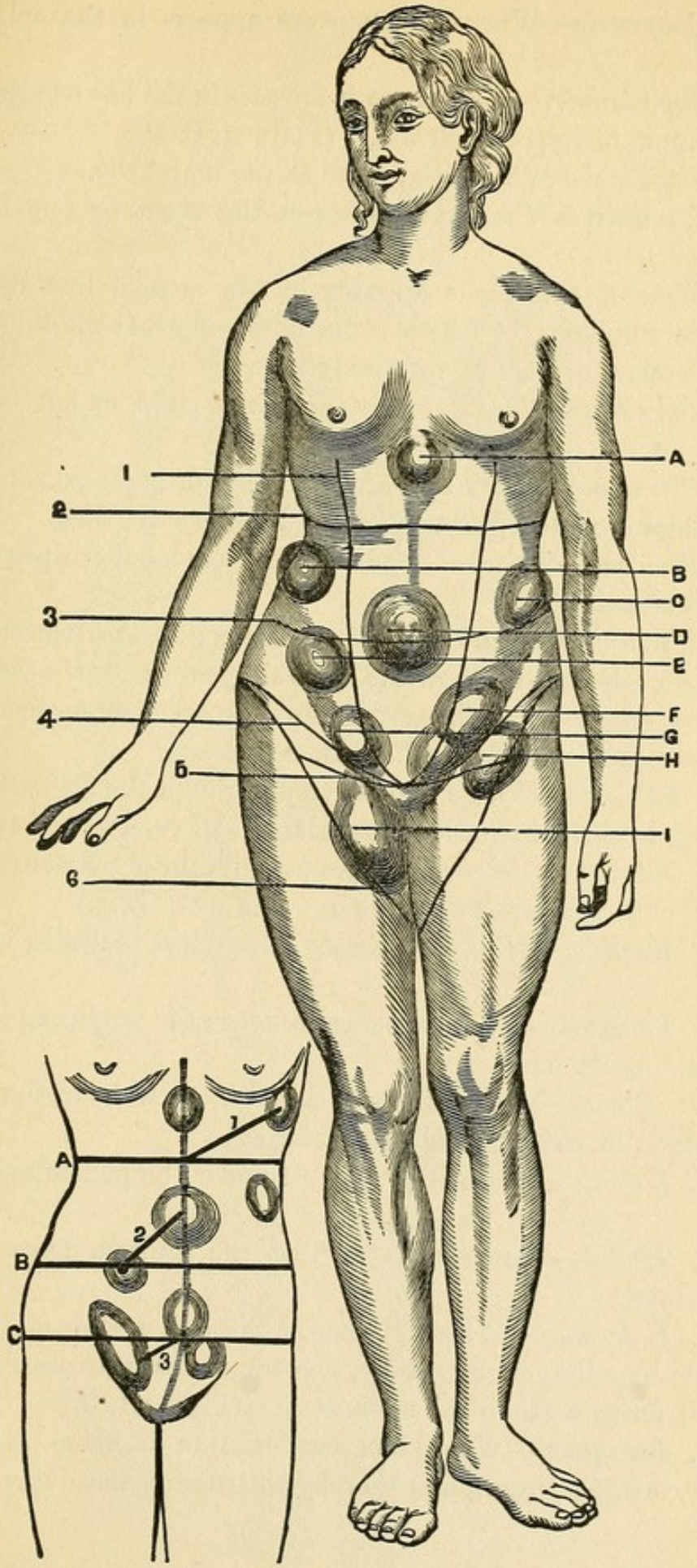


PLATE I—FIGS. 1 AND 2.—1. Epigastric Region. 2. Lumbar Region. 3. Umbilical Region. 4. Femoral Region. 5. Poupart's Ligament. 6. Scarpa's Triangle. A Epigastric Hernia. B. Hypochondriacal Hernia. C. Lumbral Hernia. D. Umbilical Hernia. E. Ventral Hernia. F. Inguinal Hernia. G. Direct Inguina Hernia. H. Crural Hernia. I. Femoral Hernia.

1st. *Epigastric*—Where the rupture appears in the epigastric region.

2d. *Hypochondriacal*—Where it appears in the left or right side upper region, or hypochondrium. (Plate II, C. D.)

3d. *Umbilical*—Where it appears at the umbilicus.

4th. *Lumbral*—Where it appears in the right or left lumbar region.

5th. *Ventral*—Where it appears in the median line above or below the umbilicus, or between the umbilicus and the linia semicircularis above or below, right or left.

6th. *Inguinal*—Where it appears in the right or left inguinal region.

7th. *Crural*—Where it appears at the left or right crural region, in the femoral or Scarpa's triangle, at its upper portion.

8th. *Femoral*—Where it appears below the falciform process, in the femoral triangle.

9th. *Phrenic or Diaphragmatic*—Where it passes through the diaphragm, whether through the natural openings, as the ascending vena cava, aorta or œsophagus, or through an opening made by a wound through its walls. (Plate II, A. B.)

10th. *Ischiatic*—Where it passes out through the ischiatic opening, along with the ischiatic nerve, artery and vein. (Plate II, E. F.)

11th. *Obturator*—Where it comes through the obturator foramen, with the obturator artery and vein. (Plate II, G. H.)

12th. *Vaginal*—Where it passes through the walls into the vagina.

13th. *Perineal*—Where it passes between the vagina and rectum out on the perineum.

14th. *Rectal*—Where it passes through the walls of the rectum and rests in its cavity, forming a heterocele.

15th. *Labial*—Where it passes out under the pudendum in any part.

16th. *Scrotal*—Where it passes into the scrotum from the inguinal rings.

17th. *Enteronal*—Where it passes through a loop of intestine produced by adhesion internally, and simulates intussusception, or where it forms a sac in the mesentery. (Plate III, G.)

18th. *Invaginal*—Where one portion of an intestine passes into another, invaginating it, and thereby obstructing the alvine evacuations.

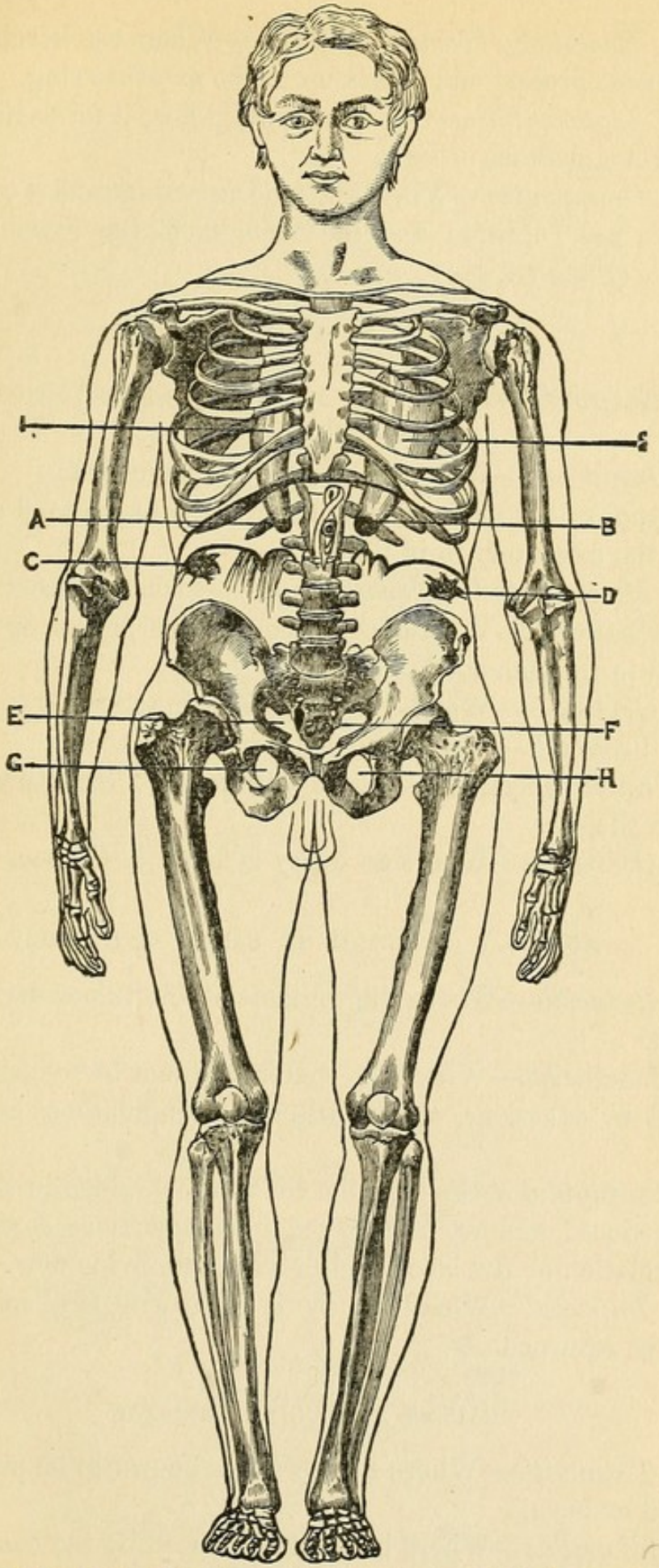


PLATE II—FIG. 3.—1 and 2. Diaphragmatic Hernia. A. and B. Neck of Diaphragmatic Hernia. C. and D. Neck of Lumbral Hernia. E. and F. Opening for Ischiatic Hernia. G. and H. Opening for Obturator Hernia.

19th. *Encysted—Hernia Infantilis*—Where the hernia forms in the inguinal process and comes up to the external ring.

20th. *Ligamentatic*—Ovarian hernia, where it forms in the canal of Nuck-ligamentous process.

21st. *Diverticular*—Where the mucous and muscular coats of the intestines are ruptured, and the contents of the bowel pass into the sac. (Plate III, E.)

CONTENTS OF A HERNIAL SAC.

1st. *Enterocele*—Where the contents of the sac are only intestine.

2d. *Omentocele*—Where the contents are omentum.

3d. *Angeo-Mesenteriocele*—Where a mesenteric gland and a portion of the mesentery is in the sac.

4th. *Mesocolonocele*—Where the meso-colon is secured in the sac.

5th. *Viscerocele*—Where portions of the liver, spleen or kidney are included in the tumor.

6th. *Gastrocele*—Where the stomach is in the sac.

7th. *Veserocele*—Where the bladder is in the sac.

8th. *Entero-epiplocele*—Where intestine and omentum are both found in the sac.

9th. *Ovariocele*—Where an ovary is found in the sac.

MOBILITY OF TUMOR IN CASES OF HERNIA.

1st. *Reducible*—Where the contents of the tumor may be easily reduced.

2d. *Irreducible*—Where the contents cannot be reduced, but are retained by adhesions, with or without strangulations, or from impaction.

3d. *Strangulated*—Where the contents contained in the sac cannot be reduced, and are compressed in some portions, so as to cut off the circulation of the blood and prevent the alvine flow.

4th. *Impacted*—Where the sac is filled with fecal matter, so it cannot be returned.

CAUSES PRODUCING HERNIA.

1st. *Traumatic*—Where the hernia is known to be produced by a wound or burn.

2d. *Idiopathic*—Where hernia is produced by the contraction of

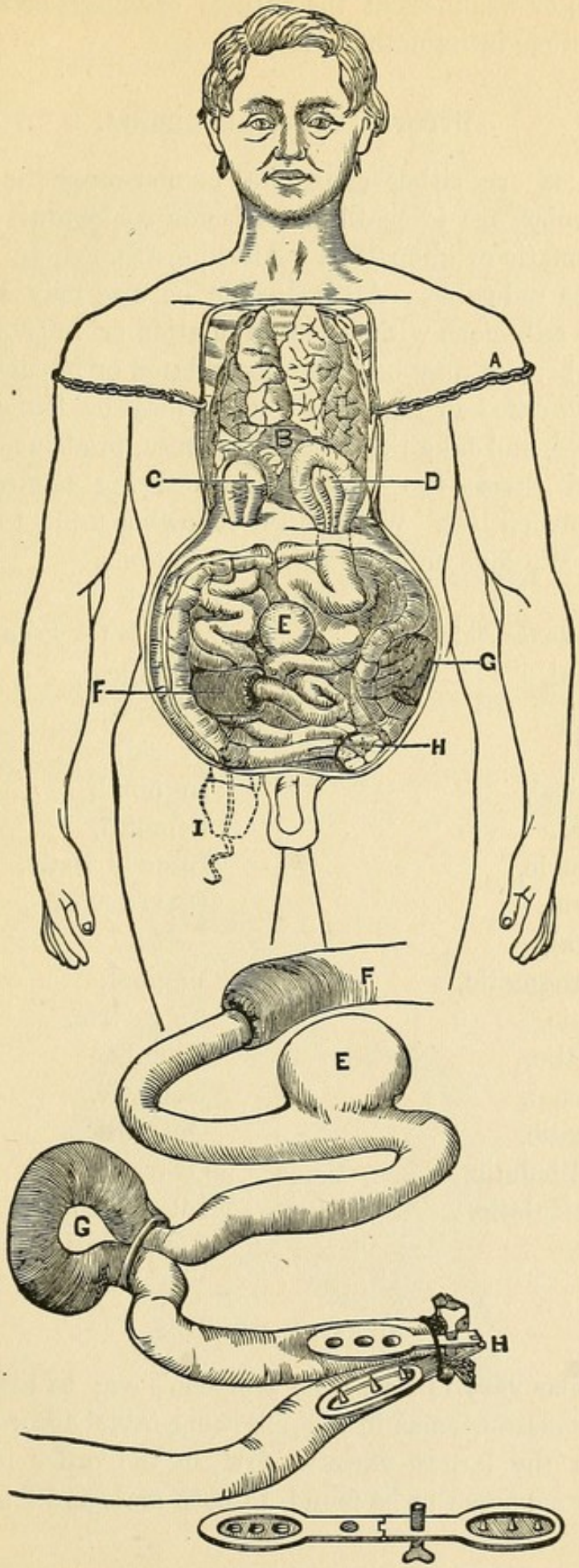


PLATE III—FIG. 4.—A. Chain holding open the Chest. C. and D. Intestine in Diaphragmatic Hernia. E. Appendiformical Hernia. F. Intussusception. G. Intestinal Hernia. H. Artificial Anus. I. Cæcum.

the muscles, or weakness at the natural openings, or where it follows the testicle in its natural descent.

DYCOTAL TABLE OF HERNIA.

All hernias are either congenital or non-congenital. All congenital hernias are idiopathic. All non-congenital hernias are either traumatic or idiopathic. All idiopathic or traumatic hernias may be reducible. All reducible hernias may become irreducible by adhesions without strangulation or impaction, and all irreducible hernias may become strangulated or impacted.

All strangulated or impacted hernias may be found in the following places, and take the following names, in about the order we have stated them—the most common being named first, and the most unusual last. We give the following table, to be filled by statistics. We give only our own observations.

In the Male.	*In the Female.*
Inguinal,	Umbilical,
Scrotal,	Ventral,
Crural,	Crural,
Umbilical,	Inguinal,
Ventral,	Femoral,
Epigastric,	Infundibulatic,
Lumbral,	Diverticulatic,
Femoral,	Labial,
Diaphragmatic,	Vaginal,
Ischiatic,	Epigastric,
Obturatic,	Rectal,
Enteronal,	Ischiatic,
Spermatic,	Obturatic,
Infundibulatic,	Ovariatic,
Diverticulatic.	Intusceptic,
	Ligmentatic.

SIZES OF HERNIAS.

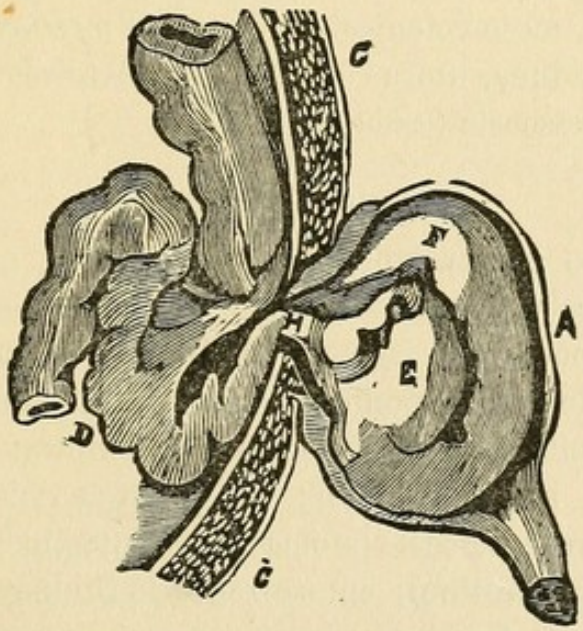
All hernias vary in size, from a pigeon's egg to that of a man's head. We class hernias in the following table according to their size, giving the largest varieties first, in the order in which they are usually supposed to be found, in both male and female:—

Male.	*Female.*
Scrotal,	Umbilical,
Ventral,	Ventral,
Umbilical,	Epigastric,
Epigastric,	Lumbral,
Lumbral,	Hypochondric,
Hypochondric,	Diaphragmatic,
Diaphragmatic,	Rectal,
Rectal,	Vaginal,
Femoral,	Femoral,
Ischiatic,	Labial,
Obturatic,	Ischiatic,
Enterocelic,	Obturatic,
Intusceptic,	Enterocelic,
Spermatic,	Intusceptic,
Freniculatic.	Infundibulatic,
	Ligamentatic.

ALL HERNIAS HAVE EITHER SACS WITH OTHER COVERINGS, OR THEY ARE WITHOUT SACS OR COVERINGS.

This applies alike to male and female, whether with or without coverings. See Figures 5 and 6. The tumor may be composed of

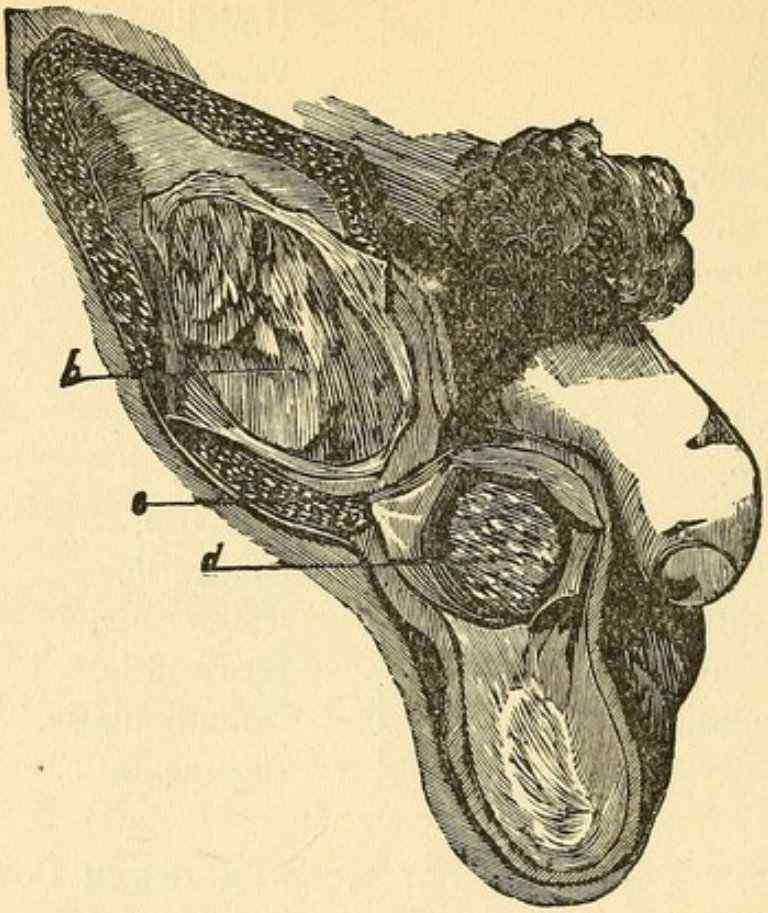
FIG. 5.



A. Hernia in Sac. CC. Abdominal Walls. D. Intestine. E. and F. Folds of Intestine in Sac.

the following anatomical parts, or a combination of them, in the

FIG. 6.



b. Sac laid open. *c*. Abdominal Wall. *d*. Omentum in Sac of Scrotum.

order in which we give them, the most common being first, and the least common last:—

Enterocele, epiplocele (omentocele), angeo-mesenterocele (gland and mesentery), meso-colonicele (colon and meso-colon), viscerocele (liver, spleen, kidney, uterus or ovary), gastrocele (stomach), vesicele (bladder), cæcocele (cæcum).

COMPOUND CONTENTS.

These may be any two of the above or even more, as in some cases of umbilical and ventral hernias we find stomach, liver, small intestines, and omentum. Again we find the uterus, bladder, ligaments, ovaries, intestines and omentum. Where only two anatomical parts are included, they are named as follows:—Entero-epiplocele (omentum and intestine); entero-vesicocele (bladder and intestine); entero-gastrocele (stomach and intestine); entero-splenocele (spleen and intestine); entero-renocele (kidney and intestine); epiplo-splenocele (spleen and omentum); epiplo-gastrocele (stomach and omentum); epiplo-renocele (kidney and omentum); epiplo-uterocele (uterus and omentum); epiplo-vesicocele (bladder and omentum).

This list comprises all the usual varieties. The part most usually protruded should be put first in giving the contents.

GENERAL PREDISPOSING CAUSES—INCITING CAUSES AND EXCITING CAUSES.

Many conditions predispose to hernia, such as *sex, age, inheritance and conditions in life*, which more or less predispose the patient to the *inciting causes*, as *relaxation of the muscles, relaxation of the rings, general debility and obesity.*

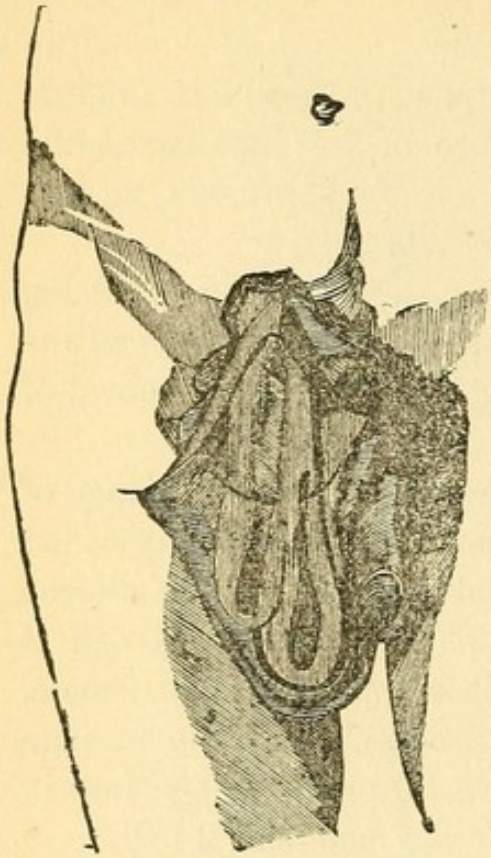
The local predisposing causes are *wounds*, weakening the walls, *burns, abscesses, ovarian tumors, ascites, punctures of surgical instruments*, as paracentesis abdominis, gastrotomy; the removal of tumors from the external wall.

A frequent predisposing cause in the male is the patulency of the inguinal process, especially of its ventral orifice, usually called vaginal, which name I think is objectionable, as it leads the student to think of the vagina; throughout this treatise we will call it inguinal process in the male, and when it is applied to the female, infundibulum process, and ligamental process, after the passage down of the testicle. Marriage is a powerful predisposing cause in the male; the proportion of cases in married men is as 2 to 1.

We well know that the testicle is found in the lumbar region, and behind the peritoneum; it gradually makes its way down, pressing before it a fold of the peritoneum, forming the ventral orifice; pushing its way further down, it reaches the external orifice, forming the inguinal process, or tunica propria testis, and lies above the cord, and continuing on down, it still carries a fold of the peritoneum, and about where the epidydimitis commences, it folds over it and the testicle, and forms the tunica albuginia propria testis. The inguinal process, or tunica propria funiculi, should be closed at birth, from its ventral to its testicular orifices, but this is often not the case, and greatly predisposes to oblique inguinal and scrotal hernias, and is the principal cause of congenital hernia of this region. This process is sometimes closed at both orifices, and patulous between, filling with serum, forming a complication that may confuse the operator for direct inguinal hernias in this region, or it may be open at either orifice, and closed in its course, each producing a weakening of the part, and the internal orifice particularly predisposing to incomplete hernia, and those of gradual formation.

Relaxation of the mesentery, redundance of omentum and relaxation of the mesocolons greatly predispose to hernia, especially of the larger class, as umbilical, ventral and scrotal, and in fact, without this relaxation and dragging down of these parts the large hernia could not occur. See Figure 7.

FIG. 7.



Double Sac in Scrotal Hernia.

Inflammation and cicatrization of the peritoneum, causing it to give way on pressure, is also an inciting or predisposing cause. Relaxation of its fibres by constant straining in *coughing, laughing, crying, defecating, painful micturition* from stone and stricture, is a general inciting cause in all idiopathic hernias.

Before passing to the anatomy or structure of hernia, it might be well for us to examine more closely and see what proportional influence *age, sex, condition* and *inheritance* have over the formation of hernias.

THE LONDON TRUSS COMPANY has given us the most extensive and reliable table on age and sex we have, and we give it in full below. Out of 77,997 cases we have the following results:—

YEARS.	CASES.	YEARS.	CASES.
From 1 to 10	7,229	From 50 to 60	14,169
" 10 " 20	4,551	" 60 " 70	9,761
" 20 " 30	8,715	" 70 " 80	3,866
" 30 " 40	13,614	" 80 " 90	442
" 40 " 50	15,627	" 90 " 100	23

There are more cases of hernia between one to ten than any other age, but relative to population, it is greater after thirty-five years, and gradually increases as age advances, from the continuation of the general *predisposing* causes, local inciting causes and the immediate or exciting causes continuing the same through life, hence longevity is a permanent predisposing cause of hernia. Men suffer much more than women from hernia, believed to be about four and a half to one, the deaths, as we have shown, being about 2.675 per cent. greater; but this ratio of deaths would be much

greater if females were as liable to strangulation as men; but they are not, in the proportion of 1 to 1.5 in males, owing probably to their occupation, but greatly due to the difference between the formation of the spermatic cord and the coming down of the testicle, and round ligaments and the ovaries.

The London Truss Company gives us the following data: out of 83,584 cases relieved, 67,798 were males, and 15,786 females, making about the proportion of 4½ to 1, as before given.

Men are predisposed and more liable to different kinds of hernias, as inguinal; women to femoral, ventral, umbilical, and all the pelvic varieties. Men alone are liable to scrotal; women alone to vaginal, labial and pudendal.

Occupation has much to do with the producing of hernias, as we have foreshadowed in giving the months in which the greatest number of deaths occur. Any occupation requiring muscular straining, especially of a continuous character, greatly promotes hernias, by dilating the rings, separating the relaxed fibres. Those that are liable to produce burns of the abdomen, cuts or contusions, as we have before given, as sailors, soldiers, engineers, carpenters, etc.

Inheritance has a serious influence on the production of hernia, as well as other malformations, for wherever it is congenital there is a malformation that does not prevent the protrusion. It is not unusual to see whole families affected with hernia, father and all his sons; a majority is a common thing.

ANATOMY OR STRUCTURE OF HERNIA.

All hernias, except those we have mentioned before, to wit, those produced by incised wounds, and hernia of the bladder and cæcum, which lie mostly out of the peritoneum, have no peritoneal covering on their lower and outer sides, hence they easily become strangulated, or rather irreducible, by adhesion of the adjoining parts.

The hernial sac is formed out of the peritoneum by its gradual distention, as the blowing up of a bladder. When the sac is completely full, the peritoneum lining it is put on the stretch and is fully distended, but when the hernia is reduced, the peritoneal sac contracts on itself to a certain extent, like an inflated bladder, but fills again as the contents are pressed into it. The sac has always a *mouth*, *neck*, *body* and *fundus*. See Figure 7, page 22.

The mouth is the internal orifice; the neck is the part constricted by the walls of the opening; the body is the expanded portion lying under the skin and fascia; the fundus is its lower portion rounded on itself.

There may be two or more of these sacs on the same side, sometimes leading into one neck; some may be quite large and others small. The sac is always the size of the tumor, being its internal cover, and consequently, from a "pigeon's egg to an adult man's head." Sacs that are in the line of descent of the testicle are called, by some, *congenital sacs*, and those forming gradually and out of the normal canals, non-congenital.

Acquired Sacs.—These sacs, of course, contain all the parts we have described in our dycotinous table, and need not be repeated here, but in addition to intestine, omentum, etc., they have floating bodies, apparently from the omentum, but more probably the result of former acute inflammations, and are membranous, like croupal exudations. They have always more or less serum, and sometimes the serum is in such great quantity as to make up the tension, and increase the size of the sac to double its former dimension. The thickening of the sac also varies from that of an almost transparent membrane to a thick rough coat, corrugated and indented.

The shape of the sac varies according to the place of its protrusion, and is small or large, according to the room it has to expand in, as we have seen in umbilical, ventral, and scrotal hernias, and as small as a pigeon's egg, where it passes under the ilio-pubic ligament, forming crural hernia or an ovarian and cæcal. In incomplete hernia the sac has a large mouth and conical body and fundus. In the inguinal variety it is often hour-glass shaped; but when well formed it is nearly exact in character to Figure 7, page 22.

The sac rarely ever has any muscular fibres. In scrotal hernia it is not uncommon for the lower portion of the tunica propria testis to be filled with serum, forming a true hydrocele, while the hernia lies protruded above. This serum may be indirectly connected with the hernial sac, or be entirely shut off from it; these cavities are no doubt formed out of an old sac, from which the hernia has been reduced, and pressure with a truss or some other cause has caused adhesive inflammation and closed up the neck, or it may have closed spontaneously by effusion at its neck and the innate contractility of the sac itself.

REDUCIBLE HERNIAS IN GENERAL.

The etiology of reducible hernia has been sufficiently given in the preceding pages to fully show its course and progress.

Symptomatology.—The symptoms are plain and easily understood, and it is scarcely possible to make a mistake. When small as a knuckle it may protrude, producing slight pain and soreness; but upon reclining it will usually go back of itself, or by putting the finger on it, it will slip back, and when the finger is taken away it will return. This is especially the case where the tumor is formed of intestine alone, but where the tumor is larger, and contains intestine and omentum, it will not return so easily, and has a more firm and doughy feel, and when returning will not emit so perceptible a gurgling sound. If the contents are omentum alone there will be no gurgling, but it will slip through its opening into the abdomen with a sudden jump or spring, described by some as as a "flip" or "flap." Flatulent rumbling or borborygmi are common in a large hernia, when it has intestine in it, whether attended with omentum or viscera. In the reduction of ovarian hernia, it feels as if a wad was tightly pressed in a hole, and when we have pushed it out, it seems to roll from under our finger. In diaphragmatic, intestinal and invaginal, there are no well-known signs, while they are reducible, except a tightness and soreness in their seat, relieved by rest in the horizontal position, and the administration of mild purgatives. In obturatical and ischiatic, there is a fullness and pressure that may be relieved by pressing down on the point of protrusion, which will return upon getting up, riding, coughing, or defecating. Vesicocele is known by painful micturition and an inability to completely empty the bladder.

Hernia in the crural region may be confounded with a psoas abscess or an inflamed lymphatic gland, several instances of which have come under my observation. A psoas abscess pointing under the ilio-pubic ligament has motion in coughing, and fills in standing, and returns in the horizontal position; has no heat of consequence, and requires a careful study to diagnose it from hernia, as I have shown in a case of psoas abscess reported in the *Nashville Medical Record*, and copied into the *Galveston Medical Journal* (see vol. 1, 1866).

A hernial protrusion in this site is usually more tense than an abscess; has not so much mobility; is generally attended with

gurgling or crepitating sound, and may be pushed back; will not return unless patient exerts his muscles, while the abscess will reform soon after taking off your fingers. There is no "flip" or "flap" in pushing back an abscess. An abscess generally forms imperceptibly and without pain in this region, generally attended with pain in the back and a broken-down and anæmic constitution, confining the patient to his bed, while in hernia the patient is generally otherwise healthy. An inflamed lymphatic gland may give us some trouble, especially in very fat persons; two cases I have met with were really embarrassing. Upon pushing down the gland it would appear to slip out of our reach, and be retained either under the folds of the skin and fascia, or roll under the ilio-pubic ligament, and there remain for a while; but it would again return. These cases were diagnosed by the neck or attachment being felt and traced up to the gland, but two cases reported in the *Galveston Medical Journal*, and copied in this work, will show that a mesentery and gland may become strangulated and simulate an inflamed gland so as not to be distinguished, except by an incision, which was made in both these cases. Aneurisms are also sometimes mistaken for reducible hernias in the femoral variety, as the hernia lies immediately over the femoral artery, or close by its side.

Both may be formed suddenly, but an aneurism will become of large size and pulsate, while the hernia must necessarily be of small size, and most always of the enterocele variety, and may, with care, be entirely removed by taxis, which cannot be done in an aneurism. It can be reduced, but will immediately return on taking off the pressure. Prognosis is nearly always favorable, but depends almost entirely on its treatment.

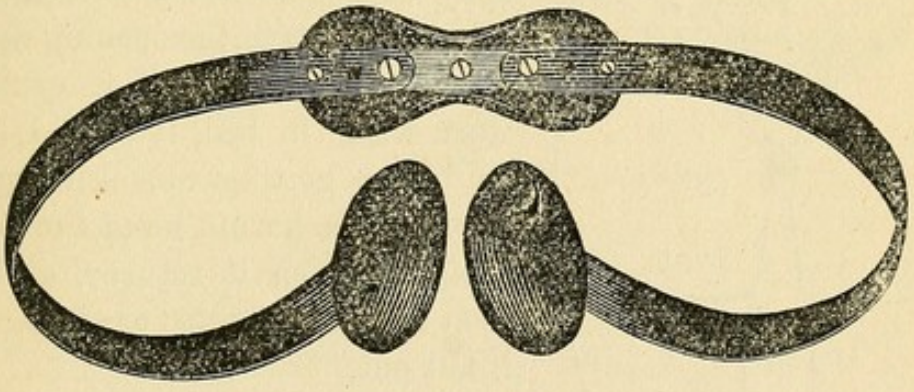
TREATMENT OF REDUCIBLE HERNIA.

The treatment consists of two processes, *Palliative and Curative.* The palliative consists of means to restore and keep back the protrusion within the natural walls, by *methods* with *trusses*, *elastic bands*, *adhesive strips*, *compresses*, and *roller bandages.* The method by *trusses* is the one usually adopted, and is the safest and best. Trusses are made of various shapes and styles, all, however, having a spring and pad, to fit over the rupture, or a pad and elastic band attached to keep up constant pressure.

The spring is always made of steel plate or annealed wire, and

covered with leather or hard rubber, with the pad attached to one end and a leather strap to buckle around the body at the other. The spring is so bent as to bring the pad immediately over the internal opening and completely cover it up. Pads are now usually made of ivory, wedgewood or amalgam, bone, glass, wire, hard rubber, beech, cedar, celluloid, or boxwood, and rarely of leather stuffed with hair, wool, or filled with air. Some are made double, some single, some with concave surface, some with a ring or small convex points, as Marsh's radical cure truss, but most of them with convex surface; some of a horse-shoe or ring shape (J. Wood's); some with a triangular pad. Their variety is almost infinite. The object of them all is to make pressure over the orifice, with their backs flat, for screws, to regulate the amount of pressure and its immediate direction.

FIG. 8.



Double Truss, with Counter-pad.

VARIOUS STYLES OF TRUSSES.

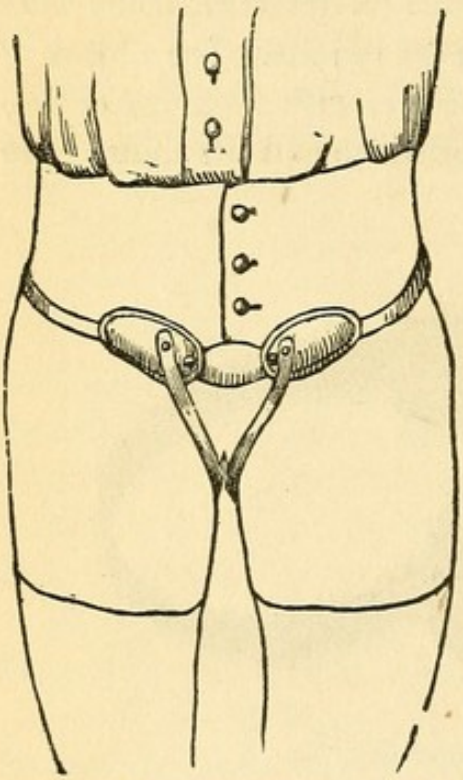
Every variety of hernia requires a variety of truss to fit it, as one for left and right side, in cases of inguinal, scrotal, crural, and femoral. Most trusses have a counter-pad placed over the spine, which is often unnecessary and in the way. See Sheldon's Trusses, Fig. 8.

Trusses should, as near as possible, comprise a retaining bandage, and the principles of a radical cure, and consequently should be applied either by the maker himself or some good surgeon, with quite a number to choose from, for a bad fitting or a badly constructed truss may become dangerous, by allowing the contents of the sac to slip under it, and thereby be compressed and assist in producing strangulation, as occurred in the case of McKim Lea. See case reported under Strangulated Hernia.

For a southern climate I much prefer trusses made with steel springs galvanized or covered with hard rubber or celluloid, pad made of hard rubber, ivory, celluloid or amalgam, so they will not rust, whether they are covered or not. A very excellent kind are made by Messrs. Bock, of New Orleans, Seeley and Penfield, of Philadelphia, and Dr. Riggs, of New York, the original inventor of hard rubber trusses.

Every person laboring under hernia should provide himself or herself with two trusses, that, in case the spring breaks, another may be at hand to put in its place.

FIG. 9.

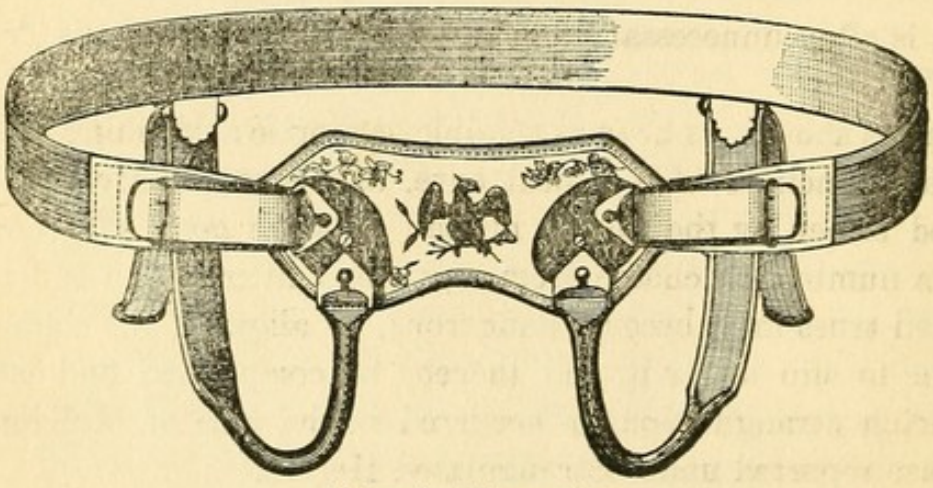


Hirsch's Truss, with Elastic Bands.

Whatever variety is used, and for whatever kind of hernia, the truss should be worn constantly, night and day, if the patient expects to be radically cured, as every return of the hernia will leave the opening as patulous as before, and if it cannot be worn while in bed, it should be put on before getting up, or doing any work. The hernia *should always* be *replaced* when it returns, as it will soon become impacted or strangulated if left out.

For very young children, an elastic truss should be worn, and for adults, where the ordinary truss cannot be retained while in bed. In umbilical and ventral hernias, the elastic bands shown in Fig. 9 should be worn, with a compress under the

FIG. 10.

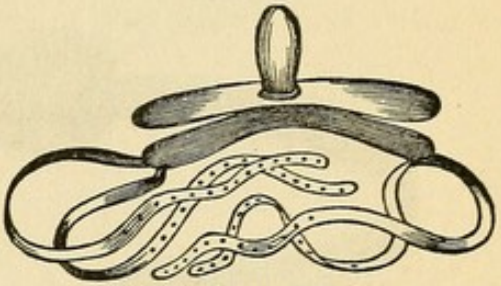


Abdominal Supporter.

truss; or an abdominal supporter, see Fig. 10; or a retentive strap and roller bandages may be used where supporters cannot be had; these will assist in making a radical cure, and might well be substituted for a truss in children.

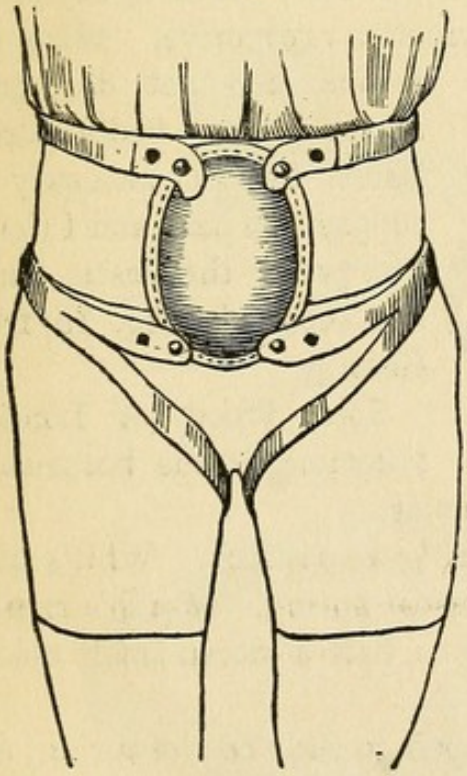
In spring trusses for direct inguinal, crural, and femoral hernias, there usually is a peritoneal band attached, as seen in Fig. 21, otherwise the pad is liable to slip up or to the right or left of the orifice, and thereby become dangerous. A most valuable set of elastic trusses has been invented and put into use by J. I. Hirsch, of Germany. We give diagrams of the principal varieties, and manner of their application. The one shown in Fig. 11 is especially useful in vaginal and rectal hernias, and with a different kind of pad will be found very useful in recent umbilical hernias. Figures 12 and 13 are modifications of the same principle.

FIG. 11.



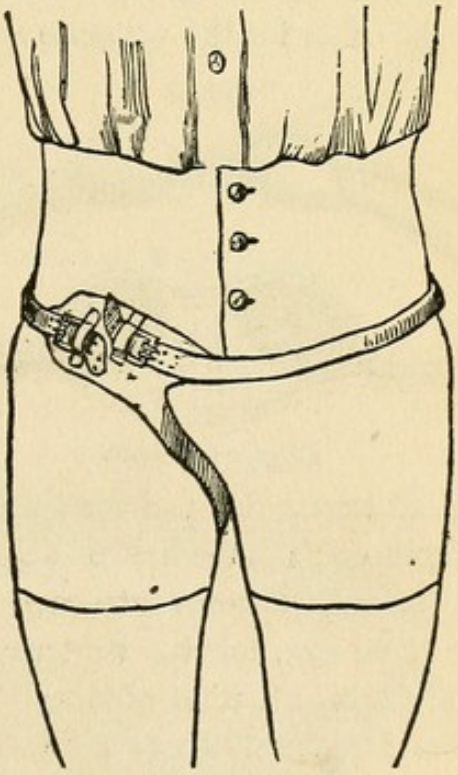
Elastic Vaginal Truss.

FIG. 12.



Hirsch's Elastic Umbilical Truss.

FIG. 13.



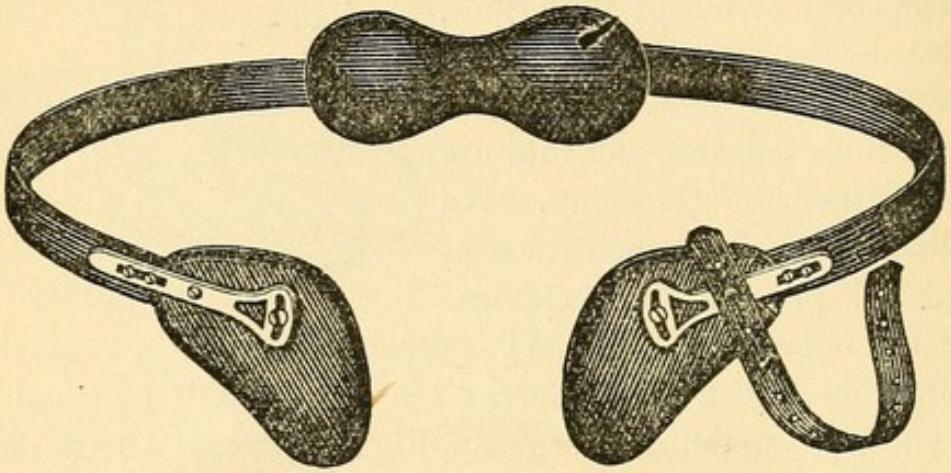
Hirsch's Elastic Truss, with Perineal Band.

The great advantage of these trusses is their convenience; they can be worn night and day, but they are not so safe as the

spring truss, and they will not last so long, and will soon become offensive from absorption of the perspiration.

The spring of a truss is sometimes so strong as to predispose to hernia of the opposite side. All very fat persons have to wear a strong spring truss, and then it is best to use Wood's, Fig. 14,

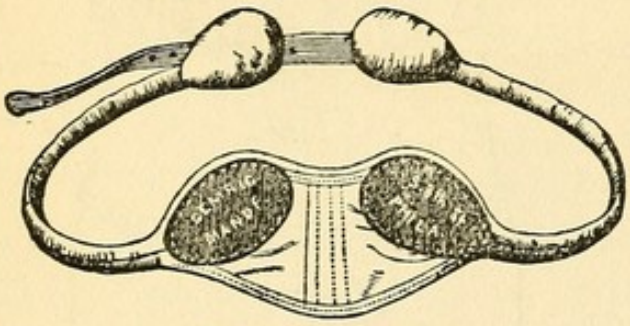
FIG. 14.



Truss with Strong Spring.

which has two pads, one for the hernial side, which is retentive, and the other for the opposite side, which is preventive. When the testicle has not descended nearly all are badly borne, but it is still necessary to support the part, and I therefore prefer the elastic bandage shown in Fig. 15, from Gemrig.

FIG. 15.



Elastic Bandage.

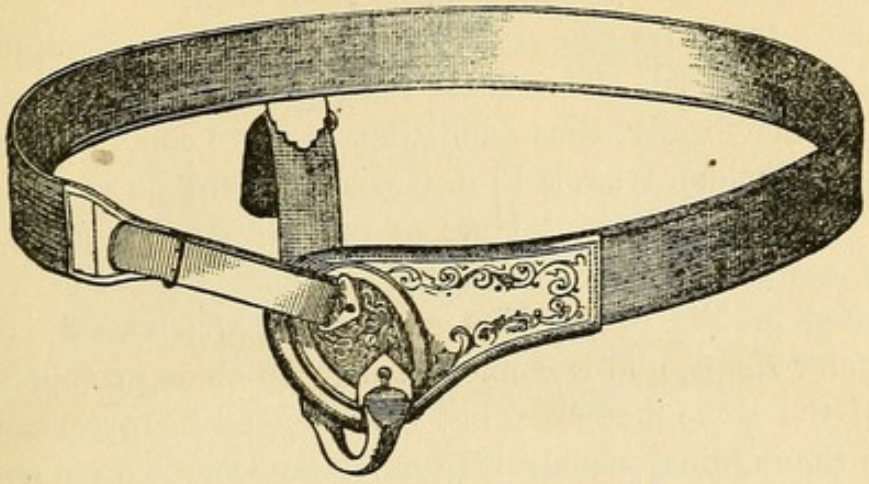
John Wood, of London, recommends the horse-shoe, ring, or triangular pad for large hernias.

Thompson's truss has a door spring to its lock. Whit's truss has gun-lock springs attached to usual spring. Marsh's radical cure truss has, for its ventral surface, half a dozen small oblong balls, forming a kind of ring.

The Maidstone truss allows the pad to slide on the spring, and allows the instrument to adapt itself to the movements of the body.

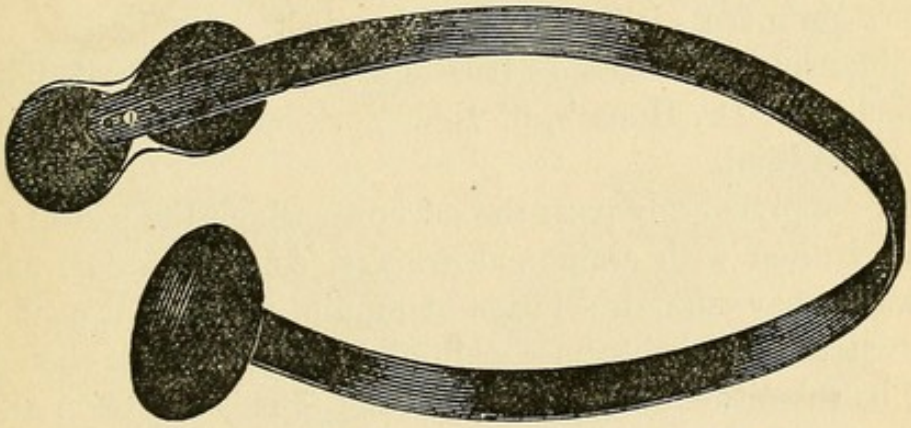
Solomon's truss, modified by Eldy, Sherman, and others, allows the pad to revolve on a ball and socket, to adapt it to a right or left hernia.

FIG. 16.



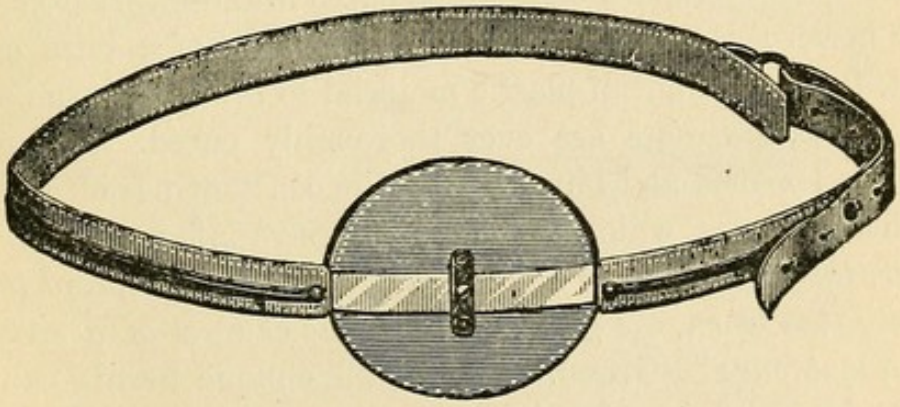
Elastic Truss, with Perineal Band.

FIG. 17.



Single Celluloid Truss, No. 2, with Counter-pad.

FIG. 18.



Umbilical Truss.

Edwards' truss allows the pad to both slide and revolve, and is adopted (in principle) by Sheldon, of New York.

Sheldon's truss has two pads, both of wood; one semilunar and the other cylindrical. The latter rests partially in the crescentic margin of the former, thus admitting of more concentrated pressure. The Sheldon truss is Prof. Gross' favorite; he says, in vol. I, p. 573, "The most elegant truss at present manufactured in this country is that of Dr. Sheldon, the inguinal variety of which is represented in Fig. 430. The pad, made of boxwood, is of the semicircular shape, and is connected with an oblong compress composed of the same materials but smaller, and so arranged as to bear on the inguinal canal." In other respects it does not differ from the more ordinary trusses.

Nuson's truss. The spring is made of round wire instead of the usual flat band of steel. See Pomeroy's amalgam wire truss, on same principle.

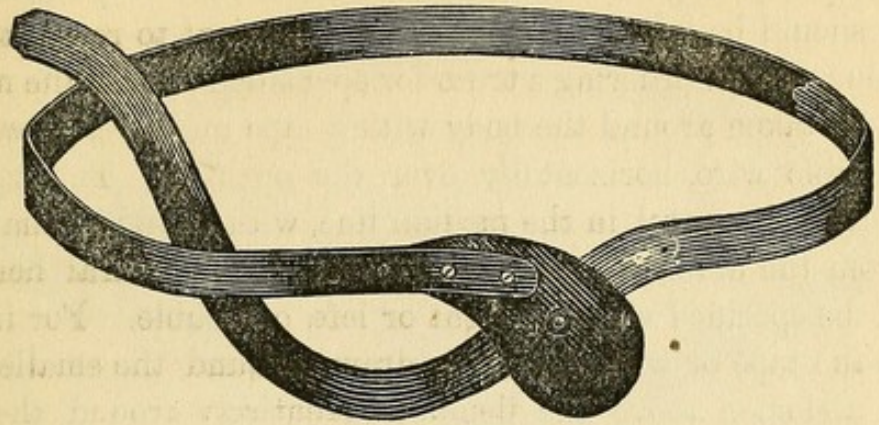
Mock Main truss is a simple band or belt.

Bouigereaus' and Hirsch's trusses are elastic bands of india-rubber webbing. Dr. House's, of New York, is the same, and a good truss of its kind.

Before applying any truss the part over which the pad fits should be well bathed with alum and whisky, cologne water, sugar of lead water, bay rum, or solution of tannin, to prevent chafing and tenderness, and if it becomes painful, the spring truss should, for a while, be substituted by an elastic band. This is best in all cases of very young children. Great attention should be paid to cleanliness, especially where a perineal strap has to be worn, and particularly in nursing children.

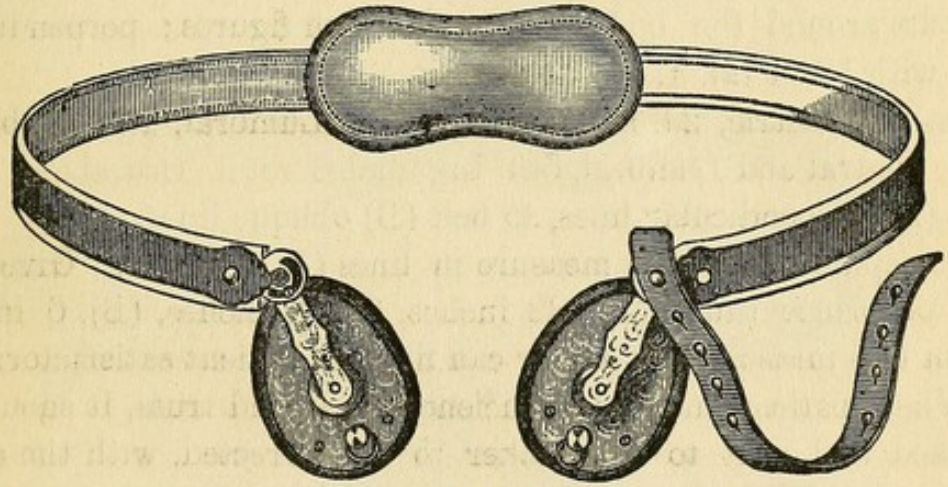
The ratio of radical cures by the truss is in proportion to age, the time of protrusion of the tumor, and the size of the orifice and tumor. The small size being often cured in those free from obesity, while in very large hernias the probabilities of a cure are very slight, from the want of plastic material to fill up so large an opening; hence, few cases are ever thoroughly cured. But most all cases are lessened and improved by the constant use of a good and well-fitting truss, which produces adhesive inflammation. "*The sooner, therefore, a truss is applied, the better it fits, and the more steadily it is worn, the greater will be the chances of a speedy and permanent cure*" (Gross). Congenital oblique hernia can almost always be cured by a good truss constantly worn, night and day.

FIG. 19.



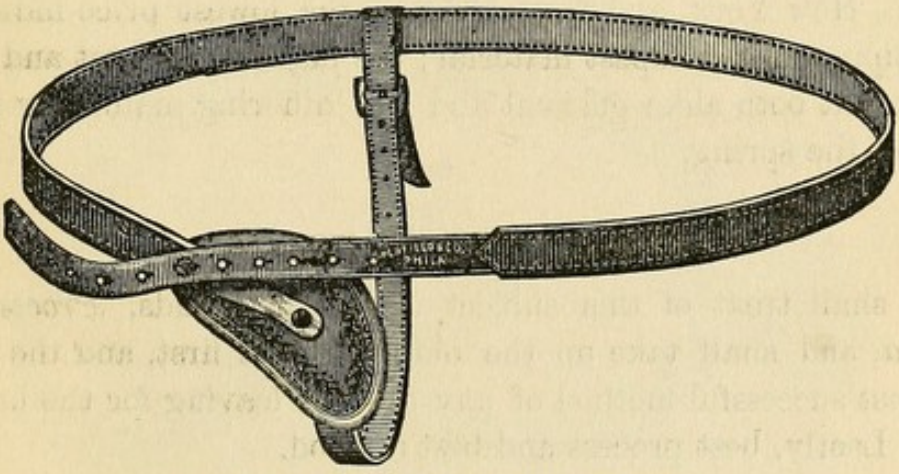
Single Celluloid Truss, No. 3.

FIG. 20.



Penfield's Set-Screw Truss.

FIG. 21.



German Truss, with Perineal Band.

All cases, as we have before said, are benefited, whether large or small, old or young, or however unfavorable they may appear. No hernia should be left without a support sufficient to retain the hernia reduced. In ordering a truss for epigastric hernia, the measure should be taken around the body with a tape measure, or with soft and flexible wire, horizontally over the opening. The same for umbilical and ventral, in the median line, with the additional measure from the umbilicus and the pubis. In all lateral hernias it should be specified whether right or left, or double. For inguinal hernia the tape or wire should be drawn around the smallest part of the abdomen above the ileum, and entirely around the body, marking where it crosses the spine with another from its nearest point to the hernial orifice, and from this orifice to the line just above the ileum, whether in the inguinal or crural region. See diagram, Figure 2 (C), page 13.

Belts around the body are numbered in figures; perpendicular line with letter (a). 1, epigastric—B.

1st. Epigastric, 2d. Hypochondric, 3d. Lumbral, 4th. Umbilical, 5th. Ventral and Lumbral, 6th. Inguinal Scrotal. Crural and Femoral (A) perpendicular lines, to belt (B) oblique lines.

For epigastric hernia measure in lines (1) A and B. Give with size of orifice thus: (1), 22 inches, (A), 4 inches, (B), 6 inches. From this measure any maker can fit your patient satisfactorily.

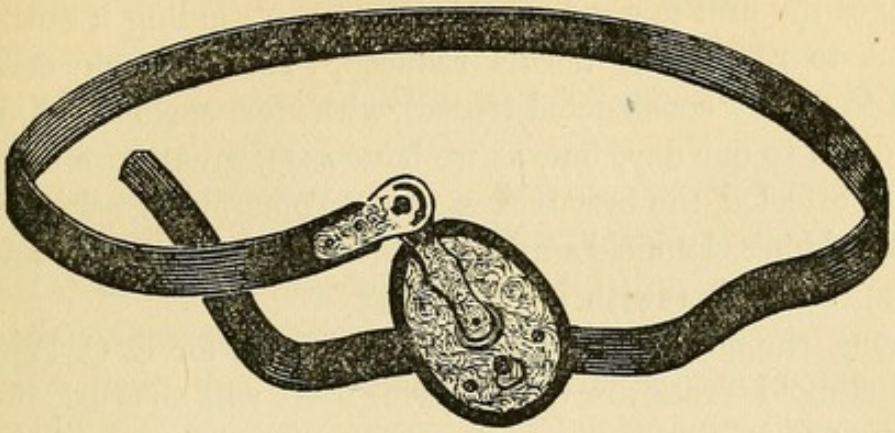
Where patient finds any deficiency in an old truss, it should be marked and sent to the maker to be corrected, with the above measures. With these simple and plain rules any non-professional person can order his own truss, and by stating what maker he wants, as named in our list and shown by diagrams, he will get just what he desires. I have given in the appendix the prices in Philadelphia, New York, and New Orleans, the lowest price indicating the simplest and cheapest material; the highest, the best and finest finish; but both alike efficient and not differing materially in the make of the spring.

RADICAL CURE OF HERNIA.

We shall treat of this subject under two heads, *Process* and *Method*, and shall take up the oldest process first, and the oldest and least successful method of any process, leaving for the last the best. Lastly, best process and best method.

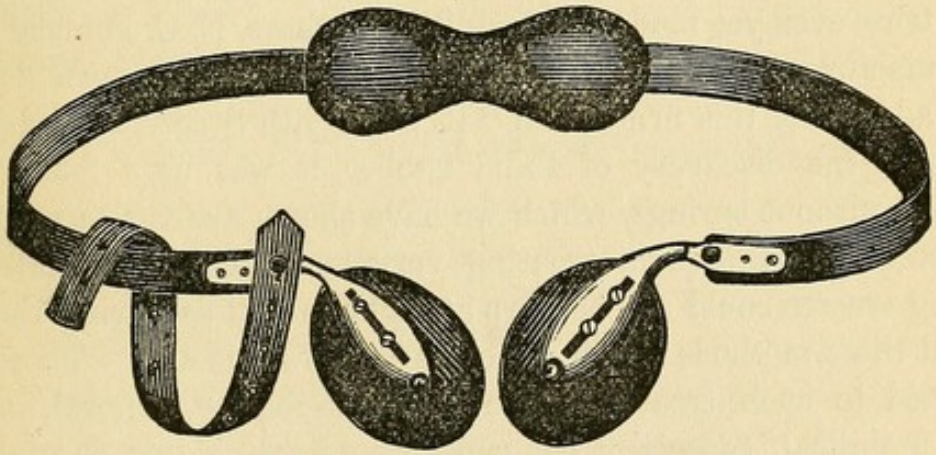
The *process* by *truss* has been fully explained under the head of

FIG. 22.



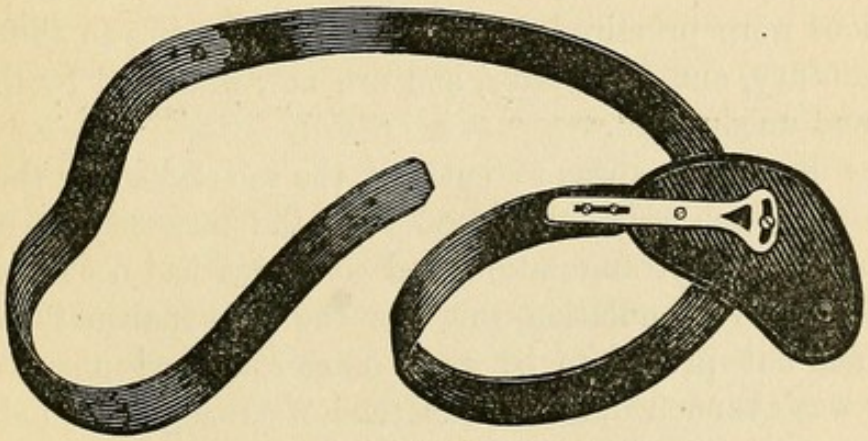
Single Celluloid Truss, No. 5.

FIG. 23.



Double Celluloid Truss, No. 9.

FIG. 24.



Single Celluloid Truss, No. 10.

reducible hernias and their treatment, and need not be repeated. This, undoubtedly, was the oldest process, and the retention by bandages the first method of this process. Finding it entirely inefficient to retain the hernia reduced, the ancient physicians resorted to rudely constructed trusses with steel springs, which have come down to our day, but, as we have seen, greatly improved and almost perfected, the best trusses being Pomeroy's, Sherman's, Seeley's, Sheldon's, Penfield's and Marsh's. Illustrations of several of these are given herewith.

Among the many great advantages claimed for E. C. Penfield & Co.'s Celluloid Truss, are the following:—It will not rust, break, or wear out; it is always clean; it can be worn in sea bathing; it is not affected by perspiration; it is not affected by heat or cold; it is readily adjusted; it is free from any unpleasant odor; it always retains its position. These are but a few of the many reasons why the Celluloid Truss is the best, cheapest, most durable and only perfect truss ever yet made. In addition to these, E. C. Penfield & Co. manufacture over 150 varieties, and any special pattern desired. The address of this firm is No. 112 S. Eighth Street, Philadelphia.

Upon the discovery of India rubber, it was used for making trusses without springs, which we have shown are very useful, and of special advantage in treating very young children, and when spring trusses could not be worn at night as well as during the day.

All these methods fail in old cases and of large size. Those best adapted to such treatment are inguinal-oblique, femoral, crural, and umbilical, especially congenital inguinal-oblique, scrotal, and umbilical, cures rarely ever being effected in any other varieties. These failures induced surgeons to try other processes and methods.

OTHER METHODS AND PROCESSES.

Incisions were practiced from the remotest times to the seventeenth century, and even later, and are now practiced by the barbarous and uneducated.

1. The first method was to cut out the sac and suffer the parts to heal up, which was introduced from the necessity of cutting down in cases of strangulation, and as cures had occurred after strangulation by granulation, this was the principal method for a long time, but proved to be very dangerous and unsuccessful, hence it was abandoned, and the method of cutting down and ligating the sac was introduced.

2. *Method by exposure of sac* and putting a ligature around its neck. This was an improvement, as it prevented death from hemorrhage and did not expose the peritoneum; but this was also dangerous, and was finally abandoned for want of success.

3. *Incision of the sac and the application* of irritants to cause inflammation, and thereby produce obliteration.

Process by removal of sac and scrotum in scrotal hernia. This was a barbarous and wicked practice, but was much followed up to and even during the seventeenth century; and it is said that an itinerant operator in Europe fed his dogs on the testicles he thus removed (Gross). This barbarous and wicked process was finally put down by law, but was followed by other methods alike dangerous and cruel, as that of Belmas.

Belmas' Method.—He cut down on the neck of the sac, and put over its orifice, along its neck, bladders of gold-beater's skin, with the view of making pressure on the neck and causing adhesive inflammation, thereby promoting its closure; but his plan proved unsuccessful and dangerous, and it is now entirely abandoned.

PROCESS BY PLUGGING AND INVAGINATION.

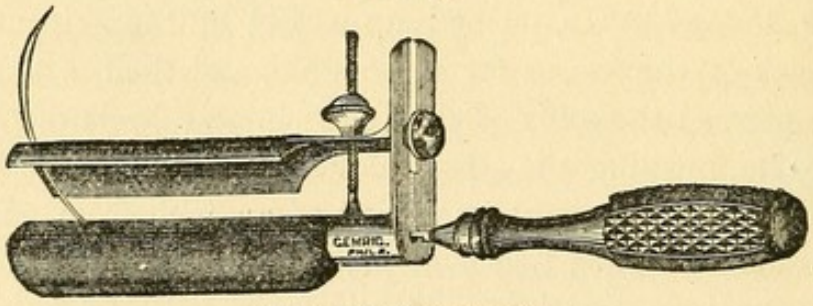
Among the earliest methods by this process was that of Gerdy's.

Gerdy's Method.—He pushed up a fold of the skin and fascia into the neck of the sac, as far as possible, and then, with a curved needle, he pierced the folds of skin, muscle and fascia of the superimposed parts, pushing the strong curved needle, double threaded, to the right and left, about one-third of an inch from each other. These threads were then tied over pieces of bougie, and left to produce adhesive inflammation. The invaginated portion was then denuded of its cuticle with spirits of ammonia, and pressure made over it to produce adhesion of its sides. This was also unsuccessful in most cases, and was, like the truss, only adapted to oblique inguinal hernias. When the threads were taken out the invaginated plug came down, and with it the hernia. Nor was this process free from danger, as shown from sixty-two cases collected by Therry; four died and only a few were permanently cured. Of all the methods heretofore used, Gerdy's was the best, and it has no doubt led to other processes and methods, as that of scarification of the neck and pressure; but before speaking of this process, let us finish the methods by plugging, which have been the most successful and popular. Dr. J. Jameson, of Baltimore, cured a

case of femoral hernia, as early as 1828, by dissecting up a tongue-like flap from the neighborhood of the ilio-pubic ligament, and inserting a portion, three-quarters of an inch thick, into the femoral canal, and closing the wound by several sutures over the inserted flap. The transplanted flap became a hard knot and completely closed the opening; this proved, in one case (that of a lady), a perfect success. We do not know whether he ever repeated it or had any followers, except Redford Davies, of Birmingham, England, who treated a case with a hard plug. His patient died some time afterward, but not from the operation. This method carries with it the principles of success, in femoral and crural hernia, where the walls of the rupture are small and cannot be distended, but is not at all adapted to any other variety.

Wurtzer's Method.—In 1833, Wurtzer, of Bonn, in Germany, invented and used an instrument for the radical cure of hernia. This instrument carries out the idea of Gerdy in a very simple manner, and one measurably free from danger. Its action is the same as that of Gerdy's, that is, by invaginating a portion of the skin and fascia, holding it there until inflammation unites the invaginated portions.

FIG. 25.



Wurtzer's Instrument.

The instrument is composed of three essential parts—a wooden (or as now made, a hard rubber) cylinder, a long curved needle, and a cover for making external pressure. The cylinders are made of different sizes, to fill small or large openings, as in children and adults. They are usually three inches long and three-eighths to three-quarters of an inch in diameter, of a flattened shape, and perfectly smooth and rounded at their points, with a hole through the centre coming out behind the point, about one-quarter of an inch, on the upper side. When put in operation, the needle is entirely concealed in its length, except at its point, where it comes through the superimposed integument and passes through a slit in the external plate. The handle of the needle, as well as its point, is

made movable, and when in use both are taken off and brass knobs screwed in their place. The cover is concave, to fit over the cylinder and to closely compress the inclosed folds when in use.

The mode of applying Wurtzer's instrument is simple and easy. The parts being well shaven, and the bowels moved several hours before the hernia is reduced, the integuments are pushed up as far as possible, with the index finger of the left hand, with its palmar surface turned upward and forward. The cylinder, with the plate and needle removed, is guided by the finger, and the finger gradually withdrawn as the instrument is put in place. The point of the cylinder should be well placed in the internal ring and then pushed up as far under the tendons as possible, and there held until the needle is passed through, and the external plate well screwed down, being well assured that the instrument is firmly fixed under the tendons, which will be loose if below the internal orifice; if, in very relax cases, it has been placed above the ring in the cellular tissue above the tendon, it must be withdrawn and carefully placed under the tendons, as directed. The handle of the needle is then unscrewed and a brass knob screwed in its place. The movable point is also taken off and a brass knob put on. The apparatus, thus fixed in place, is left in from six to eight days, when it is taken off and a truss applied. The patient must still keep his bed for eight or ten days, until all soreness leaves the part, and he can bear, without pain, the truss. The diet should be plain and mostly solid; the actions and pains, if any, are controlled by morphine. The puncture of the needle will generally begin to suppurate on the fourth day, and should there be much pain the plate may be loosened by turning the screw, or if the part becomes loose it may be easily tightened by turning down the screw.

Dr. Otto Weber, of Bonn, writes to Mr. Beckett, that of fourteen cases operated on by Prof. Wurtzer, *not one was radically cured;* "that, first, the plug of skin is, by degrees, entirely drawn out again; secondly, that the true hernia apertures, the external and internal rings, are not closed by the operation; thirdly, that an imperfect cure may be effected by means of a partial closure, by adhesion of the internal walls of the neck of the hernial sac, and thickening of the surrounding connective tissue." In this country I believe the same report might be made. It utterly failed in all the cases operated on by the author, but a better success has attended Prof. May's operations and operators in London.

Rothmund's Method.—He used an instrument with three needles, one in the centre, one on each side, with a cylinder completely filling the orifice, made larger by layers on the sides of Wurtzer's instrument. He reports, up to 1853, one hundred and forty cases, with the following results:—117 cured, 4 ameliorated, 6 not benefited, and 13 relapsed. "Of the latter, some were radically cured by being operated on a second time."—*Gross.*

Owing to the failures with Wurtzer's instrument, I set myself to work to make improvements on his process. In the fall of 1858 I invented a similar instrument.

This instrument consists of two plates screwed together by the screw No. 2, which separates the two valves by the lower nut, and opens them to any desired extent, as pressure is made with the screw of a tourniquet; a concave plate, like Wurtzer's, with five holes in it, for five screws. Screws Nos. 1 and 3 hold the plate down, and act as the screws in Wurtzer's instrument. The other two screws, Nos. 4 and 5, are made with a cutting point, and after the cylinder is put in place, as in Wurtzer's operation, the plate is screwed down by screws Nos. 1 and 2. The cylinder still held steady in its place, the screws are pushed through into the first valve of the cylinder, and with their cutting points into the second; the first valve has a nut at the body of the screw with threads above its cutting point; the screw is firmly screwed into the first valve, the nut is then put on, and the plate screwed down at its point; the other screw is put in in like manner. This is left in, as in Wurtzer's operation, for six or eight days, then removed; patient should be, in every respect, treated as with Wurtzer's instrument. Finding, in applying this instrument on the dead subject (I have never used it on the living), as will be explained further on, under author's method and process, page 48, great difficulty in keeping the cylinder well in place while the screws were being put in, I made a further modification of Wurtzer's instrument.

I had the canal for the needle made in the body of the upper valve, and put in two screws, as in my substitute, to right and left of Wurtzer's needle, while the valves are separated by the under nut, acting as before, on the principle of the tourniquet screw. No. 2 screw passes to the left of the needle; No. 3 to the right.

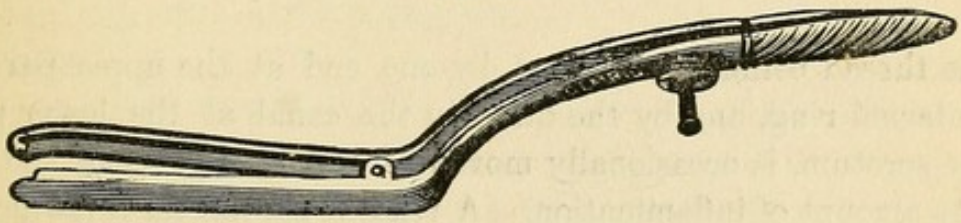
Now I claim these advantages over Wurtzer's instrument: First, the two valves can be made, with the screws, to separate to the desired extent to fill the internal orifice, and the ends are more

expanded than the body or proximal end. The screws go directly through, perpendicularly to the surface, and through the invaginated integuments, sealing them up more closely than could otherwise be done, and the two screws act somewhat like the right and left needle of Rothmund's instrument. Thirdly, their direct line prevents them from cutting out, as the needle does without them.

This instrument I have never used on the living subject (as will be seen) because, before I got it made, I invented the *process* with the *needle*, which I think fills all the indications; but as objections have been made to that process, on account of penetrating the abdominal wall, I have thought it necessary to put these suggestions here for those who are timid, and those who have not anatomical knowledge and tact to use the needle. This instrument, as well as Wurtzer's, is comparatively free from danger, and has the merit of being easily applied by any one, but is, like all plugging operations, only applicable to oblique-inguinal, scrotal, and crural hernia, and like all plugging operations, will finally fail, and the hernia return as bad as ever.

Professor D. Hayes Agnew's Method.—He uses an instrument such as is seen in Gross' (new edition) *Principles and Practice of Surgery*, 1872. This instrument closely resembles a bivalve speculum, the blades of which have, first, two longitudinal grooves, three inches in length, and connected by a hinge near the handle, which is itself controlled by a screw; secondly, a very long, slender needle, mounted upon a wooden handle, and terminating in a curved point, pierced by an orifice; and thirdly, a common stout suture needle, two inches and a half in length.

FIG. 26.



Dr. Agnew's Instrument.

The parts being well shaved, and a portion of scrotal integument being pushed into the external ring, the instrument, with its grooved blade looking toward the abdomen, is employed to carry, by gentle but steady pressure, the invaginated plug to the upper extremity of the inguinal canal.

Holding the parts in these relations, the surgeon inserts the

point of a long needle, armed with a silver wire, into one of the canals of the inner blade, widely separated from the other, and passing it on, perforates the superimposed structure. The needle, being withdrawn, is then carried along the outer gutter, and thence, in like manner, across the tissues, the two punctures being about half an inch apart. In this way the base of the plug is thoroughly embraced by the loop of wire, the ends of which are then twisted over a roll of lint upon the surface of the abdomen.

The instrument being held steady in its position, the sides of the inguinal canal are next approximated by three horizontal sutures, about half an inch apart, the needle, armed with a stout silk thread, being passed between the blades of the cylinder. In this way all danger of including the spermatic cord and the peritoneum is effectually avoided.

The operation being completed, the instrument is removed, and the patient, rigidly confined to bed, is treated antiphlogistically. The horizontal sutures should not be removed for ten, twelve or fourteen days, or until there is reason to believe that a sufficiency of plastic matter has been poured out to insure the firm union of the plug. The wire thread may, if necessary, be retained for an almost indefinite period.

Mösmer's Process.—He passes a seton longitudinally through the sac, to produce suppuration and its closure. He performed it, according to Rothmund, thirty-four times, with twenty-nine cures, two ameliorations, one failure, one death and one relapse.

Professor Armsby's Method, of Albany, N. Y.—He uses a needle with a single thread, which is introduced, as a seton, through the hernial sac and inguinal canal, bringing it out above the internal ring.

The thread being brought out by one end at the upper part of the internal ring, and by the other in the canal at the lower part of the scrotum, is occasionally moved in order to provoke the requisite amount of inflammation. A truss is applied for a few hours immediately after the operation.

Dr. Riggs' Method is about the same. He uses an instrument like a curved porte-aille, invaginating the sac, and putting in a thread or seton, or ties it up invaginated. He gives the results of eight cases, two from his own practice and six from that of Professor Carnachan, nearly all successful, without any bad symptoms having followed. Several of the cases were of very long standing.

PROCESS BY LIGATURE.

Professor John Wood's Method, of London.—His improved operation is thus described by Druett: The instruments required are a tenotome, a semicircular needle mounted in a strong handle, and a silver-covered wire. "The patient being laid on his back, with the shoulders well raised and the knees bent, the pubis cleanly shaven, the rupture completely reduced, and chloroform being administered, an oblique incision, about an inch long, is made in the skin of the scrotum, over the fundus of the hernial sac. The knife is then carried flatwise under the skin, from the deeper coverings of the sac, to the extent of about an inch or more all around. The forefinger is then passed into the wound, and the detached fascia and fundus of the sac invaginated into the canal. The finger then feels for the lower border of the external oblique muscle, lifting it forward to the surface. By this means the outer edge of the conjoined tendon is felt, to the inner side of the finger; the needle is then carried carefully up to the point of the finger, along its side, and made to transfix the conjoined tendon, and also the inner pillar of the ring. (Gross' "Principles and Practice of Surgery," 1872, pages 577, 578, and 579.)

Prof. Wood, in his work on hernia, published in 1863, gives the results in sixty cases. Twenty-one by thread and compress, twenty-seven by various modifications of the wire operation, ten by the use of a pair of pins, two by pins and wire. *Failures*, eleven; five from wire and compress. *Cures*, forty-two; ten not heard from; four of forty-six cases by wire failed; two only of ten with pins failed; six cases doubtful; sixty-five to seventy per cent. cured; three or four still under treatment.

PROCESS OF SCARIFYING THE NECK AND COMPRESSION.

Alphonse Guerin's Process and Method consists in scarifying the neck of the sac by means of a delicate bistoury introduced subcutaneously. Pressure is then made with a well-fitting and strong spring truss, to approximate the opposed surfaces, in order to produce union by the effusion of plastic matter.

PROCESS OF ACUPUNCTURE.

Bonnet's Method, of Lyons, France. He transfixes the sac with a number of pins, which are left in until there is ulceration of

the skin, compression being used in the intervals of the little instruments, for the purpose of promoting adhesive action. Of eleven cases thus treated by Bonnet, four were cured, five were unsuccessful, and two proved fatal.

PROCESS BY INJECTION OF THE SAC.

This process is in every respect similar to the treatment of hydrocele by injection, consisting of the introduction of some mildly irritating fluid, as the tincture of iodine. This was first practiced by Velpeau.

G. W. Hinman, M. D., of Derby, cured one case by laying open the sac and brushing the inside over with tincture of iodine, patient doing well one year afterward. No mention of a truss being used.

PANCOAST'S METHOD AND RESULTS.

"The protruded viscera having been carefully replaced, and firm pressure being made upon the hernial aperture, a drachm of iodine is thrown into the sac and passed about, so as to bring it in contact with every portion of its inner surface. The operation is performed with a delicate trocar, with the point of which the sac is freely scarified before the fluid is forced through the canula. The injection being over, a stout compress is applied over the hernial opening, and unremittingly supported by the pressure of a well adjusted truss. The iodine is soon absorbed, and a cure is produced by the agglutination of the contiguous surfaces. The operation, which occasionally requires to be repeated a second, and even a third time, must be performed with the greatest care, lest some of the fluid, passing into the abdominal cavity, should cause fatal peritonitis."

Alden Marsh reports four failures by injection. John Watson, of New York, cured one case after Pancoast's operation; was doing well ten weeks afterward.

REMARKS ON THE PROCESSES OF SCARIFICATION, ACUPUNCTURE, AND INJECTION.

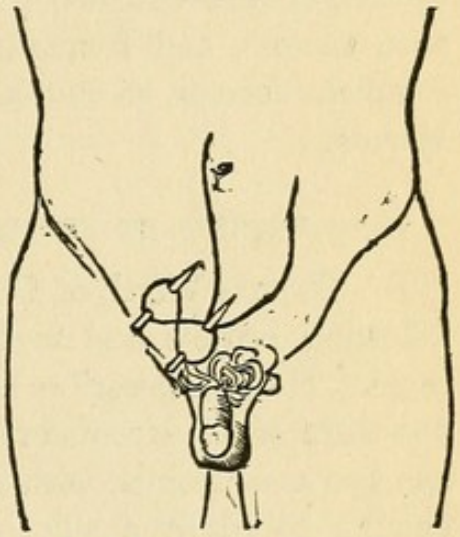
"The cases best fitted for these various procedures, as in the cases of plugging above, are such as are of comparatively recent standing, and unaccompanied by any great bulk of the tumor. When the canal is much diminished in length, and increased in diameter, as generally occurs in old ruptures, in which the orifices

of the canal are on the same line, and immediately above each other, a cure will generally be impracticable *by any method whatever.** To femoral, umbilical, and ventral hernias, these procedures are not adapted, owing to the great risk of peritonitis and extensive suppuration" (Gross, page 578).

PROCESS BY HARE-LIP SUTURE.

Prof. S. R. Beckwith, a homœopathic surgeon, of Cleveland, Ohio, reports the following process with plates, in the *Medical and Surgical Reporter* (homœopathic), for May, 1872. See Figure 27.

FIG 27.



Prof. Beckwith's Method.

He thus proceeds: replacing the hernia, the parts above the canal are raised, leaving the cord below, and a needle double threaded is passed through the gathered tissues just above the external ring. Another needle, like-threaded, is passed through in an opposite direction, about half an inch above the first, and the thread wound around the needles from heel to joint.

The advantage claimed (by its author) for this mode of operation is, that, if peritonitis should ensue, the needle can at once be removed, and the threatened danger be prevented. He says he has operated several times, but gives no results. This method, if at all successful, is only suitable to oblique-inguinal and umbilical hernias, of small size and of recent formation.

DIRECT PROCESS.

Prof. Gross says, in his new edition of Surgery, page 578, that "the most rational radical treatment of hernia is undoubtedly the *direct*, as it may be termed, consisting in cutting down upon the parts, freshening the edges of the opening of descent, and approximating them with wire sutures, either permanently retained or until complete consolidation has been effected. The operation, it will be perceived, is founded upon the same principle as that for hare-lip and cleft palate, and will, if properly executed, be much more

*We think differently, as the sequel will show.

likely to answer the purpose than the process of invagination now so much in vogue, and, for the most part, so worthless."

There is no doubt but the direct plan deserves more attention than it has received, and may be resorted to when all others have failed. I, however, cannot see the necessity of paring the edges, as recommended by Prof. Gross, for certainly the new-cut surfaces will unite without it, and we well know that compression alone is necessary to cause adhesion in all serous tissue; so, even if the sac was opened, this freshening of the edges is entirely unnecessary. This mode of closing the incision has been resorted to by Dr. Richardson, of New Orleans, after the operation of strangulated hernia, with success, and I myself have practiced it in two cases, with complete success, as will be seen under the head of Strangulated Hernia.

PROCESS BY SUBCUTANEOUS SUTURE WITH BRAID.

Dr. Thomas Wood, of Cincinnati, April 18th, 1851, reports the following process and method, as practiced by himself on three cases. He thus describes his needle: "Curved so as to form about one-third of the circumference of a circle of two inches radius, it has two spear points, with an eye in the centre of the shaft large enough to admit a silk braid one-eighth of an inch wide. The needle armed with the braid and well oiled, patient put in a relaxed position, the little finger of the left hand is passed from the bottom of the scrotum to the external ring, and while it is held there, the needle is thrust through the integuments so as to strike the inner column of the ring about one-eighth of an inch from its margin, and as near its attachments to the pubis as possible without endangering the cord. When the proper place is selected, the needle is generally passed through the tendon and its point is turned upward as it is pushed across the ring to the opposite column, so as to become entangled in the cellular tissue of the inverted scrotum that caps the ends of the finger.

"When the point of the needle is carried sufficiently far to reach the column opposite its entrance, the finger is withdrawn, so that we may be certain that part of the scrotum hangs on the needle's point, and it is again introduced. Then, as the finger is a second time gradually withdrawn from the ring, the side of the needle is made to press firmly against its end, until the point is brought nearly to the insertion of the outer column in the pubis. The

needle is then thrust through the tendons, and is made to appear out of the integument on the opposite side of the ring from its entrance, when it is to be gradually drawn through, carrying the ligature with it, until the second point of the needle escapes from the outer column, but not from the integument. The movement of the needle is now reversed. Its inner point is to pass over the margin of the outer column, and under that of the inner one, so as to traverse the first puncture made in the tendon, which is now occupied by the tail of the ligature, and is to pass out in the opening in the integument, stopping when its first point arrives at the same position it was in just before it entered the tendon. The motion of the needle is again changed into progression, and is made to sweep over both columns of the ring, on their anterior surface, carrying the head of the ligature with it out of the last opening made in the integuments.

"The needle is now removed, leaving the two ends of the ligature in the punctures on opposite sides of the internal ring. The ends of the ligature are now to be drawn firmly, so as to draw the tendinous fibres embraced in the loop into the slit made by the needle in the opposite column, and they are to be fixed by tying over a roller laid between them.

"The ligature is to be removed in ten or fifteen days, and the patient kept in a recumbent position until the inflammation has so subsided as to admit of the pressure of a truss.

"I have performed this operation (slightly modified) on three persons, and in each case it was successful. My experience, however, is too limited to warrant me in saying much in its favor; but I cannot refrain from expressing the opinion that it offers to the ruptured patient a better prospect of a '*radical cure*' than any operation before proposed."

Dr. Thomas Wood, in a paper on the subject of the "Radical Cure of Hernia," read at the February (1851) meeting of the Medico-Chirurgical Society of Cincinnati, offered the following propositions, which were discussed:—

"1st. Adhesions, formed by inflammation in the areolar or cellular tissue, will not permanently prevent a re-descent of the bowels where a hernia has once existed.

"2d. The insertion of integument in the ring and canal, and the various other operations that have heretofore been extensively tried, such as setons, sutures, excision of the sac, acupuncture, and injec-

tions, only join parts together by a cellular or serous membrane, or a like new structure, equally yielding and extensible.

"3d. Artificial cellular or serous membrane is never more permanent or unyielding than the original structures of the same nature.

"4th. No operation can make a 'radical cure' of hernia that does not offer a stronger barrier to the escaping of the bowels than cellular or serous tissue."

He then tabulates the following as being the basis of his operation:—

"5th. Tendons, when wounded, will unite again by a formation similar to their original structure.

"6th. Tendon is a permanent, unyielding tissue, seldom ruptured by the strongest exertions of the body.

"7th. If we can close the external abdominal ring by a tendinous growth, we may effect a 'radical cure' of the hernia."

His operation has in "view the closure of the external ring by a tendinous union of its opposite columns."

AUTHOR'S METHOD.

The only instruments used in the author's method are a double spear-pointed, semicircular needle, with an eye in each point (Plate IV, Fig. 1, D), silver wire, a piece of cork, soft wood, or a roll of adhesive plaster. The operation is performed by the following method: The parts being well shaven, if in the inguinal region, or in any site where there are hairs, three lines are then drawn, with a small brush and tincture of iodine, parallel to the direction of the hernial orifice, centre line immediately over the internal orifice, and passing down to the external orifice, if the hernia be oblique-inguinal; in other varieties immediately over the greatest enlargement of the tumor. The needle is then taken hold of by the left hand at its unthreaded end, then the right hand, with the thumb and forefinger, pulls up the skin and superficial fascia as high as i can be done, to the right of the middle line, letting the middle line be just below the point of the thumb. (See Plate IV, Fig. 1, A.) The threaded end is then pushed through the fold held below the point of the thumb and index finger, as seen in position 1, Plate V. The fold is then let loose, and the threaded end taken by its point with the thumb and fingers of the right hand; it is then

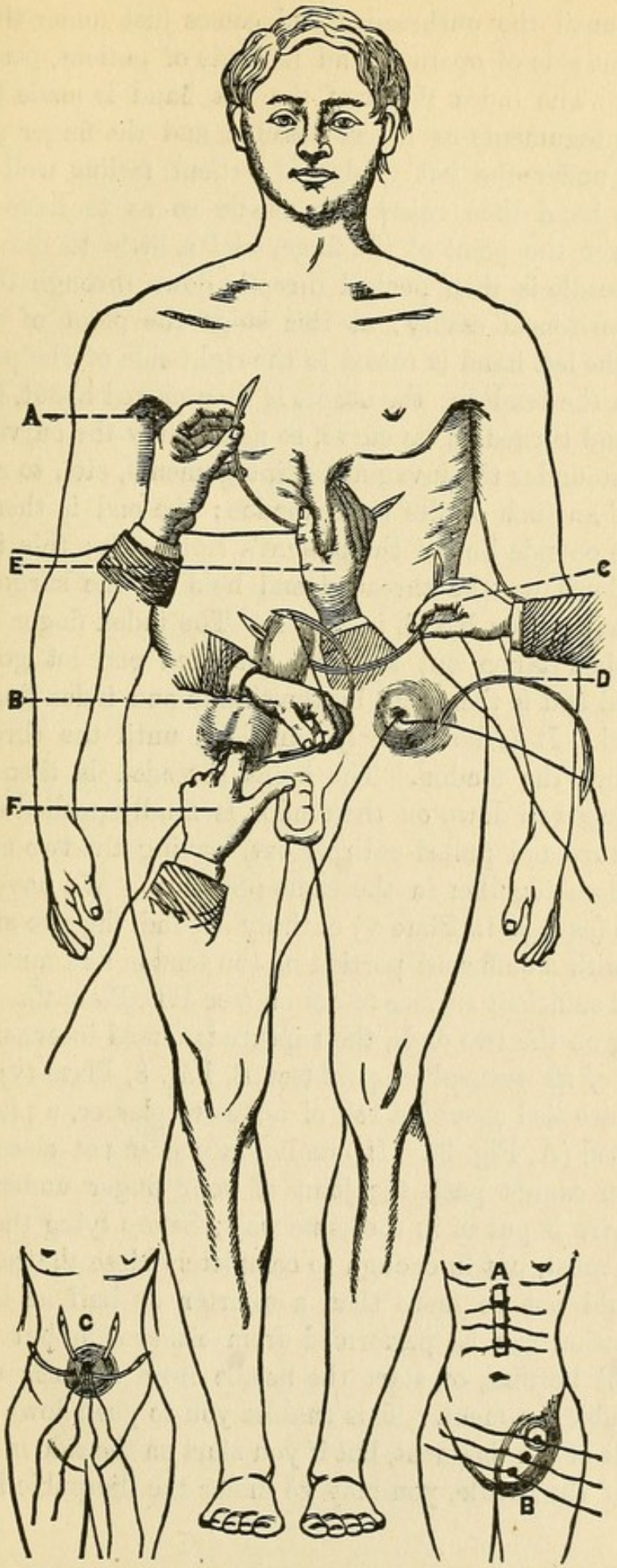


PLATE IV—FIG. 1.—A. First Position of Needle. B. Second Position. C. Third Position. D. Needle drawn out, with both Wires in Position. E. Right hand elevating Skin and Superficial Fascia in First Position. F. Lef hand Invaginating the Sac, in passing the Needle, in Second Position. FIG. 2.—Needle and Wires in Second Position, in Umbilical Hernia. FIG. 3.—A. Wires tied, operation completed. B. Wires in position, before tying.

pulled on until the unthreaded end comes just under the outside line of right side of operator and left side of patient, position No. 2 in plate. The index finger of the left hand is made to invaginate the integuments as far as possible, and the finger pushed to the right, under the left tendon of patient, feeling well the wall. The right hand then raises the needle so as to have its point directly over the point of the finger and a little to the outside of it. The needle is then pushed directly down through the tendon into the peritoneal cavity; at this stage the point of the index finger of the left hand is raised to the right side of the patient and held under the tendons; the needle is then moved about, to see if it be loose, and turned in its curve, so as to carry the curved portion of its point under the invaginated integuments, etc., to about one-quarter of an inch of the right tendon; the end is then brought out on the outside line of the patient's right side; this is done by pressing down on the threaded end held by the surgeon's right hand. See position No. 3, in Fig. 1. The index finger of the left hand is then taken out and the threaded end let go, and the unthreaded end is then held by the thumb and index finger of the right hand. It is now gently pulled on until the threaded end comes above the tendon. The point threaded is then reversed, and keeping well down on the tendon is finally pushed out at the first puncture and pulled entirely out, leaving the two ends of the ligature close together in the same puncture. We have thus put a ligature (as seen in Plate v) entirely around the two sides of the rupture, with a sufficient portion of the tendon and muscle to give the thread sufficient surface to act on (see B C, Plate v). And now, by pulling on the two ends, the rupture is closed internally, by the *replacing of its natural support* (see B, Fig. 3, Plate iv), and then the ends are tied around a roll of adhesive plaster, a piece of cork or soft wood (A, Fig. 3). If one ligature does not close the opening so you cannot push the joint of your finger under the wire, another wire is put in in the same way; before tying the first, you may, and must, put in enough to completely close the rupture, and they should not be more than a quarter or half an inch apart. The operation can be performed from either side, but it is best, in inguinal hernias, to start the needle from the side opposite to the ilio-pubic ligament. This enables you to push down the needle by the side of the ligament, but if you start on the side in the second position of the needle, you may go under the ilio-pubic ligament.

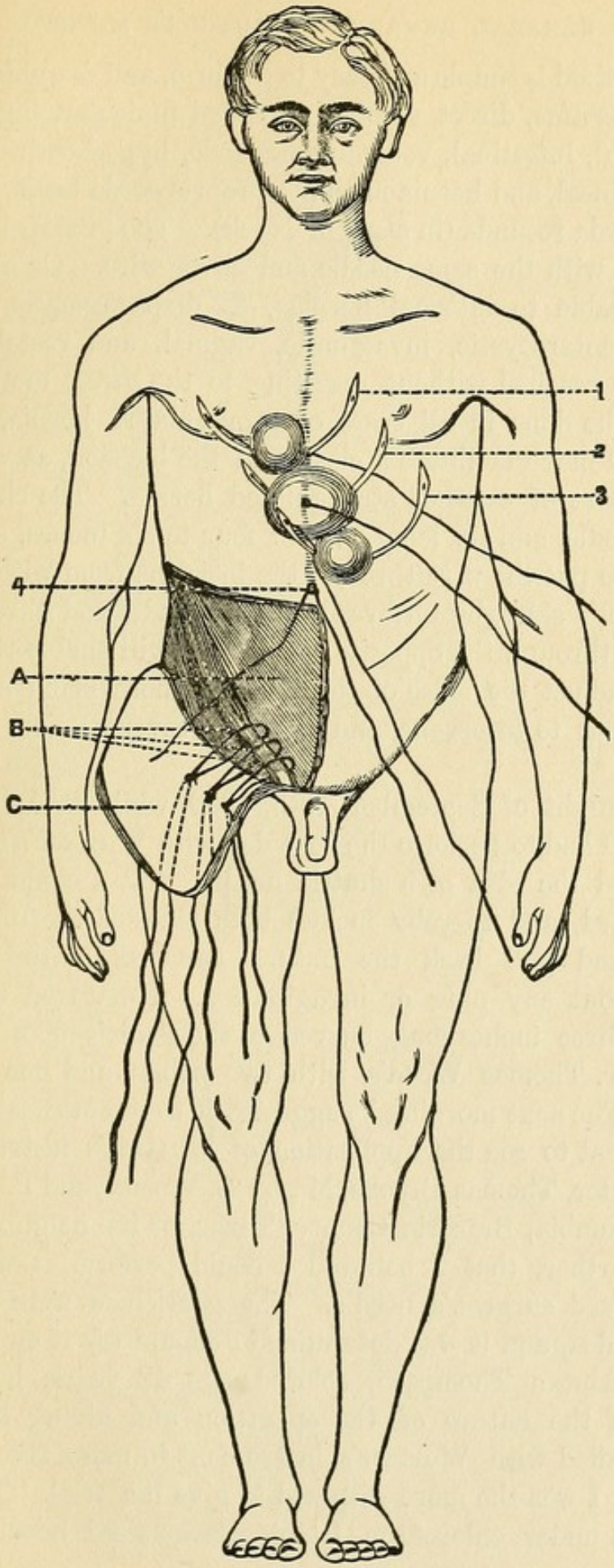


PLATE V—1. Needle in First Position. 2. Second Position. 3. Third Position. 4. Two ends of Wire extending from same Orifice. A. Flap dissected back. B. Ligatures passed around the Tendons, closing the Orifice. C. Ligatures coming together before passing through the Superficial Fascia and Skin.

GENERAL REMARKS ON AUTHOR'S METHOD.

This method is simple and easy to perform, and *is applicable to all external hernias*, direct, scrotal, umbilical funicular, inguinal, crural, femoral, intestinal, ventral, epigastric, hypochondric, lumbral, labial, perineal, and hernia in tunica propria corda testis, and tunica propria corda rotunda (in canal of Nuck). The process is the same, and made with the same needle and silver wire. Of course, it is not applicable to internal hernias, as diaphragmatic, obturatic, ischiatic, enterocystic, invaginatic, vaginal, and rectal; as they cannot be reached without resorting to the *direct* method, which ought to be done in all cases of strangulated hernia, when this needle will much facilitate a closure of the incision, as will be seen in the report of cases of strangulated hernia. The circular form of this needle, and its length, from four to six inches, enables the operator to put the wire through the incisions from within to without, on both sides, by unthreading the needle and threading it in passing it through the opposite side. This will enable the operator to nicely adjust the sides of the incision, there being no folds for blood or pus to intervene, and thereby prevent union by first intention.

In the night of September 10th, 1859, while studying over an operation I had to perform the next day with Wurtzer's instrument, I conceived the idea of a shuttle needle, that I could push back and forward, and thereby inclose both sides of the orifice of the rupture and pull back the natural supports of the abdominal wall, without any plug or invagination. I matured in my mind a needle three inches long, curved in the semicircular shape, like that of Dr. Thomas Wood's, with two points, and one eye in the centre. The next morning I suggested it to the medical gentlemen then present to see the application of Wurtzer's instrument, Drs. R. R. Porter, Thomas Brooks, Mason L. Weems, and P. M. McRea, all of Columbia, Brazoria County, Texas, or its neighborhood. I stated, further, that I believed I could perform it with a very large curved surgeon's needle. The gentlemen were all pleased with the idea, and it was determined I should try it on my present patient, Abram Thompson, colored, age 42 years, he being informed of the nature of the operation and giving his consent. Having failed with Wurtzer's instrument in more favorable cases than this, I was the more disposed to give it a trial. The patient being put under chloroform, I took a large-sized needle, threaded

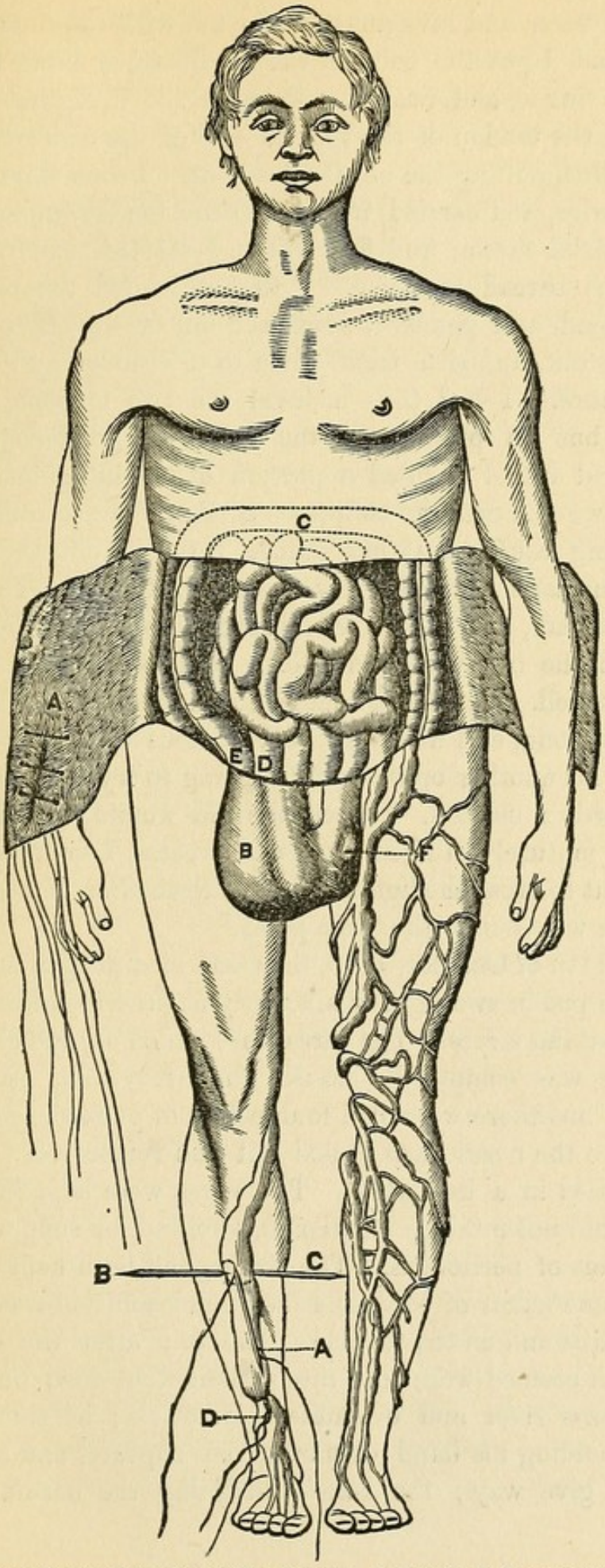


PLATE VI.—A. Internal Opening of Sac closed by Wire Ligatures. B. Scrotum. C. Transverse Colon. D. Intestine passing into Scrotum. E. Cæcum. F. Testicle on opposite side.
PLATE VI—LEFT LEG.—A. Varicose Vein Enlarged. B. Varicose Needle in First Position. C. Second Position. D. Operation completed.

with silver wire, and invaginating the sac with the index finger of the left hand, I put the point of the needle down along the palmar side of the finger, and pushed it through the invaginated integuments, and the tendon of the ventral side of the orifice and out on the inside line, pulling the needle clean out. I then started it back along the wire, and carried it down to the tendon, under the skin and superficial fascia, and out where I started, leaving the two sides of the thread together. I then threaded the needle with the other end, and passed it down and out on the other side, pulling it clear out, and then back, down to the tendon and out at the first puncture. I had thus inclosed the two tendons, as I had proposed, but on pulling on the wires, a puckering at both sides showed I had inclosed a portion of the integument on both sides, and when I came to tie the ends, they did not come up well; so, becoming confused at my failure, I pulled out the wire and applied Wurtzer's instrument, as was first intended. This cut out on the sixth day, and the lower end turned up and the hernia came down, with the instrument in place. So I took it out and let my patient get well. Unwilling to send him home uncured, after keeping him so long, and he being very anxious to be cured, I prepared him for another operation, designing to try this process over, or use Gerdy's method. When the old wound was well, and I had more maturely studied over my process, I concluded to try it again, but to cross the ligatures in the form of an X, with all four ends of the wire out at the same point.

On the 11th of October, 1859, the same medical gentlemen being present, we put in two ligatures, exactly as described above, for the one only making a cross. The wires were pulled on, and showed that the orifice was completely closed, and everything looked more favorable; but there were still four points of puckering at the four parts where the needle was pulled out and reinserted. The wires were now tied in a lead plate. The wires were kept in for fifteen days, and did not produce much pain, swelling, or suppuration, and no symptoms of peritonitis. The bowels had been kept quiet with morphine and sugar of lead, and laudanum solution was used over the punctures and on the testicle. The day after the wires were removed all seemed well, and the patient went down on the bank of the Brazos river and evacuated his bowels; he came back to my office holding his hand over the old rupture, and said he felt something give way; the next (third) day the hernia returned.

We now sent our patient off home and made the model of instrument mentioned page 40, and a drawing of our three-inch needle with one eye in the centre, and sent them to Messrs. George Tiemann & Co., of New York, who made them, and sent them to us on or about January 1st, 1860. Abram was drowned in the Caney, in attempting to swim it, and we did not get any other case until the summer of 1860, when we were called by Mr. Drayton, of Oyster Creek, to treat his blacksmith for a large direct scrotal hernia, which could not be kept up by an ordinary truss. We stated to Mr. Drayton and the negro man our plan, and showed him our needle. They both consented to the operation. On September 1st, 1862, assisted by Drs. Samuel A. Towsey and Oliver, of Sandy Point, Brazoria County, we operated on this man. When we came to try our three-inch needle in this case we found we could not use it, because it was too short to reach across the orifice and out on the other side. With great difficulty we did at last succeed, but very imperfectly, pulling out the needle entirely at the second position and having to reverse it, as in the first case, with the surgeon's needle. We also found that the wire in the centre caught against the tendons, and made it next to impossible to pull it through, bending the wire at an acute angle. We, after great trouble, thus put in two ligatures, one above the other, and tied them over a small and soft corn-cob, as we had no corks long enough to hold both wires. There was not so much puckering as in the case of Abram Thompson, and the two wires seemed completely to close the orifice and keep back the hernia; but the wires were not close enough nor high enough in the orifice, yet all seemed favorable, considering the circumstances. The wires were kept in until they cut out, and then the patient's bowels were moved and he allowed to get up; in a few days the hernia returned, but not near so bad as before; he could keep it up with a truss.

Case 3.—Negro child; on Mrs. Kyle's plantation, Oyster Creek; male; about one year old; oblique-congenital hernia. While case No. 2 was under treatment, we were called to this case, and, assisted by Drs. Towsey and Oliver, as before, we operated on him, September 25th, 1862. We used our three-inch needle with tolerable success in this case, still finding it very difficult to pull the needle through; its shortness did not give us leverage enough; we were constantly sticking our fingers, and the eye being in the centre pre-

vented it from coming through smoothly and without any jerk. We put in one wire in this case, it seeming to be enough to close the orifice, tied the wire over a cork, and applied a triangular bandage over the part, with the leg through one of its triangles, to prevent the mother from moving the dressing. The patient was left in Dr. Oliver's care, with instructions to take out the wire as soon as it got loose above the tendons. We saw it on the thirtieth day after the operation; the wire had cut entirely through, and the cork was loose and movable, with the wire just held by a small portion of skin. It was cut and taken out—the patient *perfectly cured.* At this visit, a child, of the same age and on the same plantation, was brought to us suffering from umbilical hernia, produced, as the mother thought, from crying and a cough from a cold. It was as large as a pullet's egg, but easily reduced; very thin wall, and readily compressible. We proposed to operate with our needle, which was consented to by the mother and mistress, Mrs. Kyle. Assisted by Dr. Towsey, October 24th, 1862, we put in two ligatures, in the form of an X, commencing in the centre and going to the right, and then down, as in second position of needle, in Plate IV, Fig. 2, and again out in third position, putting a wire through the two sides of the orifice, clear down to the peritoneal surface, crossing in the centre of the orifice. The other was put in in the same way. In this case the walls of the tumor were so thin that we believed we put our needle into the peritoneal cavity in passing it, in the first position. The wires were tied over a piece of cork and patient left in charge of Dr. Towsey, with directions to take out the wire when the cork became loose and movable. I did not see this case any more, but I have Dr. Towsey's certificate to the perfect cure of this case and Case 3, and that they remained cured up to last summer, 1876, when we had the last report of them; they were then large boys, over fourteen years having elapsed. Finding so much trouble with our short needle, we abandoned the operation, and refused to operate any more until we could get a larger needle, and one grooved like the one we now use. I wrote a long letter to Prof. Frederick May, of Washington, whom I had seen use Wurtzer's instrument, in the penitentiary at Nashville, Tenn., in the winter of 1858 and 1859. He used it in eight cases, with four cures and four relieved in part; no deaths; all were wearing trusses when we saw them. When I left Nashville, I bought

his instrument, and have it yet. He did not deign to answer my letter, though I had his name on an ad eundem diploma.

In 1860 I received a letter from Dr. Middeton Mechell, of Charleston, South Carolina, who wrote to me for statistics of Wurtzer's operation and other improvements in instruments for the radical cure of hernia, saying he had learned from Messrs. George Tiemann & Co. that I had made some instruments. I replied promptly, and stated I believed all cases could be thus cured, as it fulfilled every indication, restoring the natural supports of the abdomen, leaving no plug to be pushed out, and making a clean seam in the peritoneum, as seen in Plate v, where the peritoneal flap is turned down to show the wires in their position in the peritoneal cavity. Like Professor May, he did not deign to reply.

In this letter to Dr. Mechell, I stated I believed the wires might be put in with a curved needle with an eye in its point, like a horse-collar-maker's needle; that it might be threaded and pulled back. This needle was like Dr. John Wood's, made before his book was published, but when I tried it, I found it did not work any better than the old surgeon's needle; it had a handle, which made it more easy of insertion.

The Civil War came on, and Dr. Mechell's manuscripts were burned up; the blockade was established, and I could not get any more instruments made at Messrs. Tiemann & Co.'s, and we did not have any makers South, so I did nothing more until 1866, when I visited New York, in June, and had Messrs. Tiemann & Co. make a needle of the present shape. They made me some electrotypes of the needle, and cuts showing my then proposed plan of operating, and I gave them a written description of the process, to be published, with the cuts, in the New York *Medical Record*, then to be sent to me at Galveston, Texas, which was then and is now my home. This paper, with the wood-cuts, appeared in the 15th of September number, 1866.

Before I got any case to operate on with my needle, or an opportunity to insert the cuts in my journal (*Galveston Medical Journal*), my office was burned, and my needles and electrotypes were lost. But I had prepared an article on hernia for my journal, and published it in the November and December numbers of 1866, from which I have taken most of the above report, and which may be consulted for further particulars. I sent again to New York for my needle, and got Wood's, of London, with which I tried to perform my

operation on the dead subject, but failed, as above stated, to do it to my satisfaction. I wrote again, and referred to the cuts, and sent a pen draft of the needle wanted, and in due time they came.

CASE 5.—Josiah Overton, sailor, age thirty years, had inguinal direct hernia of left side, about the size of a man's fist. Had been operated on with Wurtzer's instrument in Calcutta, but the hernia returned, and he came to the City Hospital (then under my charge), for strangulated hernia. It being reduced, and the tenderness passing off, I proposed to cure him by my process, to which he consented, and the following is the report, made by Dr. C. H. Wilkerson, then a second course student and resident in the hospital. See page 745, June, 1867.

"Josiah Overton, aged 24 years; an Englishman; seaman on the schooner, 'Wide World;' was admitted into City Hospital, May 8th, for treatment of reducible oblique-inguinal hernia of the right side. He had been treated for it with Wurtzer's instrument, in Calcutta, about nine months before; it had returned several days before admission, as bad as ever. There were scars of the needle at two points, but no indentation about the opening of the internal or external ring, but there was a thickening around the scar in the scrotum. Prof. Dowell determined to operate after his own plan, with the consent of the patient. He performed the operation on the 10th of May, assisted by Drs. Hanna, Barnet, and myself.

"The operation was performed in the following manner:—The double spear-pointed curved needle was threaded with silver wire at one end, and the threaded end was taken in the right hand, and a portion of the skin and cellular tissue pinched up with the left hand fingers over the rupture, and the needle inserted from left to right, and then pulled through until the threaded point reached the body of the tendons on the right side, when the sac was invaginated and the threaded point pushed through the side of the right tendon and passed across the opening to the left tendon and out on the left side; then the needle was drawn until the unthreaded point passed the external side of the tendons, and then reversed and pushed through the skin beyond where it was first inserted. A second ligature was applied in the same manner, and both tied over a piece of cork, drawing the edges of the two tendons together, as described in the December number of the *Galveston Medical Journal* and in the *New York Medical Record*, of September 15th, 1866.

"May 10th.—Evinced peritoneal symptoms.

"14th.—Pain more contracted; is entirely confined to neighborhood of operation.

"15th.—Sutures withdrawn and cold fomentations applied.

"20th.—Pus has been forming and oozing through the apertures since the withdrawal of the sutures.

"24th.—Diminished excretion, gradual reduction of swelling, and subsidence of pain since 20th.

"28th.—Patient is rapidly improving; is cheerful and easy; says he can cough and sneeze without the return of his complaint, which he could not do before the operation.

"June 3d.—Is walking about, quite well; says the operation and treatment were not so bad, nor so painful, as the former; says he is all right now.

"CARY H. WILKERSON, *House Surgeon.*"

CASE 6.—Mr. W. R. J., aged twenty years, a clerk, native of Galveston, grandson of N. M. and nephew of Commodore M. Hernia on left side, oblique-inguinal, of several years' standing. This patient suffered also from congenital strabismus, and the hernia was no doubt of the variety I have called hernia tunica corda propria testis, usually called infantile, or encysted.

The operation was performed in the winter of 1869–70, in the presence of Prof. Webb and a portion of the medical class of that session. Two ligatures were used, and the wires were taken out on the tenth day. Some suppuration along the lines of the wire, but only in those sides where the skin and cellular tissue were inclosed in turning the needle. No symptoms of peritonitis. No fever of any kind, and very little pain, and that mostly produced by flatulency, the result of taking morphine to keep the bowels quiet. Lead and laudanum solution was used as before. The bowels were moved before cutting the wires, on the tenth day, and only one wire was taken out; the other was cut, but left in, as there was some puckering on one of the sides. This wire was pulled out by being caught in the blankets of the bed; it was believed by the patient to have buried itself under the skin. After getting well and free from all suppuration, he came to my office, saying, it was buried, and he wanted me to take it out. He said he could feel it, and I examined it, but could not feel any wire. I thought it must be there, as there was some tightness and a band in the line he complained of, but not finding it, I put him under chlo-

roform in my office, and cut through the skin, but failed to find it. I then cut down to the band, and still did not find it. I continued my incision down to the spermatic cord, still not finding it. The hernia came down as before, and I closed the wound with silver wire, interruptured suture, putting the wires deep down to the sac, which was not opened. Let the patient up from chloroform and told him what I had done, and yet had not found the wire, and it must have come out. I sent him home, and in a day or two he found the wire stuck in one of his blankets. The sutures were taken out on the eighth day, but patient was directed to keep in bed for thirty days, and I then put on a well-fitting truss. In April, 1872, he came to my office to consult me about a new elastic truss (House's) he had just gotten, and asked my advice about its effects, as it had no spring. I examined him and found the opening entirely closed; could not insert my finger at any point, and I told him he was entirely cured. He then said he had several times forgotten his truss and went days without it, and the hernia had not returned.

This case was, no doubt, a perfect cure at the first; but losing the wire caused a complication I would not expect to meet with again, for if I left the wire in, I would so bend it, or tie it at one end, that it could not get into the abdomen; and even if it did, I do not believe it would produce suppuration, or any inconvenience, except in wearing a truss.

Case 7.—*Umbilical Hernia.* Mrs. Russell, Irish woman, aged 35, was operated on in St. Mary's Hospital, under the care of Dr. C. H. Wilkerson, my former student. Below is his report of the case, published in the *Galveston Medical Journal*, 1870.

"Elizabeth Russell, aged 35 years, applied for admission to St. Mary's Infirmary, Aug. 20th, 1869, to be treated for an enlargement over the umbilical region, which, she said, had existed for the past two years.

"The tumor, she added, was caused by straining at lifting, appeared suddenly, gave great pain at the time, and now gives rise occasionally to a great deal of suffering; increases and diminishes in size alternately, being as large as an orange at times, but often remains the size of a pullet's egg.

"On inspection an umbilical hernia presented itself; the tumor, about the size of a walnut, occupying the space belonging properly to the umbilicus itself.

"The tumor, evidently, contained only mesentery. This rupture not only gave her constant uneasiness, but often severe pain, and prevented any attempt at work or even exercise. Having applied collodion, tannin, bandages and a truss, to no avail, it was decided to operate upon her for a radical cure: accordingly, on the 24th of August, the patient having been gently purged by way of introduction, she was placed under chloroform by myself, and operated on by Prof. Dowell, after a method of his own invention, viz., the subcutaneous suture.

Operation.—The hernia having been reduced, a long curved needle, double-eyed, double-pointed, and armed at one extremity with silver wire, was thrust down through the centre and brought out below, at the base of the umbilical tumor. This suture included integument and cellular tissue only. Without reversing the needle or clipping the wire, it was immediately passed back through the entire base of the tumor to the opposite side, going deep, and taking up in its course through this structure integument, cellular tissue, the split borders of the recti muscles, and passing down to the peritoneal surface.

"Again, without reversing the needle, it was passed back through the tumor, this time seeking the summit of the enlargement, where it was originally introduced, and embracing in its passage skin and connective tissue only. This constituted one stitch, although six perforations with the needle had been made. The aperture of exit was directly where the primary entrance had been made, the ends of the wire meeting at the summit of the tumor.

"Another stitch was then taken, crossing the first at right angles, and the extremities of the wires, having been drawn firmly together, were tied down over a small piece of cork, and the patient left to recover from the effects of chloroform.

Result.—Aug. 25. Patient passed a moderately quiet night, but only through the agency of morphia. Feels easy this morning, but drowsy from opiates.

"26th.—Better and livelier to-day; appetite returning; tongue coated with a white fur. Collodion applied to the parts.

"27th.—Redness, soreness, and some swelling around the umbilicus. Ordered lead water and laudanum fomentation.

"28th and 29th.—Symptoms much the same.

"30th.—Redness and swelling going down; remedies kept up.

"31st.—Nothing but soreness from the sutures remains, these

having been taken away on the 28th. Says she feels well with that exception.

"Sept. 10th.—Patient discharged, well and sound; has walked all about town and yet no return of tumor. Only a little soreness remains, the effect of the sutures, an argument, probably, in favor of the success of the operation."

It will be noticed that the wires were taken out on the fifth day, and that this was of the variety of umbilico-epiplocele, which is common in females of adult age. I believe this is the first case on record of an umbilical hernia cured by an operation in the adult.

Case 8.—French sailor, aged thirty years; native of France; was a great stammerer from youth, showing congenital defects. He was operated on in St. Mary's Hospital, Catholic, under Dr. C. H. Wilkerson, who did not reside in the institution. The patient's bowels were moved with castor oil in the morning, the parts shaved, and the patient put under chloroform, making three lines, as usual, with tincture of iodine or ink. The hernia being on the right side, we put the needle through in the first position, to the ventral side, which we found to be of great disadvantage, hence the direction given in the process and method now practiced, of commencing by putting in the needle in the first position from the ventral surface, and carrying it down inside of the ilio-pubic ligament, to avoid inclosing this tendon in the second position of the needle. In this case we did *inclose the ligament*, and the opening did not come well up, and when the wires were taken out, on the fifteenth day, there was considerable suppuration, and several abscesses of small size formed. So it was a failure, as the hernia returned. After these healed up, we operated again, with the same medical gentlemen present—Profs. Rankin, Allen, and the medical class of 1870 and 1871. The ligatures were kept in to the twentieth day, with the same suppuration and result—a failure.

We believe in the first operation we failed on account of the inclosing of Poupart's ligament (ilio-pubic), and in the last by keeping the ligatures in too long; we afterward avoided both these accidents by our present way of putting in the wire, and by taking it out on the fifth or seventh day, and putting on a support. The one I used was the truss of a self-examining endoscope, which answered the purpose very well. The patient was unwilling to be operated on again. He had not suffered much pain under either operation, but suffered from a low typhoid form of fever. We do

not think he was treated well after either operation, as Dr. Wilkerson did not reside in the institution, and we only visited it every Tuesday and Friday, on clinic days.

CASE 9.—Mr. (now Dr.) J. H. Mayfield, a private student of mine, age twenty-two years; small inguinal hernia of the left side. Was operated on in St. Mary's Hospital, June, 1871. Present, Drs. Booth, house surgeon, and C. H. Wilkerson, surgeon. Bowels moved with castor oil in the morning; the parts were well shaved, and three lines made with ink. Patient was put under chloroform, and the operation commenced by putting the needle through in first position, from the ventral side toward the ligament, and then down for second position inside of Poupart's ligament. Two wires were used, which completely closed the opening; ligatures tied over a piece of cork; taken out on eighth day; some suppuration, but no symptoms of peritonitis, and not much pain. After the wires were taken out, a compress and bandage were used for about thirty days. Cure perfect. He was in my office in April, 1874, still perfectly well.

CASE 10.—Dr. C. H. Wilkerson operated on a French boy, about twelve years old, assisted by Professor Callaway and myself. I directed him how to hold the needle, and in every step of the operation, he using my own needle, loaned him for that purpose. The wires were kept in for fourteen days. I did not again see the case, and had nothing to do with the after-treatment, but it was *a failure*, I believe from keeping in the wires too long. He was operated on again, assisted, as before, by Prof. Callaway and myself. The wires were taken out on the eighth day, and union appeared perfect. Dr. Wilkerson published this case in the *Galveston Medical Journal* (my own journal), without mentioning my directing him, he using my needle and carrying out my entire method, as if it was an original operation of his own, only stating I gave the chloroform, claiming all the credit for himself. This was put in while I was absent from the city, which made it much worse, showing so little gratitude and complacency to his former preceptor. I thus speak of the case, as it was republished in several journals, and no mention made of its being my process and method, Dr. C. H. Wilkerson claiming all the credit to himself. It is due him, to say that his apology was, that it was so universally known to be my operation that he did not think of it; but before I submitted the manuscript to the printers, I put in a note stating it

was my process and method that was used. He or the printer took this out. The printer denied it. Ingratitude has no bounds, and if I cannot rely on my own pupils to establish my precedence in this operation, *who can I rely on?* I felt this more severely as Drs. May and Mechell had treated me so cavalierly. Dr. Wilkerson told me the hernia in his patient had returned from his lifting and hauling sand, about the 1st of April, 1872.

CASE 11.—John Foster, aged about thirty-two years, German sailor, was admitted into the "Galveston Medical College Hospital," then under my charge, for a wound of the scalp, resulting in traumatic erysipelas. He recovered from this, and finding him suffering from a very large scrotal hernia of the right side, we proposed to cure him, and explaining the nature of the operation to him, he consented. He had been operated on in Calcutta, by what I supposed was either Gerdy's or Wurtzer's method; and he said it had done him a great deal of good, as before that it came half down his thighs, and could not be kept up with a truss. The hernia was as large or larger than the two fists together. He was not well prepared, being dissipated, and was drunk when first brought into the hospital. But being anxious to be operated on, and impatient to leave the hospital, we operated on him February 18th, 1872. The bowels being moved in the morning, chloroform being given—Profs. Rankin, Goodwin, and the medical class of 1871 and 1872, were present—four ligatures were put in and tied over a soft piece of wood wrapped with a roller bandage. Patient vomited much from the chloroform, and had hiccough in the first twenty-four hours. We moved his bowels with castor oil, to see if there was any intestinal obstruction; the bowels were freely moved, but the hiccough and vomiting continued; pain around the umbilicus, with tenderness over the stomach, but little in the line of the ligatures. The hernial sac became distended to its full size and form, hot and tense, some heat of skin, and pulse one hundred and twenty. Blister over the stomach, and morphine continued, with solutions of lead and laudanum. Scrotum very tense on the fifth and sixth days, œdematous, and crackling with gas. Exploring needle used on the sixth day; serum and blood came out. The part was freely lanced, and the bowels moved on the seventh day, and the ligatures taken out after the action on the bowels. The line of the ligatures perfectly tight; no fluid could pass into the peritoneum. Fever continued; testicles and scrotum poulticed, and morphine

internally; continued to vomit what he drank, but no stercoraceous matter. Would get up in the night and empty his own chamber mug; pain and swelling in sac continued to increase, and finally, there being perceptible fluctuation, an abscess was lanced, which discharged about half a pint of sanious pus, but with no fecal odor. The poultices were continued, and another abscess was finally lanced, discharging a large amount of pus, as before. After this he continued to improve rapidly, his vomiting ceased, and his appetite returned. He got drunk twice, and fell eight feet down a a ladder, without the hernia returning. He continued in the hospital, assisting the cook, till the 15th of April. The endoscope truss was then taken off, and a good-fitting truss applied. Hernia line very firm and no tendency to return. He left for New York, on a steamer, on the 15th of April. This was the only case attended with any serious symptoms, most of them suffering but little pain or swelling of the parts, and only three any symptoms of peritonitis; in two, this only lasted about twenty-four hours, as was seen in the full report of the cases. No deaths, and only *one complete* failure in eight cases operated on by myself after I got the present needle. Dr. Wilkerson's case being apparently a success, but at last report had returned.

Four cases of strangulated hernia were cured by the interrupted suture, with the semicircular double-spear-point needle, as will be seen further on, under strangulated inguinal and scrotal hernia.

The following cases, which have all occurred since April, are reported as examples of the whole :—

Case 12, *partial failure.*—P. B., colored; aged about 39; stout and healthy. Hernia right side, seventeen years' standing; large scrotal; April 11th, 1876.

Operation for radical cure by our plan of subcutaneous sutures with silver wire. Patient put under chloroform by Dr. Orman Knox, of Jonesville, Texas. We reduced the hernia; then having made three lines, one over centre of tumor, and one on each side, about half an inch from the centre, four stitches were put in, one below the other. This was a bad case for the operation, as the tendons were severed above the ileo-pubic ligament for two inches, and the hernia was direct at the line of the operation, but probably had become so by long standing, as the opening was large.

April 13th.—Doing well; scrotum slightly swollen, but not painful; no fever.

April 19th.—No fever; scrotum much swollen, but soft; liga-

tures removed; cure appears perfect; bowels had been moved yesterday.

May 30th.—Saw patient; bowel had returned to sac on the night of the 24th, while in bed, he having been ploughing and riding. The swelling of the scrotum had never been reduced, and I ought to have put in a seton through the sac or used Wurtzer's needle, so as to cause destruction of old sac. This was neglected in this case, and was one cause of failure, but the great distance to which the tendons were separated was the main cause; in subjects as old as this man they can rarely be pulled together at one operation. Applied a Pomeroy truss and left him at work and comfortable. I will operate again in October.

Case 13.—April 19th, 1876, H. S., aged 69; knock-kneed from a boy; ruptured on left side; very large scrotal. He suffered eighteen years ago with strangulation, and was operated on by Drs. Orman Knox and H. P. Perry; recovered, and was cured for one or two years. Ever since it has been getting larger, until now it is as large as a boy's head. Assisted by Dr. Knox, who gave chloroform, I operated by the "subcutaneous suture." Reducing the hernia, we put in four stitches, one below the other, about one inch apart, and pulled the parts well together, overlapping the tendons.

21st.—Doing well; no fever; ordered the bowels to be moved with Epsom salts.

27th.—Stitches taken out; had not had any fever; bowels had been moved; scrotum tender, but very little more swollen than at time of operation. Operation a cure. Dr. Knox writes me, June 25th, "*H. S. a perfect cure.*" August 28th.—"Tumor decreasing, still perfectly cured."

Case 14.—J. B., aged 7; healthy; hernia, scrotal, left side, three years' standing, supposed to be caused by having had a rope tied around the body. Dr. Knox gave chloroform. One ligature completely closed up the opening.

25th.—Up, walking about; no fever; very little swelling of scrotum, a little red.

28th.—Ligature taken out.

I was taken very sick about this time, with bilious fever, and did not see him any more until May 20th. Upon examination, found a swelling of the cord; pronounced it hydrocele of the cord, and stated that it would require a second operation.

May 26th.—Operated on the cord, putting in three ligatures, one below the other.

28th.—Testicle much swollen; old sac enlarged; no fever. Gave him one-eighth of a grain of morphine, to keep him easy and make him sleep. No fever; walking around the room, and even out in the yard; has good appetite. I left next day for Philadelphia. Dr. Knox writes, June 25th, "J. B. perfect success;" family much pleased. August 28th.—"Scrotum filled with serum, but no protrusion."

Case 15.—May 26th, 1876, I. I. P., aged 28; native of South Carolina; hernia testalic, right side; no scrotum on that side; testicle lodged in superior ring; swells and gives great pain, especially when he lifts or rides much; was much swollen yesterday. Dr. Knox gave chloroform. Present, patient's father and others. Mr. P said his son had been born with no scrotum on that side, and that the testicle had not come out more than we then saw.

Operation.—Testicle pushed up and back; four ligatures put in subcutaneously, one below the other—I say below, as the upper stitch must always (in this method) be put in first—making one line in centre and two on each side; having moved the bowels well, as is my custom, and also moving them before taking out the stitches, giving morphine whenever patient is in pain, and applying cold lead and laudanum water when it is soothing and pleasant. After putting in the ligatures we put lint over them, and poured collodion over this, which excluded the air, and compressed the parts. I also directed Dr. Knox, when they cut the wires, to put on lint, and pour on collodion.

May 28th.—Had to take some morphine to keep easy; no fever; bowels ordered to be moved with Epsom salts. Dr. Knox writes, June 25, "Mr. P. well; walking about." August 28.—"Is well."

The following is a table of all the cases operated on, and their results up to date, September 12th, 1876:—

STATISTICAL RESULTS.

OPERATORS.	NO. OF CASES.	CURES.	FAILURES.
Dowell	68	60	8
Wilkerson	12	7	5
Bacon	1	1	
Trueheart	9	6	3
Powell	2	2	
Rankin	1	1	
Worthington	1	1	
Neeson	1	1	
Worthington & Bibb	1	1	
Totals	96	80	—

In the sixty-eight cases operated on by myself, two were umbilical, one epigastric, one testicalic, and the others were femoral, inguinal and scrotal. From one to five sutures were used. In one case only has there been any serious trouble, and that was caused from suppuration. The longest time any one was confined in bed was thirty days; the shortest, twenty-four hours. One case was operated on twice; failure both times. Dr. Wilkerson operated twice on two cases.* Dr. Trueheart's failure was in a case of double hernia. Dr. Powell operated twice on one case. No deaths have occurred from the operation. Dr. Rankin published his case in full in the *Texas Medical Journal.*

The other cases of failure by me, one (Mr. Holt) was caused by obesity and bilious vomiting. Another (Mr. Kirtland) from no known cause; believed we did not go deep enough to include the sac. Mr. Hubbard's rupture returned from vomiting. The eighth I have not seen since operated on, but learn it was a failure.

The above tabular statement exhibits all the cases, with results, that have been reported to me. In concluding this paper, I can truthfully say that no operation of so great import has ever been attended with better results.

The details of these cases must have wearied the reader; but we thought they were all necessary to the illustration of the different steps, as they show the difficulties that have to be overcome; from which we deduce the following principles, to be adopted and carried out in this operation.

1. *Points that should be specially attended to in the operation.*

A. The bowels should always be moved three hours before the operation.

B. The body should always be in a horizontal position, with the hips above the head, and legs slightly flexed on the thighs.

C. Hernia should be carefully reduced.

D. Patient should be thoroughly anæsthetized with ether or chloroform; I prefer chloroform.

E. Needle should be started from the ventral or median side, in all cases of inguinal hernia. Wires should be pulled in with waxed thread, as in vesico-vaginal fistula.

F. Wires should not be left in longer than the eighth day, and a support used afterward, either by truss or bandage, and patient kept in bed for ten days, at least, after the wires are taken out,

* He detailed nine cases in the *Texas Medical Journal.*

and not allowed to get up without an abdominal support. One patient, Thomas Nelson, 16 years of age, remained in bed only one night, and on the eighth day, before the wires were taken out, was at the railroad depot, walking around as if nothing had happened. Children never complain, and all have been cured.

G. From a quarter to half an inch of the sides of the orifice should always be included in the wire.

H. Bowels should always be moved before the wires are taken out, with enemas of water and soap (soapsuds), or water and castor oil.

2. *Points to be especially avoided.*

A. The spermatic cord must be kept downward and not inclosed in the ligature.

B. No immovable part, as the ilio-pubic ligament, should be inclosed.

C. The adjacent arteries and nerves should be avoided, if possible, in crural and inguinal hernia.

D. The ligature should always be tight on both sides, showing that the tendons are well included.

E. No plug must be left in the loop of the ligatures, to be pressed into the rupture, thereby preventing the serous walls from firmly uniting.

F. The needle should have free play in passing across the orifice internally, so as to be sure that no omentum or intestine is caught by its point and transfixed.

G. Patient should not be allowed to get out of bed while the wires are in, nor for five or six days after they are taken out, though some have walked around after the first day without any injury or inconvenience.

H. There should be no puckering on the right or left side of the first puncture.

I. Patient should not be allowed any very solid food, or very rich diet while under treatment—milk and soups are best.

By observing the above rules *all cases may be cured*, as they enable the operator to restore the natural supports of the abdominal wall, even where there never were any. There is no exposure of the peritoneum to the air; no plug placed in to be pushed out; no injection or scarification necessary to produce adhesive inflammation, gentle pressure being quite sufficient to unite serous membranes, as every one knows who has operated for strangulated

hernia, remembering how firm the stricture becomes in four days—so firmly united as to tear rather than separate.

We thus close our remarks on the radical cure of hernia, giving about all that is known on the subject, believing there will never be a better method invented than the Author's; but of this we are not sure, as we have seen, in our day, so many improvements made on what was once thought perfect.

IRREDUCIBLE HERNIA.

I think this is a very unusual form of hernia, as in my long experience I do not remember seeing a single case, but Gross, Gant, Ashhurst, and nearly all writers on hernia give examples, and we give below a remarkable case from Dr. Prince's Orthopædic Surgery. The symptoms are well marked and cannot be easily mistaken. Generally the tumor is large in size, and belongs to inguinal, scrotal, umbilical, cæcal, vesical, or ventral varieties. Hernia of the cæcum and bladder, from their anatomical characters, being without peritoneum, are usually irreducible; contents usually mixed, omentum and intestine, but this is not invariably the case. Patients suffer much from dyspepsia, flatulency, borborygmi, and colic. Tumor may be lessened by an effort at taxis, but cannot be reduced. Bowels are not compressed so as to prevent the alvine evacuations. Irreducible hernias are very liable to become inflamed and impacted, and also readily converted into strangulated.

Cause.—Irreducible hernia is usually produced by adhesion of its contents to the sac, contraction of the neck of the sac, enlargement of contents after protrusion, as in the omental and visceral varieties, so that they cannot be pushed back and remain without constriction.

Prognosis is always unfavorable in these cases, as the patient's life is constantly in danger from inflammation, impaction, and strangulation.

Treatment—Palliative and Curative.—The Palliative treatment consists of a well-fitting bag truss, to keep the tumor of the same size, and to prevent a downward dragging and extension of the sac. Dr. Riggs, of New York, makes the best I have seen. The bag should be made of strong duck or leather, and should be confined by elastic belts or springs around the body. When it is scrotal or ventral, of large size, it must be retained in a bag, and kept up by

bands around the body, to completely prevent its downward pressure.

Curative Treatment.—This consists in complete rest in the horizontal position; the use of mercurials and alteratives to reduce the tumor so it can be returned; complete relaxation of the neck by sedatives and anodynes, as opium, chloroform, belladonna, and veratrum. An ointment of belladonna, veratria, and iodide of mercury may, for a time, be used over the tumor, with the view of producing absorption and relaxation. Patient should not let himself become constipated or the hernia impacted by cherry, watermelon, or other seeds, which are often the cause of strangulation. The tumor should be kept immediately over the mouth of the sac, and the attachments to the sac are sometimes removed by a subcutaneous incision with a tenotomy knife. A small opening being made through the skin and fascia, the constricted portion is found and the part cut. The knife is guided by the finger or a grooved director, or what is perhaps better, a broad director. The sac should not be opened, as there would be great danger of wounding the intestine. After the strictured sac is cut the hernia may return with its coverings, which is very dangerous, hence this is a bold and unusual practice.

Dr. David Prince, in his "Intestinal Plastics," page 38, reports the following singular case, and its final cure:—

"I. C. C., aged twenty-nine years, tall and slender (colored clergyman), entered my infirmary, November 17th, 1868. He had become, in May, 1867, the subject of inguinal hernia, with the symptoms of strangulation, which continued twelve days, when a distinguished surgeon of Iowa operated upon him, leaving the patient with an adventitious anus, and the loop of intestine adherent within the scrotum. Whether the incision of the intestine was made upon the supposition that there was gangrene, or whether it was accidental, is not known. From subsequent examination, and the well nourished condition of the patient, the seat of hernia seemed probably to be in the lower portion of the small intestine, in which the fæces passed from right to left, and that the opening made by the surgeon was in the ascending portion of the loop. It followed that all the *fæces* passed out of the abdomen into the scrotum, and in returning into the abdomen passed by the adventitious opening made by the operator. Much of the contents leaked out, especially when, in consequence of taking cathartics, or having a diarrhœa,

they were unusually thin." The patient wore a compress of his own, that was considered insecure. The original operator attempted to close the orifice at four different times, September, November, December, and February, without success. "In none of these operations were any attempts made to dissect up and explore the intestinal protrusion," and, according to patient, the only aim was to close the orifice. "My first examination was intended to be thorough, but I failed to detect the entrance of the ilium into the external loop through the ring. It was supposed that the intestinal wall had so sloughed as to have removed the partition wall, and that an operation that should sufficiently dissect the intestine from its adhesion in the canal, permitting it to be drawn into the abdomen, would lead to a closure of the orifice. The progress of the operation revealed the mistaken diagnosis, and led to a change of the plan of treatment.

"*Operation, November* 19*th*, 1868.—The loop of intestine was first dissected out of the scrotum, and the portion of intestine protruding through the external ring was cut off. It then appeared that there were two intestinal openings into the abdomen, and the philosophy of the case was for the first time unequivocally cleared up. A ligature was introduced through the septum, about an inch and a half beyond the level of the skin; each end of the ligature was passed through a double canula, and made fast, and from day to day tightened up until it cut through. The fear of peritoneal inflammation prevented the insertion of the ligature to such a depth as certainly to restore the permanent continuity of the intestinal canal." A good deal of constitutional fever followed this operation, the patient being delirious for several days. The rapidity of the pulse was kept down by veratrum viride, at first, and the powers afterward sustained by quinine and beef-tea. Some sloughing of the scrotum occurred, apparently from the arrest of pus in the pocket from which the intestinal loop had been dissected. The thread cut through in a few days, and the external wound contracted rapidly; but upon careful examination it was found that the septum came too near the surface to make it safe for the integument to close, lest a stricture and arrest of intestinal contents should be the result. Besides, it was supposed that there must have occurred adhesion in the septum or eperon, behind the ligature. This supposition is the more probable as the surfaces, covered by granulations, pressed against each other, and

would thus have the best opportunity to hook into each other, and thus effect a continuity of tissue. "The contemplation of the danger of failure of adhesion after the introduction of the forceps of Dupuytren, led to the invention of an apparatus intended to avoid gangrene. For this purpose it is necessary to avoid a tight squeeze upon any of the tissue. A hook or tongue is made to invaginate the intestinal coats through the ring, thus bringing the peritoneal surfaces into close contact, but without such force as to interfere with the circulation. The perforation takes place by a gradual thinning over the point of the instrument, so that the orifice is at first small, and is surrounded by a large extent of serous surfaces in close contact. This differs entirely, in the principle of its action, from the instrument of Delpech, which cuts out a disk by the gangrene occasioned by the pressure of two rings together, involving more risk than the forceps of Dupuytren, which only cut a fissure. (See author's instrument, page 17.)

The apparatus (see Prince's Orthopædic Surgery) consists of — *aa*, a loop or ring to be introduced into one portion of intestine through the orifice; *bb*, a perforating hook for the purpose of making a communication between two adjoining intestinal tubes.

The loop or ring having been introduced through one intestinal orifice, and the hook through the other, the hook or male part of the apparatus pushes a portion of the doubled intestinal wall through the ring or female portion, and slowly perforates the intestine by ulceration without gangrene. Two peritoneal and two mucous surfaces are to be perforated by a point or hook invaginating them within the circumferences of the ring. As there are no sharp corners or points, the process is sufficiently short to permit adhesion of the peritoneal surfaces. The opposite end of the back horizontal portion of the apparatus has a hook to hold an elastic cord, to aid in the pressure of the hook through the loop *c*; the elastic cord just mentioned, *a*; a shield made of tin, to serve as the bars of a lifting process to be instituted as soon as the hook *b* has fully engaged in the loop *a*; *ee*, a derrick for the lifting process; *f*, an elastic cord attached to the combined arrangement *aa*, *bb*, and tied over the top of the derrick *ee*, the lifting power.

In two weeks a passage seemed to have been made from one tube to the other, through which some of the intestinal contents passed. It became necessary to apply a lifting force to the hook and ring, in order to force them to divide the bridge between them and the

surface. For this purpose a derrick *a, ee, f,* was constructed with a base of tin, having an orifice in the centre, with a loop of wire about three inches high. From the top of this loop an elastic cord *f,* was extended to the wire apparatus, constituting a hook and eye, by which a deep orifice had been made from one portion of the intestine to the other. When the hook had come very near the surface, a ligature was passed beneath the bridge, and having been passed through the tubes of a ligating canula, it cuts through in a very short time.

After the complete and ample restoration of the continuity of the alimentary canal, the external orifice diminished rapidly, but at length it came to a stand-still. Finally, to close this, a plastic operation was performed, Feburary 23, 1869. This consisted in a free dissection of integument from above, by the first variety of the third method of my classification. That is by a jumping process. The flap was carefully adapted to its new position, and retained by sutures of wire. Moderate compression was employed to prevent its separation by the pressure of the fæces beneath. The surface from which the flaps were taken were left to granulate and cicatrize. Adhesion was effected in every part, and the final cure was thus secured after a period of treatment of three months' duration. The patient was advised always to wear a truss to protect the part from danger of a hernial protrusion, from the pressure of the intestines upon the enlarged ring. The removal of such a horrid disability could not fail to secure the warmest gratitude of the patient. * * * At this date, May, 1871, the patient continues well, and is traveling as an itinerant preacher.

I have reported this case nearly in the author's own words, and I do it for two reasons: first, it shows what may be done in such desperate cases, and leads us to hope that all similar cases may be cured. Second, to illustrate a new process for the relief of artificial anus, of which I will have more to say in treating of strangulated hernia.

INFLAMED HERNIA.

Hernias may become inflamed, whether reducible, irreducible, impacted, or strangulated.

Symptoms.—There is more or less soreness in the body and fundus of the sac, with heat, pain and swelling, and a large amount of serum may be effused; if the hernia be loose and pendant, with

much distention of the sac, sometimes gas is found, giving it a crepitative feel. The accumulation of serum makes the tumor more or less transparent. It is often attended with vomitings of indigestible matter, bile, and mucus, attended with retching, constipation, and constitutional fever

The hernia can most always be reduced by the taxis judiciously applied under chloroform, with ice applied over the tumor. There is scarcely any pain at the neck of the sac, for, if that be the case, the inflamed hernia has become, or is about to become, strangulated.

Causes.—Over-distention of the contents of the sac, as from overfeeding, constipation; accumulation of foreign substances in the sac, as worms, seeds, ingesta, kicks, falls, and blows on the sac.

Treatment—Is nearly the same as that for irreducible hernia. Rest, low diet, refrigerant lotions, as ice-water, and the hydrochlorate of ammonia, sugar of lead and laudanum, etc. The bowels should be moved with castor oil and turpentine enemata. Injections of large quantities of warm water with a hydraulic syringe; saline cathartics, or sulphate of magnesia, solution of citrate of magnesia and mercurials, where there is constitutional fever.

These means will usually relieve; but when they fail, and the vomiting continues, with stercoraceous matter, I should at once resort to the knife.

IMPACTED HERNIA.

This is another variety that readily leads to strangulation, and should be immediately attended to.

Symptoms.—There is great distention of the sac, not attended at first with much pain, and a fullness and pressure in the tumor. This variety is quite common in old standing cases of reducible hernia, where the patient has kept off the truss, or having broken it, goes for several days without it, which enables the intestine folds to fill with fæces, scybillæ, and indigestible substances. Patients that have suffered for years from reducible hernia become entirely indifferent to an impacted hernia, until it becomes inflamed and tender, and often when they attempt to reduce it they find it strangulated. The first case I saw after I commenced the study of medicine was in a doctor, and he seemed indifferent to it, even after he found he could not reduce it himself, as he had often done before. After a delay of several days in this situation, he sent for a surgeon; he failed to reduce it, and before he would consent to an

operation, he was taken with stercoraceous vomiting, and finally died, without an operation.

Impacted hernias often cause adhesions of one portion of an intestine to another, or if the contents be composed of intestine and omentum, the intestine becomes attached to the omentum, or wound around it, and when reduced, these remain thus adhered, and lead to a future strangulation, or a more complete impaction. I have known severe pain and colic to follow a reduced hernia of this kind, and to last for days, jeopardizing the patient's life, and I have no doubt, often producing death, when the patient is said to have died of colic, or invagination; it often produces nausea, and vomiting of bile, mucus and ingesta, and when fatal, stercoraceous matter, attended with peritonitis and emphysema of the intestinal canal, finally dying, with a cold clammy sweat, attended with hiccough.

Treatment—Should be prompt and efficient. The contents producing the impaction should be gradually and carefully pressed back. Patient should remain in a horizontal position, completely relaxing the muscles. If there be much serum in the sac, it may be let out with a trocar, carefully inserted, or if gas, it can be discharged by the exploring needle. Patient should then, if the hernia is not reduced, be etherized, and a second trial made by taxis. This failing, we may resort to ice wrapped in flannel over the tumor for a while, which will condense the gas and reduce the parts by preventing a flow of blood to the part and its return from the venous engorgement, then putting the patient under chloroform again, and if it cannot then be reduced, resort to the knife at once, while the patient is under chloroform. Delay is dangerous, and the surgeon who does not act promptly is responsible for the patient's life.

INCARCERATED HERNIA.

This variety is very much like the last. By it I mean, such an impactment of the contents of a hernia (it being irreducible), as shall obstruct the passage of the fæces through the intestinal portion without impediment to the circulation and without strangulation.

The *Symptoms* are an increase of the size of the tumor, pain and heaviness in it, without any pain or soreness about the neck of the sac. This is attended with constipation, nausea, and vomiting, of a chronic character, while they are sudden and acute in strangulated hernia.

Causes.—Constipation, accumulation of fæces in the sac, gas, or indigestible food. It is most common in old and debilitated persons, or persons with large, prominent bellies.

Treatment.—Mild purgatives, in the absence of vomiting, injections, gradual pressure, low diet, and rest in the horizontal position. Stimulating enemata, as turpentine, castor oil, or colocynth. When some relief is obtained, the hernia may be reduced by taxis. Care should be taken, in using manipulation, not to increase the accumulation, which it is liable to do, if the lower intestines are not first emptied.

STRANGULATED HERNIA.

This is the condition, in which all hernias tend to result—a *constriction of the contents at the mouth of the sac*, or along the line of its protrusion, *hour-glass contraction, adhesion and swelling, becoming so great that the contents cannot be reduced* (*see Figure* 5, *page* 19), *the parts, finally, becoming so constricted that fecal matter, fluid, or solid, cannot pass into or out of the sac. The arterial circulation is cut off, and the veins, distended, exude serum. This condition lasting for any considerable time results in gangrene, and sphacelation of the contents of the sac, and even the sac itself, as I have seen the testicle completely sphacelated and dead.*

If the strangulation be complete, this condition will obtain in twenty-four hours, or if less, it may last to the fourth or even eighth day, and some may then relax and become irreducible, and thus remain for years.

Symptoms.—Pain, heat, swelling and throbbing, at the point constricted. Hernial tumor *cannot be reduced; even fluid* and *gases are retained* when the stricture is very tight. There is a soreness, fullness, and heaviness of the tumor; patient relaxes the muscles, and holds up or ties up the tumor directly above the stricture. Nausea, vomiting, borborygmic eructations, flatulence, colic and complete retention of the alvine discharges above the stricture, when it is intestinal, but when it is omental, ovarian, vesical or visceral alone, the bowels may be moved, and most usually the patient has tenesmus and passes at first fecal matter, then mucus with blood, as the strangulation continues. The abdomen becomes tender and œdematous; all the symptoms of acute peritonitis are gradually set up, which, at first is confined to the seat of the stricture, but sooner or later becomes general. Iliitis comes on, a reversed peri-

staltic action is set up, and the patient vomits stercoraceous matter, bile, mucus and blood. These vomitings are attended with severe pain, particularly about the umbilicus, but become general as the peritonitis spreads; a depressed countenance, quick pulse, and sometimes high systemic fever, but not always, as I have seen cases prove fatal with very little heat of skin, or excitement of the pulse, depending much on the acuteness or chronic character of each case, and the amount of peritoneum involved. *Hiccough finally comes on, pain ceases, heat subsides, and fever declines, with cold, clammy sweat, sunken eyes, and death.*

Causes—are *indirect* or *direct*. All the causes of hernia may be considered as indirect, as every condition producing a hernia continued becomes in the end a cause of strangulation, and, as we have remarked, all hernias indirectly tend to strangulation.

Direct Causes—There are natural or unnatural contractions at the point of stricture, usually, as we have seen, at the neck of the sac, or in cases of inguinal hernia, at the internal or external ring. At every point where adhesion of sac and contents have taken place, this adhesion, increasing, prevents the proper nourishment of the part, and heat and swelling increase this until complete strangulation takes place. Often the accumulation of cherry-stones, watermelon seeds, worms, scybillæ, causes impaction, as we have seen, and this produces distention of the sac, and consequent pressure at the neck, causing effusion of lymph and the agglutination of the two serous coats, as they lie over each other. The sac gradually becomes distended, hot, livid, (if the integuments are tightly distended) gaseous, and of a bladderly feel—feels like a bladder blown up, or distended with water and soft foreign substances.

These symptoms are generally sufficient to diagnose every case of hernia from any other tumor. And as certain hernias are more difficult than others, we will speak of these special symptoms when we come to treat of special hernias. Plate III, G, page 17, shows the pathological condition of the intestines in strangulated hernia.

Treatment.—This consists in 1. *Taxis.* 2. *Position* and *rupture* (Barron Suiten's method). 3. *Herniotomy* or *kelotomy* (a direct resort to the knife). These means are assisted by anodynes, as opium, chloroform, ether, warm bath, venesection, injection, with or without sedatives. Tobacco injections were much used once, but have no doubt killed more than they benefited. I myself, have seen one well-marked case (see case under ventral hernia from an old burn).

They are now almost entirely abandoned, or given with great care. But injections of warm water, with O. Burn's hydraulic syringe, or any of the improved rubber syringes, will answer very well and very much assist the taxis and position processes.

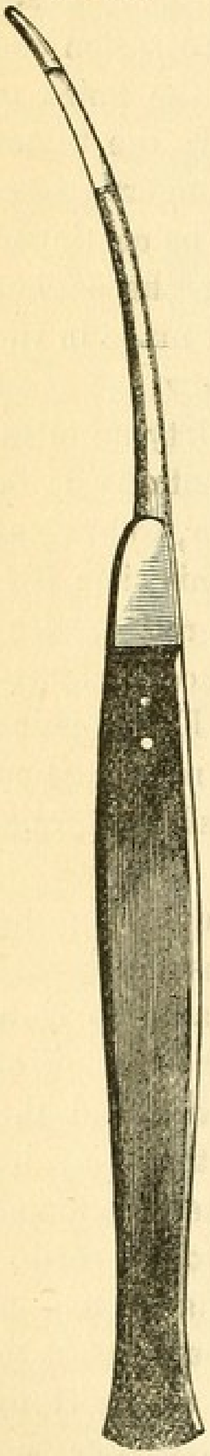
Taxis—Adjustion—from *tasso*, to adjust, arrange. The patient is placed in a position to relax, as much as possible, the muscles around the tumor, and draw the body of the intestines and omentum from the mouth of the sac. The tumor, if not large, is steadied with one hand, while the other gently seizes the protrusion and presses gradually and gently, the contents toward the point of rupture, and directly in the line of its protrusion. If the tumor is very large, both hands must be used, with the fingers pressing upward from the fundus of the tumor; this may be continued from fifteen to thirty minutes. Then, not succeeding, the patient is put under ether or chloroform; and another attempt made in the same way, no violence being used, but, on the contrary, the most careful and gentle pressure is made for fifteen to thirty minutes. Then failing, the patient is put in a warm bath; enemata used; or ice must be applied, wrapped in flannel, over the tumor, to prevent gangrene; or chloroform given a second time; and this time failing, the surgeon ought to resort immediately to an operation, without letting his patient come out from under the influence of chloroform, as further attempts and delays are dangerous. The intestine will sphacelate and its contents be poured out, or the mortification will spread to contiguous parts, and produce general gangrene, resulting in death.

Failing in the taxis, Baron Suiten resorted to rupturing the stricture by forcibly pushing the fingers under the constricted part and then returning the sac. This, at once, will be seen to be a dangerous proceeding, as the sac may be returned without relief of the stricture, and the symptoms will only be increased and the cure more complicated, by taking away the relief that may be afforded in an artificial anus, if the intestines or contents be found too much distended to admit of this being returned to the peritoneal cavity. The same objection holds good, as we have seen, in the subcutaneous incision of the stricture. No one would resort to this process, if they were not too ignorant or timid to resort to the knife when I think it ought to be used, as it does give the patient a *better chance* than to *leave him alone.*

Strangulated hernias have been reduced where they are chronic, in

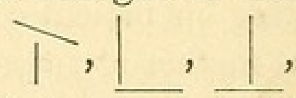
this character, by suspension of the body from the lower extremities, allowing the intestines to pull themselves out, and assisting the regurgitation of any fecal matter or fluids that may have accumulated in the sac. This may also be aided by the taxis at the tumor, and by kneading and pulling the abdomen from the stricture. When the taxis, judiciously used, and for a sufficient length of time, fails, these methods will also fail, and the surgeon ought to resort to herniotomy.

Fig. 28.



Probe-pointed Bistoury.

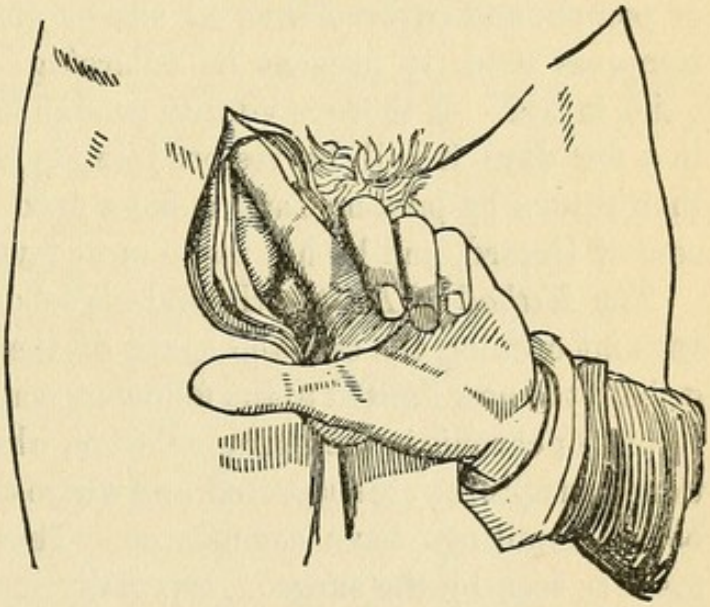
HERNIOTOMY.

This is usually performed in the following manner: Patient anæsthetized; the surgeon takes hold of the skin above the tumor, and pulls it up as high as he can, and runs a bistoury straight through the integuments down to the special coverings of the sac, and cuts from within out, with the knife held in fourth position, or he may take hold of the knife in first position, and steadying the tumor with finger and thumb of the left hand, and making the tumor tense, cut directly down through the skin and superficial fascia, making a straight or compound cut, as seen in the figures,  Y. & V. I *always make the incision in a straight line*, to enable me the better to close the wound with a silver wire, and thereby to produce a complete and radical cure of the hernia after all operations for strangulation. Sometimes it is more convenient to make the incision transverse across the tumor, just below the stricture, as it enables us the more readily to cut the stricture at the most favorable point, as in cases of ventral or lumbral hernia, but the most usual incision is directly longitudinal with the tumor and over its line of protrusion. This incision being made, we take a grooved director, and probe-pointed bistoury (Figure 28), and enlarge it, upward and downward, as far as is deemed necessary. I prefer a full incision, so that the contents can be well exposed and carefully examined before returning them to the abdomen. I always examine the contents

before cutting the stricture, as well as after, as thereby we get a better knowledge of its condition.

Having fully exposed the hernial contents by continuing our incision, by pinching up a small piece of the folds of the coverings at their most prominent points, and nicking a hole in them with the point of the bistoury, held flatwise, so as not to cut the intestine or omentum if we should have reached the sac, we then slip under this fold the grooved director, and cut up and down to the size of the first incision, if necessary, but generally a small opening is the best, first feeling over the grooved director to see if there be any artery crossing its line, and if so, tie it before cutting, to prevent any hemorrhage that might obscure the incision, and prevent as careful an examination as is necessary. When we reach the sac, it is generally known by its whitish, glistening character and its irritated red lines, and if the hernia has long been strangulated, or has been rudely handled in attempting the taxis, it will be livid in parts, indicating a tendency to gangrene.

FIG. 29.



Cutting the Stricture in Herniotomy.

The sac is opened by pinching up a little fold of it, and nicking it as before, to enable us to put in our director (when there will flow out serum, sometimes as clear as water, dark-brown, and even mixed with blood and fecal matter), and this should be carefully performed if the case has been let stand till mortification has taken place; if the sac be recent, we can generally see the director through its covering, and being fully assured that no fold of omentum, or particularly intestine, is between it and the director, we slit it up, exposing the contents, which, as we have said, should then be carefully examined, and if the part is black and cold, or pieces of fish or chicken bones, or seeds, are found with fecal matter, we may know the intestine has been badly ruptured, and that it is not fit to be returned; we then excise the dead part, and make an artificial anus by pulling down and stitching the healthy portion of the intestine over the skin.

This being done, we cut the stricture, by putting our finger (see Figure 29) under the line of stricture, and with the probe-pointed bistoury, made dull by running it over the back of a scalpel, and putting it in flatwise, we turn it directly up, and cut the stricture upward. This being done, the wound is dressed with cotton saturated with permanganate of potash, and patient given a dose of morphine. If, on the other hand, we find the tumor livid, but will whiten upon pressure, and when taken again, return red, and it is warm, with no ruptured holes (they may be as small as a pin-hole, and from one to many), or dark livid, or yellow, or grayish spots, the stricture may be cut and the intestine returned. But should we find any of these symptoms, the stricture should be cut, but left in place, and dressed as before, with permanganate of potash, and covered with oil silk or elastic cloth, and a gentle compress used, to prevent its enlarging. Patient kept perfectly quiet in bed. If there is vitality enough left in the part protruded, in a few days it will be restored to its natural color, and it will then return by pressure, and make a good result. This is the process of Gerard, and he has made most favorable reports of success.

The Method of Petit.—He and his followers divide the stricture without opening the sac, and speak in the most favorable terms of it, but it is now limited to the following conditions: Large hernia—recent, or chronic in their strangulation, where no contusions, lacerations, or ruptures are suspected, and where the operation is performed before vomitings have commenced. This limits it to a very few cases as seen by the surgeon, especially in hospital practice. It is attended with the following dangers: A sac may be returned with its contents still strangulated, especially where the stricture is of the second variety, that is, where the stricture is at the neck or in the body of the sac, as is usually the case in femoral and crural hernia. Where the stricture is outside of the sac, the hernia having been reduced, the sac expands, and patient does well, as he is not so liable to peritonitis or hemorrhage after reduction.

From the great success attending this method, we think it ought to be resorted to in all favorable cases, though the statistics are faulty in this respect, that the cases have to be selected, and only the most favorable ones thus treated; and thus it becomes a question, if there be any real advantage in it at last, and if the mortality would not be equally small, if the sac had been opened. It is certainly attended with great danger of the hernia being returned in mass, and of one portion of the intestine being ad-

hered to another, or to the omentum, or wrapped up in it, several examples of which are known to have occurred, resulting in strangulation, and requiring the compress still to be opened, and the sac with its contents again brought out, and the stricture cut. This may be done by getting the patient to cough, sit or stand up, and still failing, it must be sought for through the opening and brought out, even if the incision has to be enlarged.

Gay's Method.—A modification of Petit's. He makes a small opening near the neck of the sac, inserts the finger and searches for the seat of the stricture; having found it, he inserts along the finger a concealed bistoury, between the neck of the sac and the stricture, which is then protruded and the stricture cut. It is peculiarly adapted to femoral hernia. *The prognosis, after operations for strangulated hernia* may be seen from the following statistics:—

Authors.	Number of operations.			Sac opened.	Sac not opened.	Cures.	Deaths.
	Date.	No.	Variety of hernia.				
I. L. Petit,	1718	1	Femoral	....	1	1	..
Ravater,	1750	3	....	....	3	3	..
E. W. Wimer,	1868	48	Nearly all inguinal	Not stated	Not stated	26	8
Erichsen,	"	..	....	47.7 per ct.	23.5 per ct.	..	..
Luke,	"	84	Not stated	25	....	..	8
1 "	"	"	"	....	59	Not stated	7
Mr. Ward,	"	155	....	....	153	..	36
Sir A. Cooper,	"	77	Not stated	77	....	..	36
Dr. Turner,	"	545	"	545	....	..	260
Luke,	"	31	Femoral	24	7	Not stated	N. S.
"	"	20	Not stated	13	7	"	N. S.
Guy,	"	118	Femoral	100	....	56	44
"	"	"	"	....	16	..	6

The following table shows the number of days:—

Authors.	Date.	Variety of Hernia.	Days.	Cases.	Recoveries.	Deaths.
Gross.	1872		1	49	43	6
			3	41	30	11
			3	9	3	6
			4	5	2	3
			5	4	0	4
			6	7	3	4
			10	3	0	3

Luke. 69 cases. Variety not stated. Within 2 days 12 died, 1 in 5.7. 00 cases. Variety not stated. After 2 days 15 died, 1 in 2.5.

TABLE OF THE PERIOD OF SURVIVAL.

Burkett. In 20 cases, 1 survived 17 days. 5 survived 24 hours, and less than 48 hours. 4 survived 48 hours, and less than 72 hours. 1 survived 72 hours. and less than 96 hours. 1 survived 96 hours, and less than 120 hours. 8 survived 144 hours, and less than 168. 1 survived 168 hours, and less than 192 hours. 3 survived over 192 hours.

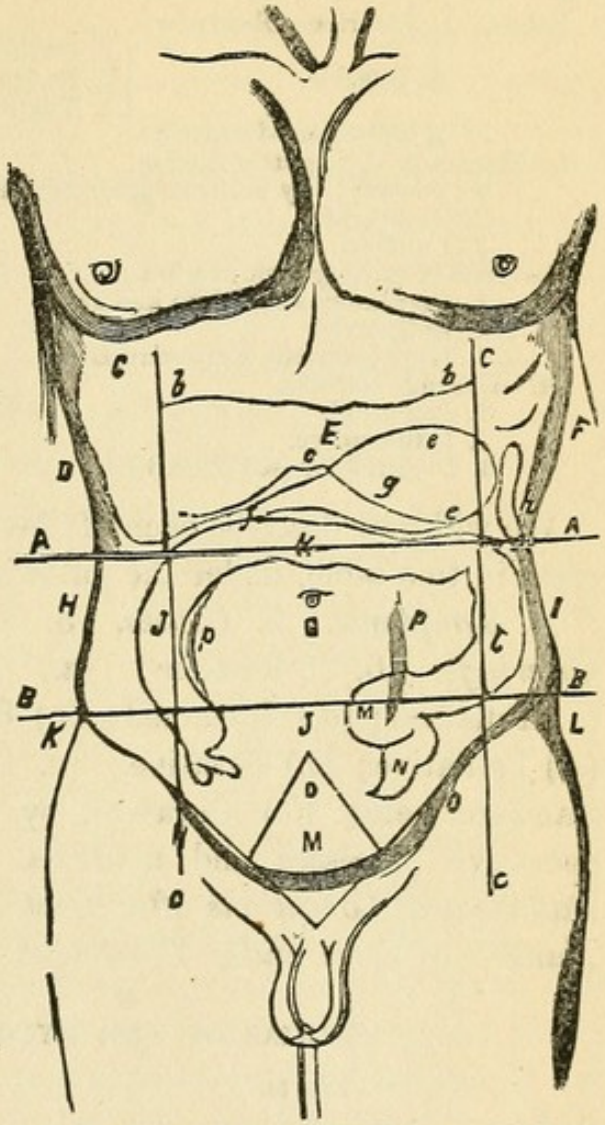
TABLE SHOWING THE CAUSES OF DEATH.

Authors.	*Date.*	*Variety of Hernia.*		*Shock.*		*Hemorrhage.*		*Peritonitis.*		*Erysipelas.*		*Pyæmia.*		*Taxis.*		*Age.*	
Gross.	1872	Not stated.		Uncommon.		Infrequent.		Common.		Not unfrequent.		Rare.		Black, from Contusion.			
Burkett.		Not stated. Delay caused two-thirds of deaths.		Bronchitis.	1	Arterial.	8	Peritonitis.	5	Perforation and Erysipelas.	8	Perforation of Bowel.	1	Black, from Contusion.	2	Neglect.	1
Guy.	1872	Cases of femoral.	52	Gangrene and Perforation.	9	Peritonitis.	8	Gangrene of Intestine.	5	Gut imprisoned.	3	Omentum.	3	Bowel Sloughed.	2	Effusion of Lymph and Serum	1
				Intestin'l Strangulation.	2	Peritonitis, Strangulation, Gangrene.	2	Peritonitis with Artificial Anus.	2	Peritonitis with Pneumonia and Pleurisy.	2	External Ossification of Arteries.	2	Peritonitis, Wound, Slough.	2	Extensive wound; Hypertrophy.	1
				Peritonitis, Adhesion of Intestine, Strangulation.	1	Peritonitis, Disease of Heart, External Wound, Sloughing.	1									Hypertrophy of Heart and Artificial Anus.	2

HERNIAS OF PARTICULAR REGIONS.

In our diagram, Plate 1, Fig. 1, page 13, and the dycotinous table of hernia, we have sufficiently given and illustrated what we mean by special hernias, or hernias of particular regions. But to classify them for more convenient use, we have modified the following table from that usually given, so as to introduce the most common first, and to ascend instead of descending in our description. And this table further illustrates what we have before stated, that the downward pressure of the intestines and relaxation of the mesentery and mesocolons are great predisposing causes of hernia. Making the inguinal, scrotal and femoral the most common; the umbilical, ventral and lumbral, next most usually met with, and lastly, the epigastric, diaphragmatic and hypochondric, the least common. The three belts in Fig. 30, mark the lines of these three grand divisions.

FIG. 30.



AA. Umbilical Line. BB. Hypogastric Line. DD. Hypochondric Region. CC. Hypochondric Spaces. dd. Diaphragm. E. Epigastric Space. ff. Lumbral Space. G. Left Lobe of Liver. J. Ventral Space. KL. Spine of Ilium. M. Vesical Space. MMM. Colon.

I.

(1.) In inguinal region are found

- (1.) Inguinal oblique.
  - (a.) Oblique inguinal.
  - (b.) Direct. "
- (1.) In the male.
  - Hernias of sudden descent are
  - (a.) Spermatic process.
  - (b.) Funicular "
  - (c.) Inguino-crural.
- Hernias of gradual development, are
  - (a.) Inguino-crural.
  - (b.) Encysted—Infantile.
- (2.) In the female.
  - Utero-ovarian process—canal of Nuck.
- (II.) Direct.
  - (b.) Inguinal-labial.

(1.) The scrotal, in male.
(2.) Labial, in female.

II.
Femoral or Crural.
III.
Pelvis. 1. Anterior—Obturator.
2. Inferior. { 1. Perineal. 2. Pudendic. 3. Vaginal.
3. Posterior—Ischiatic.

I.—Hernia in Mesogastric Region.
1. Ventral (may occur in other regions, see Plate I).
2. Umbilical.
3. Lumbral.

II.—Hernia in Epigastric Region.
1. Diaphragmatic, Right and Left.
2. Epigastric.
3. Hypochondric, Right and Left.

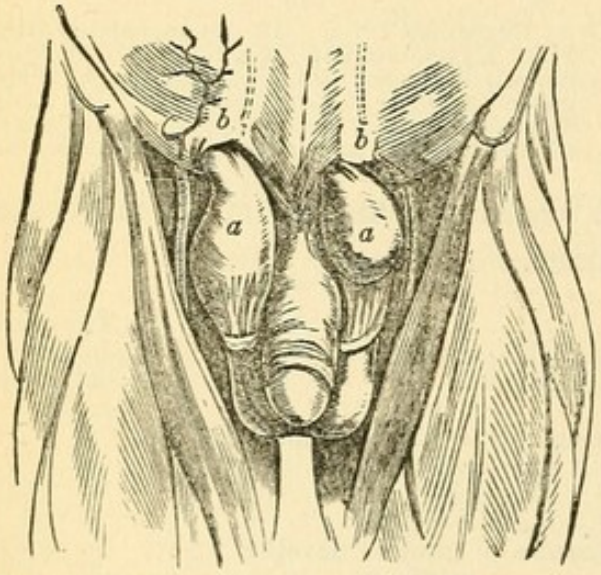
III.—Internal Hernias.
1. Intestinal.
2. Intusceptive.
3. Diverticular (see plate 3 E).

We will now describe each of these in the order in which they come in this table, under the following heads:—

1. *Symptoms.* 2. *Causes.* 3. *Diagnosis.* 4. *Prognosis.* 5. *Coverings.* 6. *Character:* (*a.*) Reducible; (*b.*) Irreducible; (*c.*) Inflamed; (*d.*) Impacted; (*e.*) Strangulated. 7. *Treatment:* (*a.*) Palliative; (*b.*) Curative. (*a.* Palliative, by Reduction, Truss. Bandages, etc. (*b.*) Curative, by reduction, truss, and various operative processes and methods. 8. *Ratio of Mortality.* 9. *Pathological Conditions after Death.* 10. *Number of Days Sick; Number of Days under Treatment.* 11. *General Remarks.*

HERNIAS OF THE HYPOGASTRIC REGION.

FIG. 31.



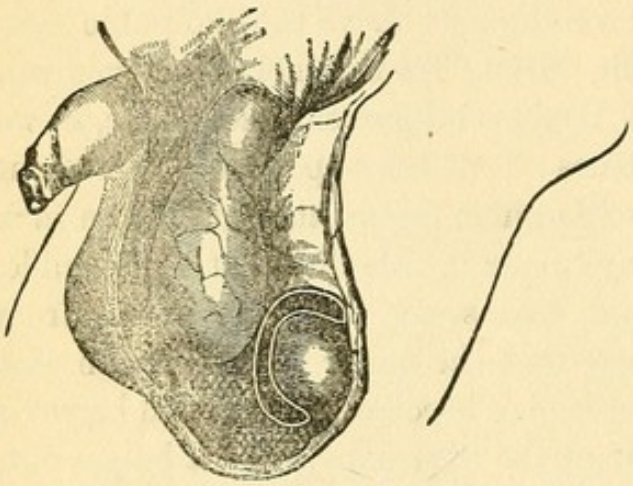
Inguinal Hernia; on the Right Side, Oblique, on the Left Direct. (a.) The Hernial Sac. (b.) The Epigastric Artery.

Inguinal is by far the most common form in which we find hernia, about three to one of all other varieties. Its symptoms are generally very plain, and as it is the most common form, when we have an obscure case, we should examine this region most carefully. It shows itself by a tumor at the internal ring, sometimes not larger than a knuckle, and then as large as an egg (see Fig. 31). It continues to increase and distend until it appears at the external ring (*a*), left

side, and becomes a *complete oblique inguinal hernia.* In its course it directly follows down the spermatic cord, and usually lies above it, but is found to the right or left, and where the testicle is retained in the abdomen it may come out at the internal ring, and place the testicle above and the cord in front. Instead of its taking its course obliquely from the internal ring, it may come directly through, forming a direct inguinal hernia, at the upper or internal ring, or it may, as seen at (*a*), left side, burst through at the lower ring, pushing the cord to the right or left, and coming out above the ilio-pubic ligament, which distinguishes this variety from femoral and ventral. The sac lies immediately over Poupart's ligament (*ilio-pubic,* as we prefer to call it). When it comes out at the upper ring, it is about one inch and a half above the ilio-pubic ligament, and half an inch to the inner side of it. So any tumor in this line that is reducible, returns with a gurgling sound, and seems to slip suddenly from under the fingers, having a hole that the finger may be put in, is a reducible inguinal hernia; but it may become strangulated between the rings, or it may not appear at the external ring, but bulges out, in coughing, laughing, riding, or lifting, and will return of itself. This is an incomplete inguinal hernia, and if the parts are not supported, will continue until it becomes of considerable size, and pulling the septum down, it will fall immediately above the ilio-pubic ligament, making an old *oblique* inguinal hernia; *direct,* and continuing its course down along the spermatic cord, or the round ligament in the female, it finally appears in the scrotum of the male, forming scrotal hernia, or the labia, forming labial hernia in the female. The scrotum being of an expansive tissue, it enlarges and descends until it nearly reaches the knees in some cases, and is quite common, of the size in the figure, in children of only a few months or years old. In the celebrated Gibbon, nearly all the contents of the abdomen came down, and it reached nearly to his knees. Such cases are not, unusual; most authors have seen such. The sac of inguinal hernia may form gradually, or it may be produced suddenly, as I once saw in a soldier, from jumping what is called a half hammer. He fell over, as it were, on his knees, burst up the ring, and the intestine came out immediately, the size of a turkey's egg, producing great pain, and a disposition to bend over, with sick stomach coming on almost instantly. I immediately alighted from my horse, as I was riding through camp, and reduced it, put on a good truss, and heard no more from the case; the pain ceased imme-

diately on its reduction, as well as the vomiting. When the sac thus forms suddenly, it is thin and transparent, and the coverings above the hernia may be well made out; but if the sac is old and slow in formation, it will become thick and filled with deposits of floating lymph, which will be found in it on opening the sac. The coverings will be so pressed together that it will be impossible to distinguish one from the other, after passing the skin and superficial fascia (see Fig. 32). If the hernia be an enterocele, it will be very elastic, and have a light gaseous feel, and when reduced, will be attended with a crackling sound. If, on the other hand, the contents of the sac be omentum or an epiplocele, it will have a more solid doughy feel, and when reduced, will return with a "flip or flap," showing it is a more solid mass. When it is an entero-epiplocele, it will combine these two symptoms, and the two portions may be felt returning at different times, first the intestine, and then the omentum; or if they be adherent, they may return at once, with a gurgling and jumping sensation. The same symptoms will be more or less acute if the spleen or kidney is included, but these give more solid sensation to the fingers than even the omentum. Where this hernia occurs before birth, it is called congenital, and is of that variety we have named *spermatic* in males, and *ligamentic* in females. Where the hernia forms in the upper portion of the tunica propria cordæ spermaticæ (called vaginal process), following down the testicle, and in females, where it forms in the upper portion of the round ligament, or in the tunica propria cordæ rotundæ, it is usually called the vaginal process of the round ligament, but we never use these terms—as vaginal should alone be applied to the vagina—when speaking of hernias of the hypogastric region.

FIG. 32.



Scrotal Hernia; showing the Usual Relation of the Sac to the Vaginal Tunic.

FUNICULATED HERNIA, USUALLY CALLED IMPACTED OR ENCYSTED HERNIA IN THE TUNICA PROPRIA FUNICULÆ TESTIS.

This variety forms in early childhood, or may be congenital. The internal ring is closed, but the spermatic cord is surrounded

below with an enclosed serous coat, or it has a sac into which the intestines or omentum is pressed, leaving the internal ring above, and sometimes the testicle; then following down the cord to the scrotum may become scrotal, or to the labia, forming inguinal labial hernia of the infantile or encysted type.

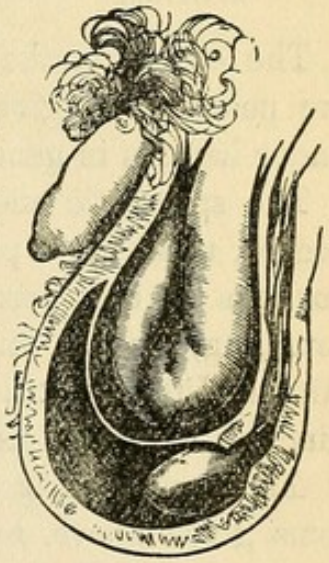
The sac of congenital spermatic hernia, is what is called the serous coat of the vaginal process itself, its mouth being at the internal abdominal ring, its neck and body occupying the inguinal canal, which, when suddenly formed, do not approximate the internal and external rings, as occurs in congenital hernia of slow growth or of long standing.

A sub-variety is the *hour-glass shaped* hernia, where the narrowing of the hernial sac exists between the testes and the external abdominal ring.

Inguino-scrotal Hernia of Slow Formation, is represented in Fig. 32, page 88; this is the common variety, as we said before; and before it becomes complete, and while it lies under the tendons of the external oblique, and a fold of the internal oblique, it is called a *bubonocele*.

The hernia descends through the inguinal canal to the external ring, and along the spermatic cord to the scrotum, as seen in Fig. 33, pushing the peritoneum before it, and lying in front of the cord, and increases to any size. This is often seen in adult life.

FIG. 33.



Infantile Scrotal Hernia.

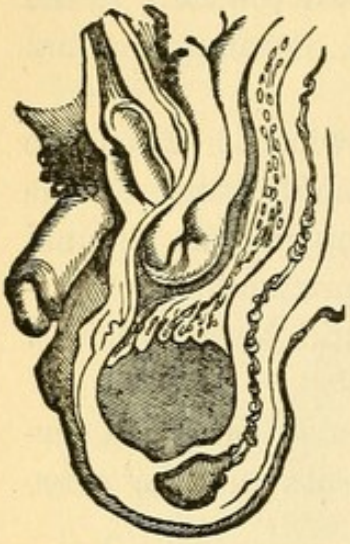
Funiculated hernia, Cooper's "Hernia of the tunica vaginalis," Hey and Leeds' "Infantile Hernia."

ENCYSTED HERNIA (ASHHURST), HERNIA OF THE TUNICA PROPRIA FUNICULI TESTIS.

Its distinguishing feature is that it is below the internal ring, which is closed, and the testile orifice is patulous, into which the intestines have formed, and have carried with them the folds of the peritoneum, passing into the tunica propria testis, and continuing its course to the external ring and the scrotum. In the female, to the labia, forming labial hernia. This hernia is said by Ashhurst to be of frequent occurrence, and forms suddenly; though common in infancy, often does not make its appearance until adult life.

INGUINO-SUB-INTEGUMENTAL (See Fig. 34).

FIG. 34.



Inguino-sub-integumental Hernia.

Inguino-Crural Hernia. This hernia, in its passage down into the scrotum or labium as usual, protrudes outward along the folds of the groin, presenting the appearance of a crural hernia, hence I have called it sub-integumental and not a crural hernia, as all crural hernias press under the ilio-pubic ligaments. And under this head may be placed the anomalies, usually called—

Intra-parietal Hernia, where it passes under the parietal wall.

Inter-muscular, where it passes between the muscles; the *hernias "en bissac"* of the French.

The *causes* of the different varieties of inguinal hernias that are peculiar are given in their history and formation above and under hernias in general.

The spermatic and funatic varieties are dependent, in a great degree, upon their predisposing cause, which is the patulency of portions of the spermatic cord. The other causes are general: coughing, crying, laughing, defecating, are common in children. Riding, lifting, pulling, blowing wind instruments, any and all kinds of muscular contractions.

The Diagnosis is generally plain when we have all the symptoms given above, but there are other reducible and irreducible tumors, especially found in the inguinal region, that may lead to grave and serious results.

We copy below a diagram from "Gant's Surgery," giving them in full, which we advise all to study carefully. Page 946.

The Reducible Tumors; Their Entrance or Return into the Abdomen.

	CHARACTERS IN COMMON.	SPECIAL CHARACTERS IN INCOMPLETE.
1. Inguinal hernia.	1. All return into the abdomen when the patient lies recumbent and the abdominal muscles are relaxed.	1. Hernia enters most readily when once commenced. Passes quick and suddenly. Entrance complete. Thick and opaque neck of tumor. Testis may or may not be perceptible until reduced. No vibration.
2. Hydrocele of vaginal process of peritoneum.		2. Hydrocele of vaginal process of peritoneum enters slowly and very suddenly. Entrance complete. Narrow and translucent neck of tumor. Testis imperceptible until the fluid has entered the abdomen.
		Their Passage from Abdomen—Special Character.
		1. Hernia is developed from above, descends when the patient rises or exerts the abdominal muscles, and more quickly than other. Pressure over the ring prevents its descent.
		2. Hydrocele seems to develop from below upward. The serum sometimes remains when patient is recumbent.
3. Hydrocele of the funicular portion of the vaginal process.	3. Hydrocele of funicular portion of vaginal process enters like No. 2. Entrance complete. Translucent. Flesh of tumor may pass into inguinal canal. Testis perceptible at fundus of tumor. Vibrations.	3. Similar to No. 2.
4. Varicocele.	4. Varicocele enters very slowly. Entrance not complete. The bulk of tumor only diminished. No vibration.	4. The tumor increases like hernia when the patient rises, but it increases also if pressure be made over the course of the spermatic veins in the inguinal canal, or by relaxation of the blood, however caused.

The tumors to be diagnosed by the above rules, and those that follow, are—1st. from hernia undescended into scrotum; ABSCESS in the course of the inguinal canal; HYDROCELE or HÆMATOCELE of the cord; tumor of the cord; *adenitis* and undescended testis; hydrocele of the round ligament in the female; serous cysts in the tunica ligamentis, or canal of Nuck. 2d. From hernia in the scrotum; *hydrocele* of *the tunicæ albugenia testis; hæmatocele;* varicocele *and tumors of the testis and scrotum.* These should all be studied in general works on surgery, with all their relations and symptoms.

Disease.	*Weight.*	*Translucency.*	*Fluctuation and Vibration.*	*Relation of Testis to Tumor.*	*Figure and Development.*	*Size.*	*Consistence.*	*Pain.*
Hernia.	Lighter than either the fluid or solid tumors.	Very rarely so; generally opaque.	Only when fluid co-exists with the hernia.	Position variable, but the testis usually disseverable.	Pyriform, but with thick neck. Occasionally globular or ovoid. Outlines regular. Begins at neck of scrotum and descends.	Variable; at times very large.	Soft and yielding, except it be omental.	Painless unless diseased.
Fluid tumors.	Hæmatocele rather heavier than hydrocele.	Hydrocele particularly so. In rare cases opaque. Hæmatocele opaque.	Distinct vibration, very characteristic, as in hydrocele.	Perceptible in spermatocele; not in hydrocele of tunica vaginalis propria testis, usually.	Pyriform, but with very thin neck. Outlines very regular. Globular as hydrocele of spermatic cord. Oblong as in spermatocele, and nearly transverse to vertical axis of scrotum. Begins near fundus of scrotum and ascends.	Rarely very large.	Yielding and elastic. Exceedingly incompressible as hydrocele of cord.	Painless, unless testis be squeezed, usually.
Solid tumors.	Generally firmer than fluid.	Opaque.	Absent.	Often involved and imperceptible; though its site may be discovered by pressure.	Outlines of testis often preserved. Sometimes surface irregular.	Large; steadily increasing.	Resisting, firm, and rarely hard.	Painful, but varying in degree.
Mixed tumors.	Heavy.	Sometimes in parts of them.	In some parts, not in others.	Involved.	Irregular outline.	Large; at times rapidly increasing.	Resisting in parts, soft in others.	Variable.

With all these plain rules to guide us, we will still meet with cases the true character of which nothing but an operation can reveal. The author and Dr. Anger were compelled to resort to the exploring needle, to distinguish a psoas abscess from a strangulated hernia beneath Poupart's ligament. See report of case in *Galveston Medical Journal*, 1866, and *Nashville Medical Record*, 1858. I also was in great doubt in the cases of McKim Lea and a butcher of Galveston. Mr. Lea had been using a badly-fitting truss, and the hernia had been reduced, as was supposed, but there being adhesions to the omentum, it did not return with the intestine, and became strangulated and gangrenous. It had been supposed to be only a lymphatic gland inflamed from using a bad truss, and the various attempts to release it by taxis. I found a small, immovable tumor, very tender over the external ring, crackling under pressure, showing emphysema. We cut down on it, and found a knuckle of omentum, perfectly dead, with grumous blood all around it, but the orifice was completely closed, and no fluid passed into the abdomen. We cut off the mass, washed out the blood, and sewed up the wound with silver wire, enjoining complete rest. He recovered slowly, but it continued to discharge pus and serum for over six weeks. He was radically cured, and has had no return of his hernia since.

The butcher had a sudden rupture, while lifting a quarter of beef on to a hook in the market; felt acute pain, and was sick at stomach; very fat. After two days he came to me with great tenderness in the inguinal region, with a boldly defined tumor just above the ilio-pubic ligament. It was movable and appeared to slip back when pressed on, but would immediately return. We pushed it back and put on a truss, and sent him home, but requested him, if not better, to let us know next day, and we would operate. He was no better, but worse. We went and operated on him, and found an oblong tumor in the groin, passing up through the external tendons, which was strangulated and dead. We cut it all off with the scissors, washed it out well, and sewed up the external wound. The tumor appeared to be a fold of mesentery, with two or more mesenteric glands included. Patient suffered much from neuralgia of the crural nerve, but finally made a good recovery and was radically cured.

I remember another instance in which I had two boys about eight years old under treatment at the same time. One had an

encysted serous tumor, about the size of a pullet's egg, under the scrotum, and immediately above the tunica albugenia testis, but not connected with it. The other had hydrocele with patulous cord, and when the scrotum was held up or squeezed, it disappeared. The encysted tumor was so soft that, when pressed on, it appeared to pass into the tunica albugenia testis, but would return. I cut down and removed the encysted tumor and made compression with a truss over the external ring in the hydrocele case, and after closing the canal, operated on him and effected a cure. Both of these had been thought to be hernias, and could only be diagnosed by the careful rules given in the table.

Prognosis.—Generally favorable except in neglected cases of strangulated hernia, impacted, inflamed, incarcerated, and irreducible, all of which are attended with great danger, either immediate or remote, and should be closely and promptly attended to.

CHARACTERS AND RELATIONS.

A recognized oblique inguinal hernia has for its internal or medial side the internal tendon of the transversalis muscles; the internal layers of the internal and external oblique, above the inter-columnar fascia, and the peritoneum; above the peritoneum, infundibular fascia; conjoined tendons; superficial fascia and skin. Outer side, folds of the tendons of the transverse internal and external oblique muscles.

Its coverings are seven, the same as the spermatic cord receives, and enumerated from within to without, in the order of hernial development. 1. Peritoneal pouch-sac. 2. Sub-serous cellular tissue. 3. Fascia transversalis, or infundibular. 4. Cremaster fascia. 5. Intercolumnar or spermatic fascia. 6. Superficial fascia. 7. Skin. These coverings are only interesting with reference to the development of oblique inguinal hernia, but they are so "altered in appearance and united by pressure, as to not have much importance surgically." "The relations of the inguinal canal, spermatic cord and testicles, to the visceral protrusion, and of the epigastric artery to the mouth of the sac, are specially important."

The inguinal canal lies about half an inch to the median side of the ilio-pubic ligament; commencing a little above its middle portion, it extends from the internal to the external ring at the crest of the pubis, obliquely, and parallel with the ligament, and is

about one and a half inches long, in its natural state. Its boundaries we have given in those of oblique inguinal hernia. The cord lies behind and beneath the hernia, in the common inguino-scrotal hernia, the testis below and somewhat behind its fundus, as seen in Fig. 32, page 88. The elements of the cord are sometimes dispersed by the hernia as it descends, the vas deferens being on one side and the spermatic vessels on the other, and entirely in front of the hernia, and the testis below is also in front. The *epigastric artery*, arises about half an inch from the ilio-pubic ligament, and bends toward the median line, and ascending, passes into the fascia transversalis, immediately behind and internal to the mouth of the sac, running obliquely upward and toward the median line, between the external and internal rings. Its course varies as to the position of the rings, as they approximate in old hernias (they pushing it around and outside of the external ring) and by its abnormal course, which occurs very rarely, but may come from the internal trunk of the iliac, from the back of the ligament, as high as two inches and a half above it, from the obturator instead of the iliac, or from below the ligament, arising from the femoral artery. The first does not interfere, in inguinal hernia, at the internal abdominal ring, but the two last may have special relation to the crural ring, and therefore to femoral hernia. The seat of the stricture is most usually at the mouth of the sac and the internal ring, and next at the border of the internal oblique muscles in the canal; lastly at the external abdominal ring.

2. *Direct* inguinal hernia, common to both male and female.

Symptoms are, in general, those of oblique; and the *causes* are the same, except the predisposing, as congenital malformations; consequently, its course is nearly direct, and the same as oblique, which see.

Its *diagnosis* is more easily made out. 1. It is more easily reduced, and goes straight through to the abdominal cavity. 2. It is harder to retain by trusses and bandages. Progresses more rapidly. 3. It comes out in a small, triangular space, bounded, *externally*, by the epigastric artery, the margin of the rectus muscle on the outer side, and the ilio-pubic ligament; its inner portion, below. This triangle is called the triangle of Husselmarch, and is immediately behind the external ring, with the conjoined tendon and the fascia transversalis intervening. The coverings are seven, as in oblique inguinal, and are the same in kind, with the excep-

tion of the conjoined tendon, which takes the place of the cremaster fascia. Then numbering them in the order of development, they are: 1. *Peritoneal* pouch or sac; 2. sub-serous cellular tissue; 3. fascia transversalis; 4. *conjoined tendon* (sometimes ruptured); 5. intercolumnar fascia; 6. superficial fascia; and 7. skin. The *spermatic cord* lies on the outer side of the sac, the testicle below the fundus, and both are distinctly separate. The epigastric artery also courses up *external* to the mouth of the sac, curving over it inward, so as to sometimes enclose the upper as well as the outer margin.

Seat of stricture. 1. at mouth of sac; 2. (when tendons are ruptured) at the conjoined tendons; 3. at the external abdominal ring. See Figs. 423 and 430 (Ashhurst).

In the female, oblique and direct hernia have the same anatomical relation, except the spermatic cord is substituted for the round ligament. The oblique occurs, as in males, very early, as we have seen, in life. Except umbilical, oblique inguinal is the only kind developed before five years of age (Gant, page 941), and until the age of puberty, is more common than any other variety. This form is now much more rarely met with than formerly, as generally supposed. Thus, in Mr. Ringdon's observations, made on all varieties of hernia, in 1582 cases 761 had inguinal hernia, and 812 femoral. Being thirty less than femoral, and femoral only being thirty, more than one half of those of inguinal.

The tumor of direct hernia differs in shape and size, as well as situation, from oblique; comes out near the root of the penis; globular in shape, not pyriform, as oblique, has a wider neck, and is not, generally, so large. Both may be double, an incomplete one on one side, and a complete one on the other.

Treatment of inguinal hernias, like hernias in general, consists in *palliative* and *curative. Reducible oblique inguinal hernia* is better adapted to the palliative, and some of the processes of radical cure, than any other. It is more difficult to reduce when it is incarcerated or strangulated, than any other, except, perhaps, femoral. Before resorting to any palliative treatment, the hernia should be perfectly reduced, whether it can be done by taxis, by *Suiten's method,* by position, or by an operation with the knife.

The Taxis.—The bladder and rectum being emptied, the patient is put on his back, hips raised, body lowered, head and neck bent on body, legs flexed on the thighs, and held close together with

toes everted to table. In this position the surgeon takes hold of the tumor at its neck with the left hand, and gently pushes and pulls downward, while the right, with the palm of the hand holding the tumor, pushes the fundus upward with a kneading motion, and the hernia begins to disappear with a gurgling sound, and finally slips from under the hand, leaving a hole that the finger may be put into. If the contents are omentum it will return with a jump, or jerk, or "flip flap" sound. If it be entero-epiplocele, we will have the two sensations combined; usually, the bowel is returned first. The pressure should always be made in the line of descent; and in oblique inguinal hernia it should be made upward and outward, along the line of the ilio-pubic ligament. In direct, it should be pushed downward and backward. When we fail with the taxis in the usual position, we may make the patient stand up, and standing behind him, seize the hernia, and push down with left hand, and press up with the right. A hernia may thus be reduced when it could not have been in the recumbent position, owing, perhaps, to the parts being put more in the position in which the hernia was developed. If the hernia be very large, or scrotal, the surgeon, standing behind the patient, takes hold of the tumor with both hands, and pulls downward, to release the hernia from around the orifice, and then with the ends of the fingers placed on the fundus, pushes gradually upward, while the body and palms of the hand make pressure downward. This failing, patient may be turned on the opposite side from hernia, and elevated to further assist the taxis by position. The same efforts may be again resorted to in this position, and will sometimes succeed after failure in the other. These efforts must be most gently and constantly continued for fifteen or thirty minutes, and these failing we may resort to rupture.

Baron Suiten's Method, of Brussels. He feels for the neck of the sac, and then insinuates the ends of the fingers between the sac and the walls of the orifice, and pushes and presses the ends of the fingernails up until he separates the sac from its attachment, and then returns the hernia. He is said to have succeeded in nearly all cases, and rarely resorted to any other for twenty years before his death. When there is much gas or serum in the sac it may be let out with an exploring needle, or small trocar. But it is evident that this process should be resorted to very cautiously, and only under the following circumstances:—When the hernia is large;

not very tender; of recent formation or strangulation; no vomitings having set up, especially vomitings from the intestines; no complete obstruction of the bowels. When it can be done under these circumstances it is a safe and judicious process, and will be attended with the best results. But, on the contrary, if the hernia be small, and very tender, of several days' standing, and stercoraceous vomitings have commenced, it ought not to be thought of, as the result may prove fatal, by tearing open the sac, and letting out the contents into the abdomen, bursting the intestines, returning the hernia unreduced, making the case worse for an operation. Failing in all these, if intestinal vomitings have not set up, we may resort to the use of adjuvants to the taxis, putting patient under chloroform or ether, and again trying the taxis. I have often succeeded in this way, when I could not without the chloroform. Failing under chloroform, and patient not yet suffering from intestinal vomitings or hiccough, with no great pain or violent distention, we may resort to the use of opium by the mouth, rectum, or hypodermically, as seems best, in the intervals of vomiting; apply ice in flannels or bladders over the tumor, and give injections of warm or cold water, whichever is considered best; or we may give one after the other, to more effectually excite the peristaltic action of the bowels. Purgatives should not be thought of if there be complete obstruction, and they are of doubtful character in any case, except as means of assisting the diagnosis, as we have seen; if the hernial contents be only omentum, the bowels are not necessarily constipated, and never, or rarely, obstructed; nor is the patient in much immediate danger. The cæcum or bladder may also be strangulated, and obstruction will not be complete. These efforts, continued a reasonable time, have succeeded in my hands when I have failed without them. *But when, and at whatever stage we find our patient laboring under the following symptoms, no further delay should be permitted, and an operation resorted to at once:* complete obstruction, stercoraceous vomiting, hiccough, great distention of the sac, much tenderness over the tumor, crackling, or œdematous feeling in the tumor, emphysema, and a quick, weak pulse, and hot skin; lastly, when the tumor is seized, as in taxis, and you can feel distinctly the contents of the sac come to a certain line, and then rebound. This last symptom is enough, of itself, to stop all further efforts, and demands a resort to an operation at once.

This may be performed in three ways. Shaving off all hairs, and putting the patient under chloroform, the surgeon proceeds, in the first method, to take up a fold of integument as far as he can, and then run his bistoury through it with the back to the sac, and cut straight out. This incision may be enlarged upward or downward as far as necessary, on a grooved director. The surgeon then takes a pair of tooth forceps, and hitches up a small fold of the coverings below, and with the point of the bistoury turned flat, cuts it open. Then taking the grooved director he puts it through this hole, and pushes it gently under it as far, either way, as the external incision, and raising it up, he feels, with the right hand index finger, for any artery, vein or nerve, that may cross it. If there is an artery or vein, it ought to be tied both sides of the groove, and then cut, to prevent any hemorrhage that might obscure the examination of the parts and interfere with the further incision. This being done, another layer is taken up and cut in the same way, until we arrive at the sac.

Now, at this point, there is matter of deep interest; and after taking in consideration the previous history of the case—all the symptoms and the general appearance, as now seen in the sac and through it—he must determine whether to open the sac before cutting the stricture, or to cut the stricture outside of the sac, and return it without examining the contents. We have fully discussed the points under the head of hernias in general, but we will repeat them here, as they are of the utmost importance. *Hernia large; of recent formation; no great soreness, and no ecchymosis of the serous coverings, and stricture outside of the sac.* In this condition it is thought safest to cut the stricture outside of the sac, as it does not expose the peritoneum. First performed by J. L. Petit, in 1718, and revived by Rareton, in 1750.

But if these favorable symptoms are not perfectly evident, the sac should be opened, and I believe this is the safest and best, after all, as we can sew up the old sac and make a radical cure, and we will be sure of avoiding returning the sac with the contents still adhered or strictured, or in a diseased or mortified condition. The sac should be very carefully opened by pinching up a small portion with a pair of forceps or a tenaculum at its lowest and most prominent point, and then cut with bistoury, flatwise. When this is done, more or less serum will pour out, sometimes as clear as water, but generally about the color of ordinary urine, making

the operator think he has penetrated the bladder, if he is inexperienced. This serum is sometimes mixed with blood, pus and fecal matter, and as I saw in one case, watermelon seed. When we find pus and foreign bodies in the sac, we may be sure the intestines have been ruptured, and it would not be safe to return the intestine. When this is the case, having fully exposed the contents and carefully examined them, to see if any portion is gangrenous, or any holes oozing out fecal matter, the bowels must not be returned, and I cut the stricture outside of the sac with a dull knife, and turn the sac so as to entirely relieve the stricture, but not to cut the line of adhesion of the sac to the orifice, lest fecal matter may burrow along this incision or it may give way and the intestine slip back so as to pour its contents into the abdomen. If the contents are in a state of hopeless gangrene, or sphacelated, they should be cut off with a pair of scissors, and an artificial anus formed. But if the contents have only a few spots of ecchymosis, or holes, the stricture may be cut and the contents still left in the open sac, after the process of Gerard, with a simple dressing and compresses. In this stricture the holes may close, and the contents, in a week or ten days, return sound. Gerard recommends this method in all cases where there is much congestion, and gives very favorable statistics of his cases. At least, the bowel should not be returned if the operator has any doubt about its soundness. When it is completely dead, or to speak more professionally, sphacelated, it must be cut off, up to the sound tissues, with a pair of scissors, and left to nature to form an artificial anus. I remember operating on a sailor, in 1863, a patient of the late Dr. N. D. Labadie, of Galveston, for a scrotal hernia, and when I cut down to the sac, I found the bowel mortified, and also the testicle perfectly black and cold; I cut it off and left the wound open, and the patient appeared to do well for four days, when acute peritonitis set in and the patient died. I believe the inflammation spread by continuity of tissue, down the cord, and thus involved the deep tissues. The artificial anus continued to freely discharge fecal matter. This case was purely lost for want of timely aid. I operated immediately on seeing his condition, but was too late. In the case I mentioned before, of Negro man, B., who had a very old hernia, that had often been strangulated and relieved by his attending physicians, two of whom were present when I operated, I found the sac much diseased, but as I had to

operate by a tallow candle, in an open cabin, I could not examine my patient well, so I returned the sac and the patient sank that night. Next morning I opened the wound and examined it, and as I said before, found a watermelon seed in the sac, and quite a number in the peritoneal cavity, and some pus and fecal matter. There were three holes in the intestines, one large enough to discharge the seed. The other portions were deeply ecchymosed, but in a condition to have been restored, if the holes had not been formed. I believe these were produced by long efforts at the taxis. Upon further inspection, I found the descending colon attached to its folds in three places, looking like the scars of a burn, showing it had been strangulated at three different times, and inflammation had progressed to adhesion before reduction. I also remember a case, in a post-mortem after typhoid fever—a case of old standing hernia—in which the omentum was attached to the ilium, and two adhesions between different portions, leaving scars like a burn.

I believe adhesions of this kind are of frequent occurrence, and are the cause of colic and symptoms of invagination, in cases of hernia. I remember, in 1871, being called by Dr. Goldman, of Galveston, to see a patient of his, a distinguished gentleman of Galveston, who suffered from severe colic pains, with nausea and vomitings, for nearly a week after the reduction of the hernia, causing very alarming symptoms, but, by anodynes and refrigerants, he made a good recovery. These were all cases of inguino-scrotal hernia, of long standing. It is thus evident that the surgeon cannot be too careful in his examination of the sac and its contents before he returns it, and if there be any doubt about the case, Gerard's method, of leaving the entire sac and contents still in position after cutting the stricture and applying a compress to keep it from enlarging should be adopted. This plan I have never adopted, but think well of it, and believe it is better than making an artificial anus at once; which may thus be avoided. When the bowels are in a condition to be returned, it ought to be done at once; wound cleansed well, and then brought neatly together with silver wire.

The plan I have adopted introduces the double spear-pointed needle, used for the radical cure of hernia, as seen in Plate IV, page 49. I put the threaded end down to the edge of the peritoneum, including about one-third of an inch, and then push it out, close to the line of incision, to the external surface. The

needle is then released by unthreading it, and needle taken out, leaving the wire in situ. The other end of the wire is then threaded, and needle carried through the opposite side from the peritoneum externally. Two, three or four wires are then put in, or as many as is needed to completely close the orifice; when they are all put in place the wound is closed by tightening and tying them firmly, making an interrupted suture of silver wire. When speaking of making the incision, I stated I always made my cuts straight, for the reason, I could better bring them together. I have used this method in two cases, the only ones I have had since the invention of my needle; both were perfect cures, and had no symptom of peritonitis while under treatment, and but little suppuration. I used simply morphine and sugar of lead lotion to the wound, covered with cotton batting and with oiled silk. In the first case I tried to pass the wires in with an ordinary surgeon's needle, but could not do it, and I sent home and got my hernia needle, and put the wires in to suit me, and the result was all I could ask. I have already mentioned two other cases, McKim Lea and a butcher, of Galveston, where the wound was sewed up with this needle in the same way, but was not put into the peritoneum, as it had closed fast around the strangulated parts that were cut off. Both, as stated before, recovered.

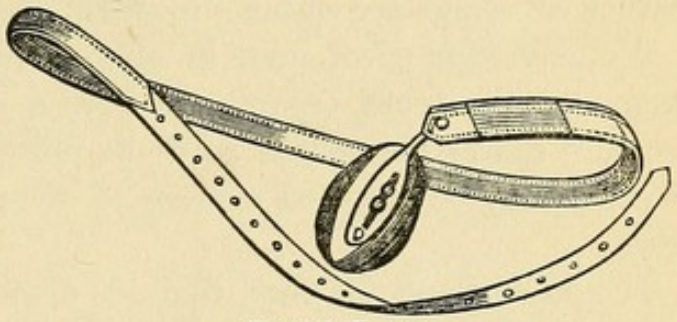
Before leaving the subject of the operation by incision for the reduction of a strangulated hernia, I will mention certain peculiarities attending the operation. First, in the funiculatic hernia (or "encysted," or "impacted," as usually called), the operator will meet with three folds of the peritoneum before reaching the contents, and the testicle will be in one sac and the hernial contents in another, and the testicle will be anterior to the hernia. The operator ought always to bear this in mind, and it may be well to diagnose this condition by the symptoms before given. If it be the oblique inguino-scrotal hernia of congenital formation, there will be only one sac, as we have seen, and the contents of the sac will lie over and with the testicle in the same covering (see Fig. 34, page 90). In hernia by diverticulum, you will find a sac protruding from the body of the intestine as an aneurismal sac on an artery (see example, Plate III, E, page 17). This must not be opened, but a ligature put in at its base and firmly tied, and the ligature be brought out at the incision and there confined until it cuts out and effects a cure, the wound being firmly closed around it as before.

The forms of *infundibulatic* and *ligamentatic*, in the female, are treated in the same way as the male. The only difference being that the round ligament takes the place of the spermatic cord, and the labial form that of the scrotal in the male.

THE RADICAL CURE OF REDUCED INGUINAL HERNIA.

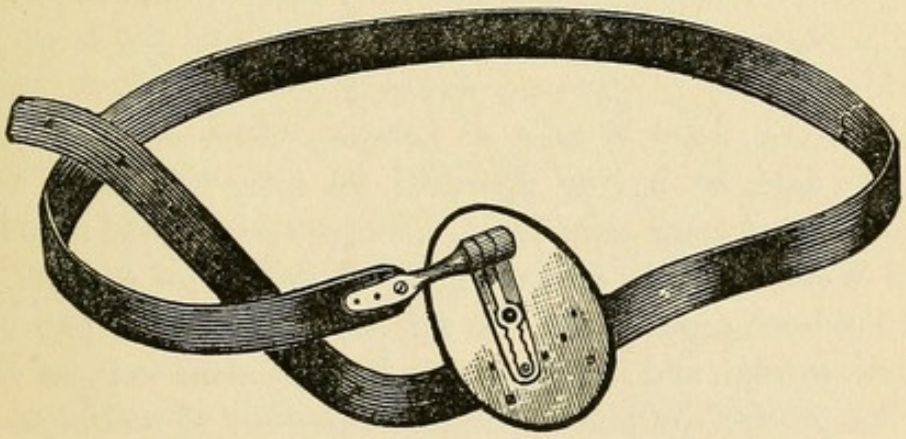
Having reduced the hernia, and the patient recovering from the inflammation, it then becomes a subject of consideration whether we shall resort to any means to effect a radical cure, or leave our patient to a palliative treatment with bandages and trusses. We do not propose to repeat what we said under "General Hernia," but to make remarks upon the principle to be adopted in curing inguinal hernia of the oblique variety, especially the congenital. Where the two rings are not dragged into one, we may effect a cure by a well-fitting truss, with little more than ordinary pressure. The French truss, Fig. 35, and Pomeroy's double-pad truss are among the best; Sheldon's next; Sherman's patent, Fig. 36, is perhaps the strongest, or

FIG. 35.



French Truss.

FIG. 36.



Sherman's Truss.

Hood's, with two pads, one for keeping up the hernia, and the other for supporting the opposite side (See Fig. 20, page 33). This should be worn constantly, night and day, if possible, and if it cannot be worn at night, it should be put on always before getting out of bed in the morning; should not be taken off while in bath,

or especially while swimming. Those who swim or take baths should provide themselves with Seeley's or Riggs' trusses, covered with hard rubber, or celluloid (see Fig. 8, page 27). They make them of all patterns, but coat the springs and pad with hard rubber; in fact, the pad is made of hard rubber, water blown to the desired shape and size. This india-rubber or celluloid coating is specially applicable to warm climates, and persons working in furnaces, blacksmith-shops, and other places where laborers perspire freely. They will last longer, and be more cleanly than any other, except those thoroughly galvanized. No leather pads or leather coverings are suitable to warm climates.

We may often effect cures in oblique inguinal, scrotal, or labial hernia, by the truss, because we have a surface to press on, and pressure causes the serous coats to unite and close the opening. No cure may be expected in cases of direct inguinal hernia by the truss.

The other plans for cure, that are alone adapted to this variety and that of femoral, are all the plugging and invaginating processes which we have mentioned in the section on hernia in general, as Gerdy's, Wurtzer's, Rothmund's and Meyer's. As these have been almost entirely abandoned by surgeons, we shall not speak more of them here. Next in order is Prof. Agnew's, a combination of plugging and ligation. His success has been worthy of further continuance, and is far superior to any of the others just mentioned, but need not be repeated here, any further than to say it is only applicable in oblique inguinal and femoral, and can do no good in any other. This is quite an advance over the others, but not preferable to Dr. John Wood's, of London, which also has precedence as to date, he having operated on sixty-two cases before 1862, and Prof. Agnew commenced his operations about that time. Dr. John Wood's process we have given in full under general hernia, and need not repeat here, but will say it is adapted peculiarly to inguinal, scrotal, and labial hernias, but not alone to these varieties, as his process by pins is suitable especially to umbilical and ventral, as well as inguinal hernias. His process by pins is far better than Beckwith's with needles and hare-lip sutures. This process scarcely deserves the notice I have given it; but as other experimenters might try it, I did not think this treatise would be complete without it. To advance in any science one should be familiar with all that others have both done and attempted to do.

Failures are as valuable as successes, and anything that carries plausibility with it should be noticed. There is no question in my mind, but that the report of Wurtzer's operation gave a new impetus to the study of the radical cure of hernia, that has brought forth such good results that we may hope to cure all cases.

The next improvement, as we think, is the process of Dr. Thomas Wood, of Cincinnati; but as he only reports three cases, little can be said about it; and as he has not illustrated his process, I do not believe any one fully understands it. I will say, however, that notices of his process gave the author aid in inventing his needle, though I never saw the original article until recently, when I found it in the library of the American Medical Association, vol. IV, in Dr. W. B. Atkinson's office. I have most of the volumes, but this number was burned up, and is very scarce; I do not know that it can be found anywhere else. I will not repeat what I have said before, nor re-quote him here; see page 46 and re-read it. His process seems to me to be only applicable to oblique inguinal hernia, where the rings are not interfered with, and, consequently, limited to a comparatively few cases.

The author's method is well adapted to inguinal hernia, oblique, or direct, as well as all others of external character. We refer to Plate IV, page 49, for illustration, and copy in full the case of Josiah Overton, from the *Galveston Medical Journal*, as this was the first case operated on with the present needle, and according to the method adopted then, and the one used June 26th, 1872, at Philadelphia Insane Asylum. See report of cases, page 58 (Josiah Overton, case of reducible inguinal hernia, operated on by me at City Hospital, by the subcutaneous silver-wire suture, performed with the double spear-pointed, semi-circular needle).

As we stated under general hernia, we think this process adaptable to all cases, and attended with scarcely any risk. Read again the report of the cases treated.

FEMORAL HERNIA IN MALE AND FEMALE.

Symptoms.—The general symptoms are the same as in all hernias, but it may be readily made out by its position. It passes *always* under the *ilio-pubic ligament*, and usually to the inner side, or as I usually say, to the *median side*, or middle side, of the femoral vein and nerve, and in its sheath, burrowing under the

ligament, and pushing the fascia propria crurialis (septum crurabile) before it, forming its own sac out of a depression of the peritoneum, or passing on down to the inner, or median side, comes out below the falciform process of the fascia lata of the thigh, in the upper portion of the *femoral triangle* (Scarpa's), into the saphenous opening, and pressing before it the cribriform fascia, makes its appearance outward in the femoral triangle, and turns upward to the ilio-pubic ligament.

The tumor is usually small in comparison with inguinal hernia, and is often found in its incomplete form, the hernial knuckle lying in the canal between the fascia propria and cribriform fascia, and may be mistaken for an inflamed lymphatic gland, a psoas abscess, an enlarged varicose vein, or an aneurism of the femoral artery. These can be diagnosed by reviewing the tables, pp. 91, 92. Sometimes the sac forms under the sheath of the vein, artery and nerve, and divides them, and again it passes between the nerve and ligamento-iliac ligament (Hay's ligament), to the outside of the femoral sheath, and again it passes through the ligamento-pubic ligament (Gibernat's ligament), and passes down on the ramus of the pubis. These peculiar positions should be borne in mind when we attempt to incise for strangulation.

Causes are the same as those of inguinal hernia, general and special. The principal predisposing cause is the relaxation of the femoral opening, as the patulence of the spermatic cord in congenital inguinal hernia. *Sex* seems also to have some influence on this hernia, as it is as common, if not more so, in the female than in the male, and is more common in females than inguinal, and next to umbilical, according to my experience, umbilical being the most common of all hernias in females, and femoral next. It rarely occurs before the eighth year, while inguinal and umbilical are often congenital. The tumor, when not strangulated, can easily be reduced, and leaves a hole the little finger can be pressed into. This form of hernia is more liable to strangulation, owing to its anatomical relations, and the confined space through which it has to pass, and the impossibility of the neck becoming much dilated or expanded.

Diagnosis, from inguinal hernia, is very plain, as it always comes out below the ilio-pubic ligament, and never above. I have entirely excluded all such names as inguino-crural hernia from this treatise, as there cannot be such a thing, taken anatomically; and

our representations should be founded as much as possible upon anatomical relations. I have also defined the variety that comes out immediately at the saphenous opening, *crural*, from *crus*, *cruris* (see plate I, Fig. 1, H, page 13), and that which forms lower down in the femoral triangle, *femoral*.

This is truly an anatomical division, and will be strictly adhered to in this treatise, as will appear in our division of the body. When the hernia, passing under the femoral sheath, reaches the femoral region before it begins to protrude, it is called *emphatically femoral hernia*, from femur, the thigh. See plate I, Fig. 1, I, page 13.

Prognosis is unfavorable in these cases, as it is so liable to strangulation, and so difficult to keep up by a truss, being much more difficult to properly fit a truss on. Any tenderness in this region should be at once attended to, and no impaction or incarceration of the intestine should be permitted. My experience in this variety would lead me to believe that the contents of the sac in most femoral hernias is omentum-epiplocele, or in the female, ovarian. Where the hernia is epiplocele, it will, when strangulated, suppurate, and it is next to impossible to distinguish it from psoas abscess, unless by its previous history. This hernia is usually slowly formed, rarely ever suddenly, and hence the still greater difficulty in distinguishing it from a suppurating bubo, or an abscess, and its long canal does not allow of much fluctuation in coughing or straining, and this may be, and often is entirely suppressed in strangulated femoral hernia. *Spontaneous cures* are sometimes made of these hernias from suppuration, where the *omentum alone is involved*. I remember one case in particular in the City Hospital, 1866, that made a complete and effectual cure. But in the same year there was a most disgusting and deplorable case of rupture of the cæcum in a femoral hernia, that nothing could be done for; after his admission the fecal matter poured out below the saphenous opening, and burrowed down even to the lower third of the thigh, dissecting up and separating all the muscles. Patient finally died, from pain and exhaustion.

Coverings of femoral hernia depend upon the different varieties we have given, but of ordinary *complete* femoral hernia, are from within out: sac (1), or peritoneal covering; crural septum (2) or fascia propria crurialis; crural sheath (3); cribriform fascia (4); superficial fascia (5), and skin (6).

Its *relations* and *boundaries* are, above ilio-pubic ligament, below body of os pubis, and sometimes above the femoral sheath, and again below it, but usually to the median side. Median or inner side, ligamento-pubic ligament (Gibernat's); outer side, ligamento-iliac ligament (Hay's). The special forms will be recognized by their names as follows:—

1. Pectenial crural or hernia of Cloque, where the hernia after passing down turns inward under the femoral vessels, and lies on the pectenius muscle.

2. Hernia through the ligamento-pubic ligament (Gibernat's), or hernia of Lougier.

3. *Hernia by diverticulum through the cribriform fascia* (Hesselbach's hernia). It assumes a lobulated form, by coming out at several openings in the cribriform fascia.

4. Hernia by diverticulum through the superficial fascia or hernia of Cooper. Lobulated like the last.

5. *Hernia external* to the *femoral vessels*, or that described by Partridge.

Usually the femoral vein lies to the outer side of the hernia, and almost immediately connected with it, only separated by a septum of the crural sheath.

The epigastric artery is above and to its outer side. The spermatic cord lies nearly immediately above it, on the median side.

The *obturator artery*, when it arises from the external iliac, common femoral, or epigastric artery, instead of its normal origin from the internal iliac, descends to the outer side of the crural ring, to reach the obturator foramen, and rarely passes along the slim border of the ligamento-pubic ligament (Gibernat's), where it would almost completely encircle the neck of the sac.

Where the hernia escapes to the outer side of the femoral sheath (Partridge's hernia), the *circumflex iliac artery* lies to the outer side of the sac.

TREATMENT OF FEMORAL HERNIA.

The palliative treatment consists in a truss with a fusiform pad and a peritoneal strap (see Fig. 21, page 33). The spring extends around to the spine, and there it has connected with it a leather strap or band, carried around the body above the opposite hip, and fastened to the pad in front. The perineal strap keeps it in place, and it is peculiarly useful in those who have to make quick and

varied motions, as marines, cavalrymen, sailors and laborers. Sudden movements or twisting of the body do not relinquish its grasp upon the orifice. Hirsch's elastic trusses (Fig. 13, page 29), are also useful in these cases, and when well put on, are probably more pleasant to the wearer than any other, and have the advantage of being able to be worn at night as well as day, which is so important in effecting a radical cure. We cannot hope for much success in a radical cure in this hernia, owing to the juxtaposition of the femoral vein and artery on the outside, and the spermatic cord on the median side, which prevent our making any severe pressure, or pressure of any extent; we must, therefore, rely on one or the other of the following processes: *Wood's*, with *wire*; Jamison's or Davies', with plugs made out of flaps; Gross' *direct* method, or the author's. All of which are adapted to this form of hernia.

In using the author's process in femoral hernia, particluar attention should be paid to the following: Bowels should be well moved before operating; bladder emptied; the needle should always be started in first position (see Plate I, A, page 49), from the median side, and in second position, should be careful not to inclose the femoral vein, artery or nerve; the ligature should be put up as high and as close to Poupart's ligament as possible, and others put lower down until completely closing the orifice. The needle should be well curved in the median side, so as not to include the sheath of the vein and artery. In any of the anomalies, I think the direct method is the safest, and should be resorted to without fear or dread, and the incision closed with silver wire, carefully put in, so as not to involve any of the important relations described.

Herniotomy.—Gay's method. He makes an incision about an inch in length on the median (*inner*) *side* of the tumor, near the neck of the sac; then cautiously divides the various tissues, until a concealed bistoury can be inserted between the neck of the sac and the inner margin of the crural ring. The edge of the knife is then turned towards the pubis, when, by projecting the blade, the stricture is cut. This was the popular method of Sir William Ferguson and he rarely used any other. He used instead of the bistoury caché, the common hernia knife.

Obturator Hernia.—This rare form was first described by Garengent. The hernia passes through the obturator foramen (see Plate I, H, page 15) and comes out and forms, in some cases, a round tumor in the femoral triangle, though in other instances not

the least tumor has been seen or felt, it being covered up with the adductor muscles. It is more common in females than males, dependent on the increased size of the pelvis and the enlargement of the uterus in pregnancy, or the pressure of an ovarian tumor. The sac (which usually contains the bowels) is small. It is gradually developed. It is often complicated with crural or femoral hernia, and sometimes it is double, occurring in both sides in the same patient, as reported by Hilton. Its position may usually be defined by the femoral vessels, as it lays behind and a little to the inner side, and under the pectineus muscle, and outer side of the tendons of the adducter longus muscle.

The *symptoms* are those common to other hernias, and when it can be seen and felt is easily made out, but when it cannot be seen or felt, we may be governed by the nature and seat of pains, and the general symptoms of strangulated hernia.

The Causes.—Independent of those that are common to hernias which we have just given, are, pressure of the womb and ovarian tumors, there may be added, in the female, anteversion and prolapsus of the womb.

It is *diagnosed* from femoral hernia by its position in relation to the femoral vessels. In femoral the hernial sac is anterior or over the vessels, while in obturator it is posterior or under. When no tumor is perceptible, the hernia may be diagnosed by the following symptoms, assisted by the general, as given above: 1. The patient has frequently, before, felt colicky pain in the pelvic region, suddenly relieved by something slipping away. 2. Strangulation is often preceded by severe pain in the upper portion of the thigh. 3. Cramps of the abdominal muscles more than pain in the abdomen, produced by reflection of the obturator nerve. 4. Pain in the course of the obturator nerve, considered by Houship very significant, and is increased by rotating the thigh outward, thus putting the obturator muscle on the stretch, thereby compressing and irritating the inflamed neck of the sac. 5. Pain may be elicited by pressure on the one side, and not the other, unless (which is very rare) the hernia be double, along the canal of the obturator outlet. 6. Pain may be elicited by pressing on the pelvic side through the vagina or rectum.

Treatment.—The taxis should be tried, but if this fail, an exploratory incision should be made downward from the ilio-pubic ligament, about three inches in extent and outside of the femoral

vessels, dividing the pectineus muscle, and cutting in two the obturator muscle carefully, or tearing the muscles with the handle of the scalpel or director. Below this the hernial sac will be seen. The stricture should then be carefully divided from below upward.

Mr. Burkett gives the history of twenty-five cases of *obturator hernia*, as follows:—

In fourteen cases the nature of the disease was not discovered until death. In one case the symptoms disappeared without treatment. Ten cases were recognized during life, and were submitted to treatment; four recovered and six died. The taxis succeeded in one case. Herniotomy was practiced in six cases; three recovered and three died. Gastrotomy was performed in one, but the patient died. An artificial anus was formed, but the patient died the day after, from gangrene. I think this is a very rare form of hernia, as I have never seen a case.

INFERIOR HERNIA OF THE PELVIC REGION.

(a.) *Perineal Hernia.*—The tumor protrudes in the peritoneum, and usually appears between the prostate gland and the rectum in the *male*, and between the rectum and vagina in the female, but occurring on one or the other side of the anus. The contents are usually the intestine, and it is easily reduced. It is more common in the female than the male, but the *symptoms* are the same—a fullness and bearing-down sensation in the pelvis. The tumor may be easily felt from the rectum, and in females from the rectum and vagina. The *causes* are pressure at stool, falls and injuries in this region; and in females, pregnancy and ovarian tumors. The *diagnosis* is very easy, and it can hardly be mistaken for any other tumor, though a retroverted womb might give some trouble to the inexperienced.

Treatment.—It can be kept in the pelvis with a truss of Hirsch's, shown in Fig. 11, page 29, or with Seeley's hemorrhoidal truss, slightly modified by enlarging its point to the shape of a glass speculum. It may also be kept up with a compress and a T bandage.

Radical Treatment.—Direct incision should be resorted to at once, and the sac well sewed up with silver wire. This is often done in pigs, and I never knew one to die from it. It is safe, and if well done, will make an effectual cure and save your patient from a great deal of trouble and pain. The *coverings* are only the skin,

superficial fascia and peritoneum. The point of stricture is the deep peritoneal fascia.

The author's process is also adaptable to the radical cure of this hernia, care being taken to well curve the needle so as not to catch any fold of the rectum or bladder in the male, or the vagina and rectum in the female, which can be easily done.

(b.) *Pudendal Hernia*—or hernia in the lower portion of the labia. It can only occur in the female, and descends between the ramus of the ischium and the vagina to the lower portion of one of the labia majora.

Symptoms.—It forms a rounded tumor—is easily reduced; sometimes of considerable size; is not often strangulated; has usually intestine, but may be *vesicocele,* from the inclusion of the bladder, which can be ascertained by the use of the catheter to draw off the water, and the finger in vagina. It is usually *diagnosed* from inguino-labial by its position at the lower part of the labia, by its round form instead of the pyriform shape of the inguino-labial, and from its being parallel to the axis of the vagina, and from femoral hernia from its position along the ramus of the ischium—this alone *being external* to the sac in pudendal, and *internal* in case of crural hernia—and from other tumors, such as abscesses in cases of syphilis, hæmatocele from bruises, and may be diagnosed by the principles laid down on page 92. Prognosis, so far as fatal results are concerned, are favorable, but unfavorable as to a radical cure, and palliative treatment is difficult to apply. The best is Hirsch's Elastic Truss, Fig. 11, page 29, or a pessary of sponge. I saw a very bad case in which it came out, and could not be retained by anything but a sponge pessary. I took a sponge of the proper size and covered it with two layers of oil silk, and inserted it in the vagina, which kept it in place while the patient was quiet, but it would return when anything heavy was lifted.

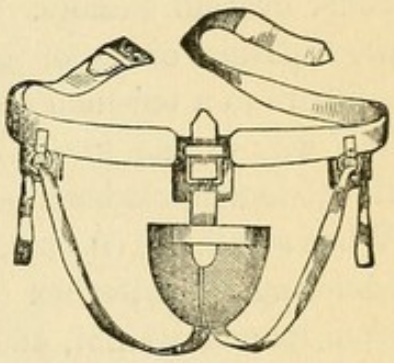
The *coverings* are skin, superficial fascia, deep fascia and peritoneum.

In strangulation, the stricture is usually at the internal orifice, in the peritoneal fold, between the bladder and uterus. When it is strangulated, and an operation becomes necessary, the stricture should be divided inward, to avoid the artery.

Vaginal Hernia.—The tumor may form in the anterior or posterior side of the vagina, and fill the vagina, and press on the one side of the bladder, producing constant micturition, or the rectum,

producing tenesmus. It may press so strongly against the urethra as to produce retention of urine. It generally fills the vagina, is soft, and easily pushed back, if the patient be on her back and the hips well raised. The *causes* are the same as in other pelvic hernias. Diagnosis is simple, and the case easily made out by vaginal examination, assisted with catheter and finger in rectum. Prognosis unfavorable as to a radical cure, it being next to impossible to reach it; if it could be reached, the direct method by incision might be performed, and the wound closed with Sim's suture, which I would certainly recommend, when it can be done. The palliative treatment is an abdominal supporter and a Hirsch's vaginal truss. (Fig. 11, page 29), or that shown by Fig. 37. The catheter must be used where the urine cannot be voided.

FIG. 37.



Vaginal Truss.

Ischiatic Hernia forms a tumor in the region of the ischiatic notch, and under the gluteus maximus muscle. It passes through the sciatic notch (Plate II, E F, page 15), above or below the pyriformis muscle, usually below, between it and the spine of the ischium, lying in close connection with the sciatic nerve and the internal iliac vessels. The tumor extends outward, and opens subintegumental below the border of the gluteus maximus muscle.

Symptoms.—The tumor is of variable size, causes more or less pain from its pressure on the nerves, and may produce cramps in the muscles, and neuralgia from pressure on the sciatic nerve. It is reducible, and this assists in *diagnosing* it from other tumors in this region. The *prognosis* is favorable in its reducible condition, and it may be kept up with an elastic bandage and compress, as shown in Fig. 13, page 29. The compress is placed under the elastic bandage, and sewed to it to prevent its slipping away.

The *operation* for *strangulation* is difficult, as the incision has to be large, and the gluteus muscle dissected up and turned inward, and the parts carefully cut on a director, feeling for the pyriformis muscle, which must sometimes be divided. The neck of the sac being exposed, the stricture should always be cut toward the anterior median line, to avoid the nerves and arteries. It must be carefully examined, and if sound, returned, and the internal orifice closed with a silver ligature cut off close, or ligatures may be

brought out in the lower line of the incision. The external wound may be then closed with silk or silver ligatures. The wires should be untwisted and taken out on the eighth day, or they may be left in and cut off close after the external wound has closed.

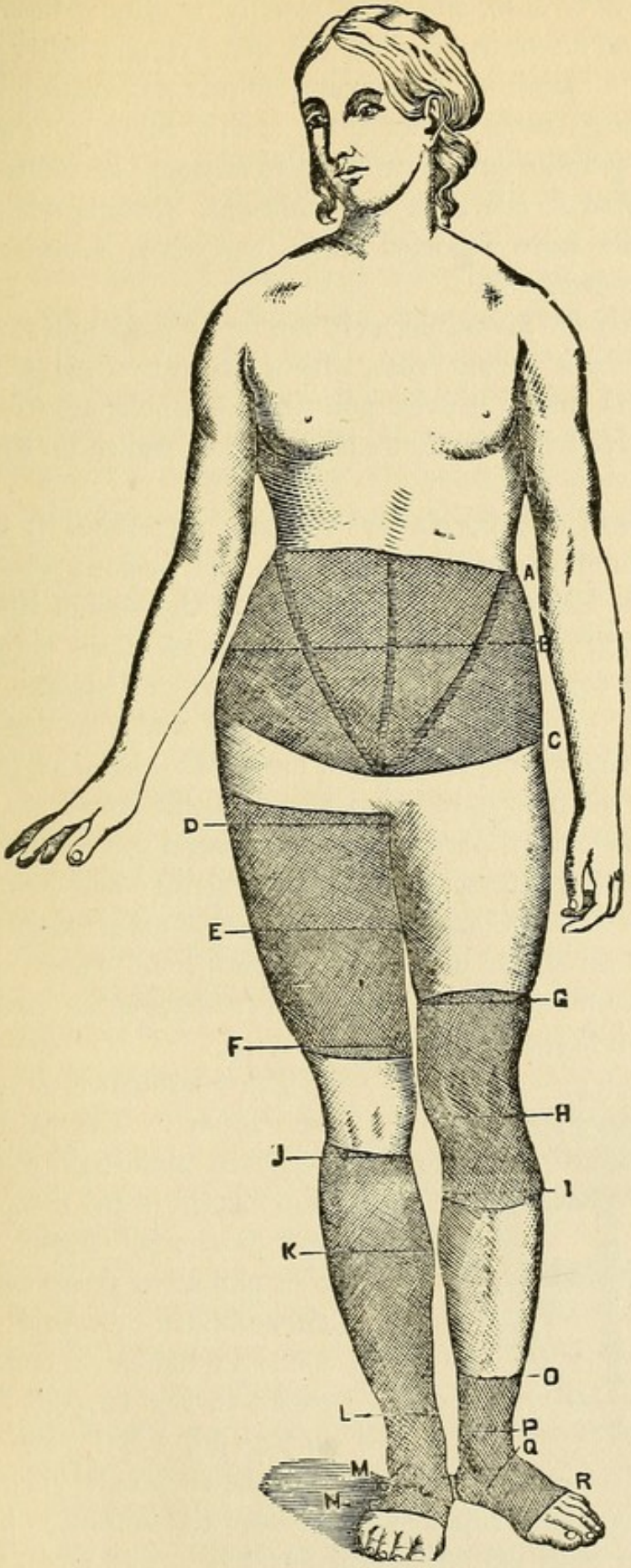
HERNIAS OF THE MESOGASTRIC REGION.

See Figure 30, page 85. These are: 1. Umbilical. 2. Ventral. 3. Lumbral.

Umbilical hernia is known by its position at the umbilicus (see Plate I, D., page 13). It is often congenital in both male and female children. In adult life it is much more common in females than in males, especially in child-bearing women, and those who are laboring under ovarian tumors. Ascites in the male and female is often a predisposing cause of great effect. It is of various sizes, from a filbert to a ten-inch sac, (see Fig 5, page 19), and it often reaches half way to the knees, carrying with it nearly all the contents of the abdomen, stomach, spleen, and even the kidneys in some cases. When small, the contents are most invariably omentum or omentum enclosing the intestine. It continues to increase with exercise and from its own weight, and every pregnancy enlarges it.

Causes.—Congenital deficiency is the principal cause; not tying the cord close enough at birth; not putting on or keeping on a proper bandage after the removal of the cord; and afterward by crying, *coughing*, *sneezing*, *laughing*, and stooling, one of the principal causes in children; and when once formed, these all tend to increase it. It is often complicated with ventral hernia. I saw a large umbilical hernia in a female with six ventral hernias, having been called, with several other physicians, to examine the patient, who was a negro slave, and had been sold as sound, but upon examination was thus seen to be affected. This was the most remarkable case I ever saw of umbilical hernia. The umbilical alone was as large as a child's head. The woman, who was pregnant at the time, had the abdominal muscles completely riddled with ventral hernias. They seemed to protrude everywhere. She stated her umbilical hernia was congenital, but not bad until she began to bear children, when it began to increase, and others to form. She wore a duck abdominal supporter made by herself, which seemed to answer every purpose. Her general health did not seem to be affected by it, and she had done ordinary field work as any other hand. The diagnosis is early made out and the

FIG. 38.



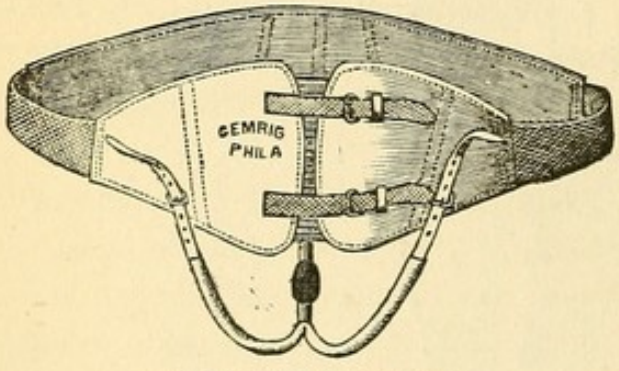
Supporter for Umbilical Hernia, A, B, C.

tumor can always be seen, and, most usually, readily reduced. It is said to become, often, irreducible, but this I cannot believe, as I have never seen a case in either hospital or private practice, and I am now old enough to be authority on such a subject. Twenty-five years' close practice in the rural districts would certainly have given me one, had it not been very unusual; though nearly all writers on hernia have reported cases, and they, therefore, do unquestionably occur.

Prognosis is always favorable, as it can be reduced, and kept reduced, if small, by a spring truss, with a broad concave pad, (see Fig. 18, page 31), and a convex point in the centre, or, which is perhaps better, Hirsch's elastic umbilical truss, shown in Fig. 12, page 29.

The *characters* of this hernia are various; sometimes it comes out in the old umbilical cord, separating it, and pushing the peritoneum before it. Again, it will come out at the side of the umbilicus in a sort of slit, and press open the fibres of the transversalis muscle, and separate the two recti to a great distance. The epiploon (omentum) completely covers this space, and is most usually pushed through the opening. It could hardly be otherwise, but by distention this is often ruptured, and the intestine comes immediately up to the abdominal peritoneum, and pushes it before it, with the deep and superficial fascia (here almost together and combined into one) and the skin. Consequently, the *coverings* are only four, and usually only three can be seen in an operation. The tumor is transparent in recent cases, but becomes more opaque as pressure ceases, and lymph is thrown out.

FIG. 39.



Abdominal Supporter.

The *treatment* is palliative or curative. The palliative has been indicated, to a certain extent, in the symptoms and diagnosis. Perhaps the best palliative treatment for an umbilical or ventral hernia is the abdominal bandage, shown in Fig. 12, page 29, or in Fig. 38, A B C, page 115, and Fig. 39. This gives a firm support to the entire abdomen, and by adhesive straps, and a small compress over the umbilicus before this is applied, is both palliative and curative. The patient can always be made comfortable and useful with this apparatus.

The radical cure is easy by the author's process, and is easy of application. I have, as before shown, cured the only two cases treated; see report of child, page 55. I give below the history, taken from the *Galveston Medical Journal*, of the first case operated on with the present needle, and the manner in which I now perform the operation. Report made by Dr. C. H. Wilkerson:—

"Elizabeth Russell, Irish, aged thirty-five, applied for treatment in St. Mary's Hospital, Galveston, Texas, August 20th, 1869, for an umbilical hernia that had lasted for ten years; caused by lifting; appeared suddenly, and caused great pain at the time; it has now increased and enlarged to about the size of an orange; is now (August 20th) about the size of a walnut, and evidently contains omentum. Collodion, tannin, bandages and trusses had all been tried, but all failed to do any good, and she therefore consented to an operation for a radical cure. Operation performed by Prof. Greensville Dowell; needle threaded with silver wire without lines." See page 60 for full account of case.

The irreducible umbilical hernia should be kept up with an elastic bag-truss or bandage, made to press down but not around the neck of the tumor, which may be of various shapes, as conical, sessile, pedunculated, etc. These conditions should always be taken into consideration in preparing a support of any kind.

When strangulated, the operation may be performed in any one of the three methods; by cutting from within to without, by a fold, direct through the skin to the superficial fascia, when the other coverings must be very carefully raised and cut, as fully described before, using, always, the grooved director. The sac being reached, and no adverse condition being indicated, and the strangulation being recent, hernia large, no stercoraceous vomitings or hiccough, the stricture may be cut outside of the sac, and directly upward, on the flat director, or guided by the finger.

The external incision may be made on the side of the tumor or above it, in a transverse line; it may be made small, only about an inch, and Gay's operation performed by cutting the stricture subcutaneously, and the sac and contents returned. These plans must be selected according to the judgment of the operator, and strictly in accordance with the principle laid down. The hernia being reduced, the surgeon should close the wound with deep silver-wire sutures, put in so that no possible enlargement of the tumor can

return. This will most always effect a radical cure; and Wood's pins are also quite efficient and useful in this hernia.

Ventral Hernia.—It may form in any portion of the abdominal wall, and the varieties denominated lumbral, epigastric, hypochondric, are all of the same nature, and are, really speaking, ventral hernias of different locations, which are important, as the coverings are different, or rather the connections are different in the different positions. Hence we now limit ventral hernia to the median line and all between it and the semicircular line, above and below the umbilicus.

The symptoms are the same as those of umbilical hernia. The tumor is not nearly so large as umbilical, and it is rarely congenital, usually traumatic, from a punch, hook, or incised wound, and burns. I saw, as before stated, when speaking of tobacco injections and their danger, the negro woman, Briggs, who had a large burn just to the left side, and about two and a half inches above the ilio-pubic ligament. The hernia was large, about the size of a small pig, and looked, before the post-mortem, like a pig in the skin, and between the skin and abdominal wall. Strangulation had taken place by impaction the day before, and it became very painful. Two physicians were called, and they failed to reduce it. They gave her a tobacco injection and sent for me; before I arrived the patient was dead; the body was not cold. It was desired I should make a post-mortem, which I did, after sending for my instruments. I did not find any adhesion nor any serious inflammation. The contents were much congested, but in a condition to have been returned. I reduced the tumor without cutting the stricture, which evidently showed, to my mind, the cause of death was tobacco injection. I therefore recommend them never to be used. The only thing that is admissible is tobacco steeped in ice water and applied externally. This will be quite active enough, and will produce nausea and vomitings in the patient. This patient might have been relieved by the hydraulic syringe, as the sigmoid flexure of the colon was in the sac, with nearly all the ilium. The opening was of a very irregular shape, and in two departments, connected by an open space, in which hung the mesentery.

The incision for strangulation may most usually be made after Gay's method, and the stricture cut subcutaneously. The incision is best made inside of the median line, or transversely, according to the course of the muscles.

Lumbral hernia occurs in the lumbral space, between the crest of the ilium, and up to the small ribs. It comes out at the inner line of the quadratus lumborum muscle, or through its body.

It is usually produced by wounds, either gunshot or incised, sometimes by deep-seated abscesses.

The symptoms are the same as in ventral, and it requires the same treatment. The contents are usually the colon, and when it cannot be returned, the artificial anus ought to be made on the non-peritoneal or posterior and outer side of the colon; hence, in operating for strangulation, the incision should be made with reference to this anatomical condition.

HERNIAS OF THE EPIGASTRIC REGION.

See Plate I, *A*. These are external and internal. The *external* are epigastric, right and left hypochondric; *internal diaphragmatic*, right and left.

Epigastric hernia is easily known. A small tumor forms just under the ensiform cartilage, or a little to the right or left of it. It is reducible, and has but four coverings: skin, superficial fascia and deep fascia, often congenital from malformation, as hare-lip, and spina bifida. When reduced it easily returns, and leaves a well-defined hole.

Causes.—These are sometimes congenital, and are very rare in those who are well formed, except it be produced by a kick, push of plow-handle, rake or hoe, a hook of cattle, or wounds in this region.

Treatment.—It can be easily retained with an umbilical truss or an elastic bandage. It does not produce inconvenience, and is not very liable to strangulation unless large. The contents are usually portions of the omentum, stomach, small intestines, and the mesentery; hence, patients suffering from it are liable to indigestion, cardialgia, and flatulency. In operating for strangulation, the stricture should be cut upward, to avoid the epigastric arteries.

Radical Treatment.—It can be cured, either with Wood's pins or the author's process. It is well adapted to the author's process, and it is readily and easily done, the ligatures put in line over the opening, and tied above a piece of cork or soft wood, covered with adhesive plaster.

CASE 16. Mr. Huffman, Lebanon, Collin Co., Texas, 1872. Epigastric hernia. Opening very small; had been twice strangu-

lated. Operation by "subcutaneous suture" (see Plate IV, Fig. 2, page 49), Dr. Shelburn giving chloroform. The opening was so small that the end of the little finger could not be inserted to guide the needle; but two sutures were put in and tied over a piece of soft wood, covered with cloth. The stitches were kept in eight days. Patient remained cured for one year, but it returned after a spell of vomiting from dissipation. Mr. H. says it has done him a great deal of good, as he can keep it up with an umbilical truss, which he could not do before. Intends to be operated on again.

Hypochondric Hernia is the same as lumbral, only the quadratus lumbarum muscle is not involved. Its *coverings* are skin, superficial fascia, external oblique, internal oblique, and transverse muscles, deep fascia and peritoneum. The stricture is usually at the mouth of the sac, and where the transverse muscle covers it. The incision may be made to the side, above or over the tumor, generally along the neck, transverse is the best, and the stricture cut upward. The opening of the sac is governed by the rules so often mentioned before, and not necessary to repeat here. The *prognosis* is favorable.

Diaphragmatic Hernia.—There are several varieties of this; first, where the tumor passes through the œsophageal opening, as seen in Plate III, C D, page 17. Where it passes through the opening for the ascending vena cava. It occurs also congenital (see Sir Astley Cooper's work, by Hey), but is most usually produced by wounds, gunshot or incised. The contents are usually the stomach and omentum, but large portions of the jejunum have also been found in some cases. It presses on the lungs, causing cough; and it passes through the diaphragm, and causes constant hiccough. In traumatic cases, blood is usually expectorated in the first stages.

Symptoms are usually obscure and hard to define. There is more or less pain at the neck of the sac, but its radiation is so great it is hard to localize it. Usually there is constipation, with vomitings of bile, mucus, and streaks of blood. When it is from a wound, it will generally assist us in the diagnosis, and its position can be defined. When the lungs are involved, we can tell which side the hernia is, and usually its size, by percussion and auscultation. There is a depressed feeling from the first; anxious countenance—indicating general distress. Pulse weak and wiry; some fever; much thirst, with a dry tongue; hiccough depressing; patient finally wanders and dies comatose.

Causes.—We have already given these; malformation was the cause in a child, given by Gross; a gunshot wound, in a case of Sir Benjamin Brodie and Mr. Guthrie; a traumatic wound, involving the ribs, in one of Sir Astley Cooper's cases; obesity, with vomitings, in the case of Senator Barrow, of Louisiana. He had the best of surgeons from Philadelphia, and those of Washington, but his case was not diagnosed until a post-mortem was made. The hernia was small, and seemed to have been purely idiopathic, passing through the vena cava orifice. The *prognosis* is exceedingly *grave*—no opportunity of replacement; no means of retention after reduction, if it were possible. Consequently, the *treatment* resolves itself into constitutional, as venesection; opium, in intervals of vomitings; injections, rest, quiet; position upright, with chest flexed on the abdomen, to relax the diaphragm; knees on pelvis, and pulling the bowels downward; chloroform, warm baths and injections, with continual syringing with warm water; milk diet, with a little lime water. This is about all that can be done for the patient. Mr. Guthrie has advised gastrotomy for strangulation, and I think this ought to be practiced when the case can well be made out, and the rupture sewed up with silver wire, and cut off close. This would, no doubt, save life in many cases, if done early enough, and it is certainly justifiable, as otherwise death is inevitable.

Intestinal Hernia.—There is an encysted form of entero-intestinal hernia, which is produced in one of three ways.

1. Plate III, G, page 17 shows the first variety, where a portion of the intestine has passed through the mesocolon, and become strangulated at the point where it passes through the omentum, or a loop of intestine adhered together.

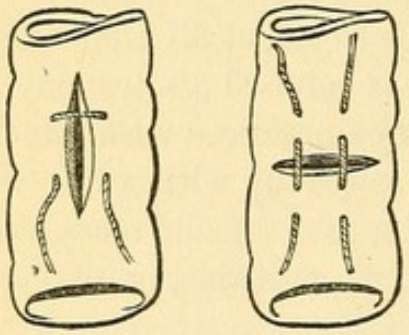
2. Where the omentum envelops the intestine and strangulates it, by constriction of its orifice, and by impaction of the bowel.

3. Hernia by diverticulum, as seen in Plate III, E, page 17. In this variety the muscular coats of the intestine itself give way, and the fecal contents are pushed through its coverings—the mucous and the serous coats—like the formation of an aneurism. They are all known by their general symptoms, as there are no external tumors, and rarely can any be felt internally. Peritonitis is developed early, and all the symptoms attending its local effects are produced. Pain in the region of the umbilicus; constipation complete in the two first varieties, but not in the diverticulum

variety; vomitings, first of contents of stomach—mucus, bile—and lastly, intestinal contents; *hiccough, general collapse, and death.*

The *treatment* is based on the general plan of diaphragmatic hernia; low diet, opium, chloroform, injections, mercurials, in small doses, warm baths, venesection, and ice wrapped in flannel over the seat of pain. When flatulence is very great the intestine is punctured with a small trocar, and the gas let off. *Position*—turning on right and left side, and kneading the bowels; elevating the head and body; elevating feet and body. These all failing we should resort to gastrotomy in the median line, and relieve the stricture in the usual way. If the sac has bursted and contents let out, they should be washed out with warm water, perfectly clean. The dead portions all cut off, and the intestines united with silk thread by the running suture on the mucous surface, as far as possible; then the gut should be turned in, and the union completed by the intestinal suture usually used for incised wounds, invented by Lambert and Gely; Lambert's, Fig. 40; Gely's, Fig. 41.

FIG. 40. FIG. 41.



Lambert's Suture. Gely's Suture.

The external wound is then closed, as in cases of the Cæsarean section. This will save some cases that would inevitably die, and should always be resorted to when all others fail.

Invaginatic hernia (intussusception), see plate III, F, page 17. This is a common affection, and one of the most serious lesions that can occur. The symptoms are the same as the last described; no tumor, only general symptoms to guide us, as constipation, vomitings (stercoraceous), hiccough, weak, wiry pulse, and all the symptoms of local peritonitis, at first, and general peritonitis following; anxiousness of countenance, *constant desire to stool*, which is almost pathognomonic of strangulated intestinal obstruction. *Treatment* is precisely the same as the above variety of hernia, but more is to be hoped for from general treatment, and the vis reductio naturæ, than in intestinal hernia. So much so, that some surgeons recommend that no external incision should be made, which I think is bad advice. When the patient is evidently verging on collapse, or about to sink from exhaustion, he should be put under chloroform, and gastrotomy performed—invaginated por-

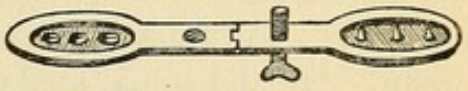
tion seized and cut off, union of intestines effected as before, by running sutures, and intestinal suture of Lambert or Gely, and the parts brought up to the external wound, where it may adhere. Two, and even six feet of intestines have thus been removed, and the patient has recovered. It is death without this in most cases, as the following statistics show :—

Dr. William Brinton, from 1200 post-mortems, gives the following results : Intestinal causes produced (besides hernia) 280 cases; about 43 per cent. was due to intestinal intussusception. The locality of the intussusception was, at the junction of *ilium* and *cæcum*, 56 per cent.; ilium alone, 28 per cent.; jejunum, 4 per cent.; colon, 12 per cent. 65 per cent. of the whole number of intestinal obstructions were from *internal strangulation* (by bands, etc.). The small intestines were affected in 95 per cent. of all cases; *strictures* and *twistings* involving the *large intestines*, 88 per cent. of all cases. Men and women are equally liable, but obstructions from impacted gall stones are four times more frequent in men than in women.

A New Instrument for the Removal of the Septum in Artificial Anus.

In 1858 I had under treatment Orlando Orr, who had been shot several years before, and while treating him I devised the above instrument, but did not find it necessary to make use of it, as will be seen by the report of his case below, but I have always thought this would be a better instrument than any then or now in use. It will be understood from the cut, Fig. 42. The female blade is made to receive the male blade, after the principle of waffle irons, and they are shaped to resemble the ilio-cæcal valve, and to cut just such a septum. It is made to pass up with one blade in each fold of intestine, and then tightened with the screw. It does not cut the septum in two, in front, which I think is important in assisting to effect a cure after the connection between the folds of the intestines is complete. I found, also, in treating Mr. Orr, that the greatest trouble in getting union in the flaps was the pressure of gas against them, hence, in all these cases the flaps must be cut so as to make valves that will press one against the other; or there must be put in a silver tube, as in tracheotomy, to prevent the gas from forming, and this must be so small that it can be easily closed after union has been secured or, as I believe, it will

FIG. 42.



soon close of itself, if the tube be not too large. This instrument is light; has no long handle like Dupuytren's; no derrick like Dr. Prince's, and it makes pressure in the centre with merely coaptation at the edges, with three points to cut through and hold the instrument in place. It should be kept in until the inner septum is cut through, which will leave an opening very much like the ilio-cæcal valve; after this heals, the external wound may be closed. I have not had any case to treat since Mr. Orr's, or I should have tried this instrument.

The following report of a case operated on by me at the University Hospital, Philadelphia, September 13, 1876, was received too late for insertion in its proper place:—

September 13th, 1876. Mr. W., who is afflicted with oblique inguinal hernia, came to hospital to be radically cured. His case was given to Prof. Dowell, who operated by his own new method, to-day. On recovering from ether he complained of considerable pain, for the relief of which one-fourth grain morph. sulph. was given by hypodermic injection. Evening, temperature, 101°; pulse 74.

September 24th. Morning, temperature 100°; pulse 60. Suffering frequent pain, running from back to groin; found it necessary to give another hypodermic injection of one-fourth grain morphia. Evening, temperature 101⅘°; pulse 78. Belly slightly tympanitic. Repeated morphia injection in evening.

September 15th. Administered a soap and water injection, with the effect to remove tympanitic condition of abdomen, and relieve pain. No abdominal tenderness on pressure, except within a small space, including the seat of operation. Morning, temperature 99⅘°; pulse 74. Evening, temperature 100⅘°; pulse 84.

September 20th. Bowels have been kept open by enemata; appetite and general health very good; have been keeping on low diet; removed the wire sutures to-day; very little suppuration; a good deal of lymph effused in sac; no pain. Pulse and temperature *normal.*

September 23d. Hardened lymph in sac being rapidly absorbed. No pain complained of. Bowels moved naturally.

September 25th. Feeling quite well; wished to get out of bed.

September 27th. Got up this morning and took a short walk.

September 30th. Doing light work in the ward.

Table of Operations for the Radical Cure of Hernia by the Subcutaneous Suture.

Case	Date.	Name of Patient.	Age.	Nationality.	Operation.	Single.	Double.	Left.	Right.	Cured.	Relieved.	Died.	Remarks.
1	Sept. 11, 1859.	Abram Thompson.	42	Black.	With surgeon's needle.	1					1		First case treated at Columbia, Texas.
2	Sept. 1, 1862.	Drayton	. .	"	With 3-in. needle.	1					1		Oyster Creek, Texas.
3	Sept. 25, 1862.	Negro child, Mrs. Kyle's . . .	1	"	Oblique inguinal.	1				1			One stitch, thirty days
4	Oct. 24, 1862.	" "	. .	"	Umbilical.	1				1			Sandy Point, Texas, two sutures.
5	May 10, 1867.	Overton	24	English.	Inguinal.	1				1			
6	1869	W. R. Johnson .	22	Clerk.	"	1				1			Operation a success, cut open, reclosed, hunting for a wire.
7	Aug. 20, 1869.	Mrs. Russell . .	35	Irish.	Umbilical.	1				1			
8	1870	. . . . .	. .	French.	Inguino-scrotal.	1				1	1		2 operations; some fever; both failed.
9	June, 1871.	J. H. Mayfield .	23	Texan.	"	1				1			Now Dr. Mayfield, of Hemstead, Texas.
10	June, 1871.	French Boy . .	8	"	. . . .	1				1			Two operations by Dr. Wilkerson; returned.
11	Feb. 18, 1872.	John Foster . .	. .	German.	Inguino-scrotal.	1				1			Scrotum suppurated; had some fever.
12	April, 11, 1876.	Philip Brown . .	39	Black.	"	1		1			1		No bad symptoms.
13	April, 19, 1876.	Henry Smith . .	69	"	"	1		1		1			
14	April 20, 1876.	Josey Bell . . .	7	Texan.	"				1	1			Hydrocele of cord; operated on for hydrocele.
15	May 26, 1876.	J. J. Posey . .	28	American.	Hernia testicalis.	1			1	1			
16	Sept., 1876.	Wilson	20	Swede.	Inguino-scrotal.	1		1		1			At University Hospital, Philadelphia.

The other cases I have no special report of. I wish all who operate after this method would keep a record according to this table, and send them to the author, at Galveston, Texas.

ORIGINAL CONTRIBUTIONS TO OPERATIVE SURGERY

AND

NEW SURGICAL INSTRUMENTS.

Causes of Urinary Calculi.

The primary cause of urinary calculi is some form of dyspepsia, or a derangement of the organs of assimilation, injuries to the spine frequently producing these derangements in the organs of assimilation. The use of lime-stone water, as indicated in this country by the great increase of cases of stone in Kentucky, Tennessee, Illinois, and Indiana; there being reported in these States, in the year 1860, respectively (deaths in these States 61,247), 31, 30, 26, 25, total 112; while in the whole United States, of 31,000,000 inhabitants, there were reported only 684 deaths. Of these 607 were males and 67 females.

We give a table of the deaths in all the States from stone during the year ending June 1st, 1868: —

	Males.	*Females.*	*Total.*		*Males.*	*Females.*	*Total.*
Maine, ...	19	4	23	Dis. of Columbia,	3	3	6
New Hampshire,	13	1	14	Virginia, . . .	34	6	40
Vermont, . . .	14	0	14	North Carolina, .	33	1	34
Massachusetts, .	30	7	37	Kentucky, . .	24	6	30
Rhode Island, .	—	—	—	Missouri, . . .	12	—	12
Connecticut, .	13	1	14	South Carolina,	16	3	19
New York, . .	82	4	86	Georgia, . . .	26	3	29
Michigan, . .	13	—	13	Florida, . . .	3	1	4
Wisconsin, . . .	11	2	13	Alabama, . . .	16	5	21
Minnesota, . .	—	1	1	Mississippi, . .	13	—	13
Nebraska, . . .	—	—	—	Louisiana, . . .	2	1	3
New Jersey, .	9	1	10	Arkansas, . .	5	2	7
Pennsylvania, .	60	3	63	Texas, ...	7	1	8
Ohio, ...	51	3	54	Oregon, . . .	1	—	1
Indiana, . . .	24	2	26	California, . . .	1	—	1
Illinois, . . .	23	2	25	Dakota, . . .	—	—	—
Iowa, ...	8	—	8	Washington Ter .	—	—	—
Kansas, . . .	1	1	2	New Mexico, .	1	1	2
Delaware, . . .	4	1	5	Utah, ...	—	—	—
Maryland, . .	8	2	10				

According to the above statistics, there has been about one death in every five thousand of the inhabitants throughout the entire

United States; while in the four States above classed there was one death in about every five hundred and fifty.

These four States have a greater proportion of lime-stone water, and the people use well water instead of cistern, while in Louisiana there were only three deaths in a population of 708,002; and while in the four States noted there were 112 deaths out of a population of 5,328,864; therefore I assume that the greatest predisposing cause is the use of lime-stone water (hard water).

Calculi are either renal or cystic. Renal calculi are those cases where the stone forms in the pelvis of the kidney and passes down to the bladder, producing what is called a fit of gravel, known by acute pain in the region of the kidney and along the line of the ureter, producing burning urine accompanied with a partial suppression, and urine filled with the peculiar sediment that the stone is composed of. Cystic calculus is known by its forming in the bladder by accretions or deposits or some small particles of stone that come down into the bladder from the pelvis, or that form on some foreign body introduced through the urethra, such as pieces of bougies, pieces of bullets, etc. Cystic calculi are known by continual irritation of the bladder, by a profuse discharge of mucus, pus and bloody urine, a sudden stopping in the discharge, and pain in the glans penis. Cystic calculi may be encysted or enclosed in a sac, and then many of the above symptoms are not to be found, but pressure in the rectal region. The stone can usually be sounded, and should always be so diagnosed before attempting any operative procedure; which brings us to the main subject of this paper, "The Operative Procedure for the Relief of Stone."

Recto-Vesical Section.—Amongst the first operative procedures was that of securing the stone with the fingers in the rectum, and cutting through all the tissues down to the stone, and allowing the wound to heal up by granulation. This is never practiced at the present day.

Lateral Operation.—The operation of cutting to either the left (which is preferred) or the right. This is now a popular procedure, and is, all things considered, perhaps the safest and the best, for the following reasons: There is no danger of producing impotency in the patient, with less liability to urinary infiltration; but is limited to stones of the size called large, and not admitting of the passage of very large ones, when the bilateral should be preferred.

Median Section.—This is the present popular mode of procedure, but, like the lateral, is not suited to large stones, but has the advantage of avoiding hemorrhage by cutting in the median line. By combining median section with lithotriptsy, this can be used for all cases, either large or small size stone.

Hyper-pubic Section.—This is now scarcely justifiable, and is only to be adopted in large stones, and more particularly in females. The dangers in this operation are peritoneal inflammation, urinary infiltration and pyæmia. Since the improvements in the operative procedure for vesico-vaginal fistula, the hyper-pubic operation is not justifiable, there being no danger in the vagino-rectal section, which will admit of the extraction of the largest calculi, and the wound in the vaginal wall can be closed in eight days with entire safety. This should be done in all females, except where the stone is small, and cannot be crushed by lithotripts. Where the stone is very small in females, the urethral section may be performed, cutting only through the anterior sphincter, and dividing the sphincter vesicæ; cut in a given direction to the right or left side, and dissect up to the right or left as far as the symphisis pubis, and backward for three quarters of an inch, then dilate with the fingers, passing the forceps, and securing the stone and extracting it. If it is too large to pass, it should be crushed with the lithotript, and then extracted by particles with the scoop.

INSTRUMENTS IN USE FOR THE LATERAL AND BILATERAL OPERATION.

Director and Bistoury.—The director in common use has a deep groove in its back, and a probe-pointed bistoury is used to make the incision through the membranous portion of the urethra and the prostate gland. Any straight knife may be used, but the best of all, in my opinion, is the gorget with a movable blade, to enable it to be well guarded and kept very sharp. The reasons I prefer this form of knife are these: It cuts only on its point, has no sharp corners or convex surface, and will not wound the rectum if held downward; the rectum cannot be pressed against its edge by its own action; while the bistoury cuts not only on the point desired, but is made to cut on its entire edge, and is liable to have the rectum pressed up against it, and thereby cut, which cannot be done with the gorget.

Dr. Goodwin's Staff and Blades.—A description of Dr. Goodwin's instruments was given in the March number of the *Galveston Medical Journal*, 1868, page 136, to which I refer the reader. Dr. Goodwin's staff is fenestrated where the common staff is grooved, and his gorget is double, as will be seen, and makes a bilateral incision with the centre point or probe, but made to fit into the fenestra, after the plan of the bayonet hitch. The point of entrance is immediately at the commencement of the fenestra, and once inserted, it cannot get out. This is of the utmost importance, and is much better than to use Prof. Post's instrument, for with the instrument of Dr. Post the staff has to be withdrawn, and then the director inserted into the bladder, which is quite unnecessary with Goodwin's instruments. Dr. Post's instrument is as securely fixed, and will not permit the cutting instrument to slip out as does Goodwin's, and is, therefore, preferable to the groove director of Prof. Smith; but for reasons stated above, I prefer Goodwin's staff to all others; but it should be made more angular, and made to fit up under the pubis, as does Prof. Smith's. With its present straight curve, the rectum will be much more liable to be cut, and this should be changed. I would have Goodwin's gorget with a straight handle and no angles, for the angles will press down on the perineum and prevent its motion. I would have the blades made movable, as the present gorget, so that one or two blades could be used, and of different sizes, as the blades of the gorget are made, so that the operator could select his own size and that suitable to the case under treatment.

The instruments I prefer, and the best of all instruments, are these:—Prof. Smith's curve to the director and angular incision; Goodwin's fenestrated grooved director; the gorget made movable and straight, with single or double blades, but only the point with a cutting edge; Prof. Smith's forceps, for cutting into the stone when too large, and the usual lithotript forceps when needed.

With these instruments, I would perform the lateral operation always when practicable; when stone is very large, the bilateral. I next prefer the median section with dilatation and lithotriptsy. I *do not believe in lithotriptsy* in the male, through the urethra.

For the left lateral incision, I prefer the grooved staff turning to the left, that is the curved lateral staff of Dr. Nathan R. Smith, of Baltimore, and with its movable cap and rod for the point of the gorget, so as to always show if the gorget is in its right place. The

angular curved staff is also preferred, and I also prefer the angular blade fixed to the staff to make the external incisions, making a smoother and more direct cut into the urethra than can be possibly done with a knife unattached.

The lithotome-cache has an advantage over the gorget. It cuts from within to without, and thereby prevents any laceration of the parts, but has the great objection that its blade has to be opened in the bladder, and might cut its folds, or hook and cut the peritoneum, as in the case of the French Marshal, causing infiltration and death; but through a small perineal section I think it necessary and useful. I prefer crushing the stone to making a bilateral incision, for fear of producing, as before stated, impotency in the patient.

With the above improved instrument, lithotomy is one of the safest and most easily performed operations in surgery, the greatest trouble being the insertion of the staff. By the median section we have no hemorrhage, but from laceration we may have pyæmia and erysipelas, when, if we performed a smooth section, it would not occur; and by the median section I think there is more danger of wounding the rectum than in the lateral operation.

The causes of death after lateral lithotomy are the following:*—

1. Death from the shock of the operation, without any discoverable lesion, may occur, as in any of the ordinary operations; it is very unfrequent, generally occurring in old people, and sometimes in children; it seems to depend upon some peculiar condition of constitution and nervous system.

2. Death from chloroform may likewise occur, and the same remarks as just made about shock apply to these cases. Lithotomy in nowise militates against the use of anæsthetics.

3. Death from hemorrhage and exhaustion may ensue, either primarily, immediately after the operation, or secondarily some days after, from separation of the plug of coagulum in the wounded vessel, or separation of a slough from a bruised vessel, or the extension of a sloughing wound involving the vessels. Death from primary hemorrhage rarely occurs, and although children can little stand any great amount of loss of blood, yet we sometimes see them rally after having been thoroughly blanched, and in an apparently hopeless condition. Liston states that the average is about one death in one hundred cases. M. Begin affirms that

* Guy's Hospital Reports, vol. 2, p. 25.

it is the cause of death in one out of every four; but this is not so in this country. Although primary and secondary hemorrhage may not *per se* cause death, yet it will so act as to cause great constitutional depression and debility, and consequently prevent the reparative process, and lay the foundation for general decline, or place the patient in a condition favorable for pyæmia.

Death from pelvic cellulitis is by far the most frequent in adults. It consists in an acute inflammation of the tissues around the outside of the bladder, more especially the neck, base and sides; and is generally produced by urinary infiltration into the cellular tissue of the pelvis. Some consider it to be due to too great a section of the prostate, involving the deep pelvic fascia, and allowing the urine to pass directly into the cellular tissue, and thus cause the inflammation; others maintain that the infiltration of the urine is not a mechanical process, but generally follows inflammatory action, and that this inflammation is due to mechanical violence inflicted in removal of the stone, from insufficient section of the gland. In some instances death has taken place from cellulitis, quite independent of urinary extravasation. This inflammation may extend by contiguity to the peritoneum, inducing peritonitis; but it generally leads to purulent infiltration, deposits of pus, and pyæmia. The symptoms are those of severe constitutional irritation, attended with rigors, great prostration and anxiety, and soon followed by symptoms of low typhoid fever; the wound assuming an unhealthy aspect, and giving exit to a fetid discharge.

5. Death from acute peritonitis *per se* is rare, seldom occurring in adults, but now and then in children where the anatomical position of the bladder is closer to the peritoneum, so that too large a section of the neck and base of the bladder may involve it. Peritonitis used formerly to be considered as the most frequent cause of death after lithotomy, but subsequent investigations have disproved this.

6. Death from acute inflammation of the mucous membrane of the bladder (cystitis), extending to the kidney or peritoneum, is also rare, although Boyer has asserted it to be the cause of three-fourths of the deaths; this is not the case.

7. Death from inflammation of the prostatic veins (phlebitis) and its effects are not unfrequent, and generally occurs in persons of advanced life; the disease does not often set in until after a week or a fortnight, when recovery is hopefully anticipated.

8. Death from pyelitis, or inflammation of the kidney, or suppuration of the kidney, has been also occasionally met with; and at the post-mortem examination the advanced state of the disease has given evidence of its having existed long prior to the operation.

9. Death may also occur from absorption of the products from the urine, thus poisoning the blood and causing rapid death.

Erysipelas, diarrhœa, fever, or any other accidental attack may render the operation fatal.

Many statistical inquiries have been made respecting the mortality after the lateral operation of lithotomy. These have been recorded by Crosse, Civiale, South, Coulson, and others, to whose works we must refer those of our readers anxious to investigate the subject. For the most part, these statistics cannot be relied upon as offering any direct assistance, except so far as a general survey, in estimating the value of the operation; they comprise compilations, selections, and returns, in which are many faults of omission and commission. This has been alluded to by Mr. Henry Thompson (*op. cit.*), who has attempted to lay before the profession a more correct table, and this may be used as a tolerably complete epitome of the mortality of lithotomy under British surgeons; it is derived from reliable sources, mentioned in the text of his work, and contains 1827 cases.

Mortality Rates at all Ages in 1827 *cases of Lateral Operation, in Metropolitan and Provincial Hospital.*

	Cases.	*Deaths.*	*Cases.*
Norwich (Crosse).	669	91	about 1 in 7½
Since that time.	124	15	" 1 in 8¼
Oxford.	110	14	" 1 in 8
Leicester	90	8	" 1 in 11
Leeds	29	4	" 1 in 7½
Birmingham	102	10	" 1 in 10
Guy's Hospital	230	33	" 1 in 7
St. Thomas' Hospital	200	29	" 1 in 7
University College Hospital	90	12	" 1 in 7½
Cambridge	183	13	" 1 in 14
Total	1827	229	nearly 1 in 8

Some have based the rate of mortality on the weight of the stone (see Crosse), and have drawn a conclusion that the mortality increases in nearly the same ratio as the weight.

Others, and perhaps with more reason and practical tendency, have considered the mortality in proportion to the different ages of the patients. This also has been done by Mr. Thompson in the following table. Still, even this method is open to objection, inasmuch as a stone may have been formed in the bladder and have remained there a long time previous to the operation.

Mortality Rates of Different Ages.

During the years	*Cases.*	*Deaths.*	*Cases.*
1 to 5 inclusive	473	33	or about 1 in 14⅓
5 to 11 "	377	16	" 1 in 23½
12 to "	178	19	" 1 in 9½
17 to 20 "	76	11	" 1 in 7
21 to 29 "	86	11	" 1 in 8
30 to 38 "	75	7	" 1 in 10½
39 to 48 "	100	17	" 1 in 6
49 to 58 "	191	40	" 1 in 4¾
59 to 70 "	233	63	" 1 in 3¾
71 to 81 "	38	12	" 1 in 3⅙
Total	1827	229	

We have taken the liberty to make a slight modification of the above, so as, if possible, to show the mortality at the different epochs of life, which may guide us in some measure; but it is somewhat arbitrary:—

Mortality Rates at Different Epochs of Life.

	Cases.	*Deaths.*	*Cases.*
1 to 5, infancy and childhood, 473 cases, 33 deaths, about 1 in 14⅓ cases 6 to 11, boyhood, 377 cases, 16 deaths, about 1 in 23½	850	49	about 1 in 17⅓
12 to 16, boyhood, with increasing development and setting in of puberty.	178	19	" 1 in 9½
17 to 29, adolescence and manhood	162	22	" 1 in 7⅓
30 to 48, adults	175	24	" 1 in 7⅓
49 to 70, advancing life	224	203	" 1 in 4⅛
71 to 81, advanced life	38	12	" 1 in 3⅙
Total	1827	229	average nearly 1 in 8

We have inserted a table drawn up by Mr. C. Williams, comprising the cases operated on at the Norfolk and Norwich Hospital, during a period of ninety years ending December 1862:—

Age.	Operations	Cured.	Died.	Mortality	Operations	Cured.	Died.	Mortality.	Operations	Cured.	Died.	Mortal'y.
1 to 10	328	306	22	1 in 14.90								
10 " 14	55	53	2	1 " 27.5	455	421	34	1 in 13.38				
14 " 20	72	62	10	1 " 7.2					574	534	42	1 in 13.6.
20 " 30	59	55	4	1 " 14.75								
30 " 40	60	56	4	1 " 15	119	111	8	1 " 14.87				
40 " 50	58	47	11	1 " 5.27								
50 " 60	132	108	24	1 " 5.5	190	155	35	1 " 5.42				
60 " 70	119	87	32	1 " 3.71					336	260	76	1 in 4.42.
70 " 80	27	18	9	1 " 3	146	105	41	1 " 3.56				
	910	792	118	1 in 7.71	910	792	118	1 in 7.71	910	792	118	1 in 7.71.

869 were males, of whom 811 were operated on by the lateral method, with a mortality of 105; 41 by the median section, with death in 11 cases; and 17 were lithotritized; 41 were females, of whom 2 died.

Table of Cases that underwent Lithotomy a second time at the Norfolk and Norwich Hospital: it is intended to show the age in years *of each patient at the time of his being first operated on, the interval* in months *between the first and second operation, the weight of the calculi removed, the result, and some observations on the general character of calculi.*

By C. WILLIAMS, Esq., House Surgeon, Norfolk and Norwich Hospital.

No.	Age at 1st Operation.	Interval between 1st and 2d Operation.	Weight of Calculi. 1st Operation.	Weight of Calculi. 2d Operation.	Result.	OBSERVATIONS.
1	15	16 mos.	ʒiij	ʒj	cured	Three phosphatic calculi removed at first operation, broken into many fragments: the calculus taken away at the second operation was of the same description.
2	48	12 "	ʒiij	ʒv	cured	One flat lithic-acid calculus first removed entire; the stone removed at the second operation was of the same consistence.
3	37	46 "	ʒv	ʒiijss	cured	One perfect phosphatic calculus at first operation; also one of same composition at the second.
4	38	74 "	℥j	ʒiv	died	One entire lithic-acid calculus at first operation, a phosphatic one at the second.
5	24	24 "	℥ij	ʒvj	cured	Phosphatic calculus, broken into fragments, removed at the first operation; the same on the second occasion.
6	63	32 "	℥iv	ʒiij	cured	One entire flat lithic-acid stone at first operation; also one unbroken flat lithic-acid calculus at the second operation. Had stone a third time, and was deemed unfit for operation.
7	2½	15 "	℈ijss	ʒj	cured	The first calculus phosphatic, and broken in the extraction; the second likewise phosphatic, and broken.
8	55	142 "	℥jss	℥ij	died	The first was a large, oval, unbroken, uric-acid stone; second was of same form and composition.
9	3½	24 "	ʒijss	ʒij ℈ij	cured	The first calculus was entire and phosphatic, the second likewise phosphatic and unbroken.
10	8	17 "	ʒij ℈j	ʒivss	cured	One entire lithic-acid calculus removed at the first operation, which left a recto-vesical fistula; the second calculus was an unbroken phosphatic one.
11	3	14 "	6 grs	ʒiijss	cured	One small oxalate of lime removed entire at first operation, and a mixed one at the second.
12	7	24 "	ʒjss	℈ij	cured	A perfect oxalate of lime stone taken away on first occasion; a phosphatic one on second.
13	18	8 "	ʒvj	ʒivss	cured	One phosphatic calculus, broken into four fragments, taken away at first; and one of the same composition at the second.
14	46	12 "	ʒxss	℈iv	died	One large entire lithic-acid calculus removed at the first operation; during which the rectum was wounded; and a recto-vesical fistula was present when the second was performed, on which occasion a phosphatic stone was taken away.
15	60	111 "	ʒiv ℈ij	℥iij ℈v	died	The first calculus was a very perfect lithic acid; the second a large urethro-vesical lithic-acid stone; symptoms of recurrence of stone came on three years after the first operation, and lithotrity was resorted to, and subsequently lithotomy.

(Table continued from preceding page.)

No.	Age at 1st Operation.	Interval between 1st and 2d Operation.	Weight of Calculi. 1st Operation.	Weight of Calculi. 2d Operation.	Result.	ORSERVATIONS.
16	62	70 mos.	℈iv	6 grs	died	One entire and two broken lithic-acid calculi removed on first operation; a small angular stone at the second, on which occasion median lithotomy was resorted to.
17	7	16 "	ʒij	ʒiij ℈j	cured	This patient was lithotomized a third time, at an interval of eleven months from the second; two entire lithic-acid stones were removed at the first operation; a phosphatic one, slightly broken, at the second; and a perfect oblong phosphatic one at the third.
18	34	16 "	ʒj ℈v	ʒij ℈j	cured	An entire lithic-acid stone, capped with a thin layer of phosphate, at the first operation; was lithotritized on the second occasion; the debris consisting of phosphates.*
19	61	30 "	ʒiv	ʒj ℈ij	cured	This man had undergone lithotrity twice previous to the first lithotomy, at an interval of twenty-eight months between each; an interval of thirteen months existed between the last lithotrity and the first lithotomy. The debris after lithotrity consisted principally of uric acid and phosphates; several phosphatic calculi, many of them broken, were removed at the first lithotomy, as well as at the second; a perineal fistula remained after the former, which was not cured even after the second, on which occasion the median method was adopted.
20	69	9 "	ʒij ℈ij	℈ijss	cured	Was lithotomized a third time, at an interval of thirty-four months from the second; several small phosphatic stones taken away at first operation; a perineal fistula present at the second and third operations, which were performed according to the median plan; soft phosphatic calculi removed on both occasions.
21	68	7 "	ʒij ℈ij	ʒij	cured	Five entire and two broken uric-acid calculi came away at the first operation, and two perfect uric-acid ones at the second; on which occasion median lithotomy was performed.
22	59	58 "	ʒij	℈v	cured	One entire lithic-acid stone at first operation, and one of the same composition at the second.
23	31	22 "	ʒj	ʒiij ℈ij	cured	First calculus (a mixed one) perfect; an encysted stone left undiscovered, which was removed at the second operation, together with one lying loose in the bladder; median lithotomy performed on second occasion.
24	66	4 "	℈j	ʒij ℈ij	cured	A broken lithic-acid stone at first operation, and five capped with phosphates removed at the second; median lithotomy resorted to in both instances; a perineal fistula resulted from the first, which was cured by the second operation.
						Two Cases that underwent Lithotrity on the first occasion, and Lithotomy on the second.
25	54	20 "	ʒij xgrs	ʒj ℈ij	cured	The detritus at first operation consisted of phosphate and lithate mixed; at the second, the calculus was made up entirely of phosphates.
26	5	30 "	℈v	ʒij	died	The debris removed in the first instance was composed of uric acid, whereas, at the second operation it consisted of urates and phosphates.

* This case hardly comes logically into the category of patients who underwent lithotomy a second time; but it is inserted as completing the series of cases in whi the stone recurred after lithotomy.

Remarks by Mr. C. Williams.— From the opening of the Norfolk and Norwich Hospital, in 1772, to November, 1863, there have been admitted 923 cases of stone in the bladder, and these have undergone some form of operation for the removal of the complaint; twenty-four of this number suffered a relapse, and underwent a second operation. The proportion that such cases bear to the whole number of stone-patients is one in 38.45.

The two cases (Nos. 25, 26), on whom lithotrity was first performed, and subsequently lithotomy, may be excluded from our consideration, inasmuch as it is very possible that fragments of calculus material were retained in the bladder, and became the nuclei of fresh formations; an occurrence not so likely to happen when lithotomy was resorted to in the first instance.

Our table, then, presents us with twenty-four cases of recurrence of stone, taken in the order in which they presented themselves at the hospital; of this number, nineteen were cured, and five died; three had stone a third time, two were cut and recovered, the third was deemed unfit for operation. All the patients were males, no instance having shown itself of recurrence in the female. One patient (No. 19) underwent lithotrity for his second operation, and was successfully cured.

Six of the cases were below ten years of age; two between ten and twenty; one between twenty and thirty; four between thirty and forty; two between forty and fifty; two between fifty and sixty; and seven between sixty and seventy. One death occurred below forty years of age, and four above that period of life.

The production of the second calculus took place in six of the cases within one year; in ten within two years; in two within three years; in one within four years; in one within five years; in two within seven years; while in the remaining two cases the operation did not become again necessary until after a lapse respectively of nine and twelve years.

The average period of recurrence in the twenty-four cases, was thirty-three months. Lateral lithotomy was adopted in all the patients with the exception of eight, two of which were cut on both occasions by the median plan; and on four that form of operation was resorted to at the second time.

In fourteen the calculi were removed in a perfect and entire condition at the first operation; while in eight the calculi were broken in the extraction; in one the stones were very small and numerous:

and in the remaining one, a sacculated stone was left undetected in the bladder.

It does not appear that the second calculus is necessarily of the same character in all cases as the first, though in sixteen the second formations were of the same composition as the first; nine being composed of the phosphates, seven of lithic acid and the lithates; whilst the phosphates succeeded the lithates in five, and the oxalates in two.

Such are the practical points in connection with ordinary lateral lithotomy. We shall now cursorily allude to the several other modes of proceeding in the perineal section, as adopted in this country and elsewhere.

1. Lateral lithotomy modified as regards the section of the prostate; Royer made a transverse incision of the prostate with the lithotome-cache, dividing the gland in its greatest diameter; but the objection to the operation was the division of the perineal vessels, and consequent hemorrhage. Senn combined the two, by making the ordinary oblique incision through the left lobe, and the transverse one through the right.

2. The perineal incision, made in a transverse direction, and of a semi-lunar curve in front of the anus. This was advocated by Dupuytren in his well-known bilateral section of the prostate gland in cases of large stone. He divided the tissues toward the symphysis, so as to avoid the rectum, the urethra was opened from above downward (median) with a double-edged bistoury, and then his curved double lithotome was introduced into the bladder; the blades were then opened and made to cut their way out, dividing the prostate in its oblique diameters. The results of this operation gave nineteen deaths in eighty-five cases, or one in four and a half cases.

3. *Median lithotomy,* where the incision is made in the central line of the perineum, formerly known as the Marian operation. This comprises two modes of proceeding, viz., with section of the prostate gland, or without section of the gland, by merely opening the urethra, with perhaps partial division and incision of the apex of the organ. Vacca was the first to revive the median operation, and he practised a vertical section of the prostate; but, although there was no fear of hemorrhage, the rectum was endangered, so that the operation could only be performed when the stone was small and in adult prostates.

Civiale, in 1836, modified this procedure by his medio-bilateral operation. Having made his perineal incision in the median line, he avoided the bulb, and opened the membranous portion of the urethra, when he introduced a straight, double-bladed lithotome into the bladder, and by withdrawing it opened, made a transverse section of the gland, as in Boyer's operation.

Buchanan has further simplified this method by the following mode of proceeding: he uses a rectangular staff, which is one bent at right angles three inches from the point, and having a deep, lateral groove, with a posterior opening. The instrument is introduced into the bladder, assisted by the left forefinger in the rectum, and thus the angle made to correspond in situation with the apex of the prostate gland, the lower or grooved branch lying parallel to the rectum. The angle rests on the farthest extremity of the membranous portion of the urethra, so that when the knife is plunged into the groove of the staff the membranous portion escapes all injury. The staff is entrusted to an assistant, and the operator, keeping the left forefinger in the rectum, takes a long, straight bistoury, holding it in his right hand with the palm upward, the blade horizontal, and the edge directed to the left; he then enters the perineum opposite the angle of the staff, and passes the knife straight into and along the groove, as far as the stop at its extremity, into the bladder. Next he withdraws the bistoury slowly, making a lateral section of the prostate, but as he does so cuts outward and downward, a distance rather more than equal to about one-fourth of a circle round the upper and left side of the rectum, in which organ his finger still remains; an external wound, surrounding the corresponding part of the anus about one and one-quarter inches in length, results from the operation. His arguments in favor of this procedure are: 1. The more easy and rapid method of reaching the prostate gland, being only two lines from the surface of the skin, the rectum pressed out of the way, and the knife passed straight forward into the bladder. 2. The membranous portion of the urethra is avoided, and less incision required; all blood vessels are out of the way, and consequently there is no hemorrhage. 3. The rectum, notwithstanding its vicinity to the incision, is less likely to be injured; and 4. There is less risk of deep-seated infiltration of urine.

Allarton's operation is also performed in the median line, but he does not make any section of the prostate gland, except it be but

partial, just incising the apex. The ordinary staff is introduced into the bladder, and then the left forefinger passed into the rectum, so as to feel the staff at the prostate: he transfixes with a straight bistoury the perineum in the median line about half an inch above the anus, carrying the knife on till it strikes the groove of the staff at the membranous portion in front of the prostate; the urethra is pierced at this spot, and after pushing the knife toward the bladder for a few lines, it is withdrawn, at the same time cutting upward, dividing the urethra a little, and finishing so as to have an external incision of three-fourths to one and one-half inches. A long, ball-pointed probe is then passed into the bladder along the groove of the staff, when the latter is withdrawn, and the left index-finger slided along the probe into the bladder, dilating the prostate and neck of the bladder to the requisite extent, and serving as a guide to the forceps. Where the stone is large he uses Weiss' three-bladed female director, or Arnott's hydraulic director.

In cases of large stone Vidal de Casis has advised a quadrilateral section of the prostate gland; he says, "no matter what kind of external incision, as long as it is not too small, whether it be transverse, oblique, vertical or curved; the point in view is to have one large external incision, and many small internal ones. The two first sections of the prostate are to be made along the two inferior oblique diameters of the gland, which will be sufficient when the stone is of moderate size; but when large, the two superior oblique divisions are to be made, first one and then the other."

We shall now pass on to *lithotomy through the rectum*—the *recto-vesical operation.* This has been recommended in consequence of its supposed readiness of performance, and the easy passage of instruments, besides being free from hemorrhage. The operation consists in placing the patient in the same position as for ordinary lithotomy; a grooved curved staff is then introduced into the bladder, and held by an assistant firmly and perpendicularly, so that the groove is in the median line. The operator takes a sharp-pointed, straight bistoury in the right hand, resting the blade flat-ways on the palm or surface of the left forefinger, which latter is then introduced into the rectum to the extent of ten or twelve lines. With the right hand the edge of the knife is turned upward, and its point thrust through the anterior wall of the rectum, so as to gain the groove of the staff, and as the knife is withdrawn, it cuts through the rectum, the external sphincter and cellular

tissue covering the urethra and integument in the median line, to the extent of one inch. The left forefinger is next carried into the wound of the sphincter, and the nail inserted into the groove of the staff, when the bistoury, with its edge downward, is guided along it through the wall of the urethra into the groove, and pushed in the direction corresponding to the raphe, dividing the neck of the bladder and the prostate to a greater or less extent, according to the presumed size of the stone; the staff having been removed, the finger is introduced into the bladder, and the calculus extracted by the forceps.

The drawbacks to the operation are the gliding of the mucous membrane of the rectum before the knife, the great risk of wounding the peritoneum and vesiculæ seminales, the subsequent occurrence of urinary infiltration, the passage of fæces into the bladder, fistulous sinuses, etc. Of 185 cases operated on, 38 died, being 1 in 4.86; but the subsequent condition of those who recovered is not stated.

The hypogastric or high operation. Epicystotomia is considered by some surgeons the most direct, short and least dangerous operation. Its advocates argue that there are no technical or anatomical difficulties, with the exception of the peritoneum, which is easily avoided. It suits all sizes of stone, enables the surgeon to have a free opening into the bladder, and there is not so much danger of infiltration of urine as has been alleged. The wounding of the perineum must be regarded as a failure in anatomical manipulation. Pith remarks, that in male children, and young persons below twenty, as well as in females, the bladder stands high above the pubes, and presents an uncovered portion freely to surgical manipulation; under eight years the peritoneal reflection from the bladder does not generally reach lower than one and a half to two inches from the navel. In old persons, especially when emaciated, the bladder lies deep in the pelvis, behind the symphysis, and is difficult to reach; hence the impropriety of operating by this method in such cases.

Other surgeons maintain that there is great risk of peritonitis, infiltration of urine, and wound of the peritoneum, and that the operation is only applicable in cases of deformed pelvis; and where there is much fat it is rendered very difficult.

The old method was that of Franco, who introduced a finger into the rectum, and pushed the stone up toward the hypogastrium, and

its prominence formed the guide for the incision. A more cautious proceeding was afterward adopted. The preparation for the operation consists in emptying the rectum and distending the bladder, either by the patient retaining his urine, or by injecting a sufficient quantity of tepid water to produce distention without over-excess, which latter is best performed under chloroform at the time.

The patient is placed on the back, with the pelvis raised, and the operation is performed in three steps. The first consists in laying bare the anterior wall of the bladder, by a vertical incision in the median line immediately above the pubes, cutting through the linear alba and fascia transversalis, and exposing the loose subfascial cellular tissue, in which some fat is often found.

The second step is that of opening the bladder, and is the most important part of the operation, requiring the greatest precision and care; the opening ought to be made close to the symphisis, and quite in the median line. Some surgeons have suggested and used an instrument called the sonde-a-darde, which consists of a trocar concealed in a catheter. This is introduced through the urethra into the bladder, and then the trocar is extruded and pushed through the fundus of the bladder at the external opening. This is considered both imprudent and mischievous. It is best to transfix the bladder through the wound, and thus secure it. The bladder is then to be opened by a median incision from below upward. A few authors recommend a transverse incision. The external incision in the meanwhile must be kept open by retractors, in consequence of the tendency of the parietes to contraction.

The third step consists in the extraction of the stone, which may be readily done by a pair of straight forceps.

Civiale uses the sonde-a-darde, and has otherwise modified the operation.

The after treatment is now confined to simple measures; formerly a gum catheter was left in the bladder; others made a counter-opening in the perineum to drain off the water, and some used sutures in the bladder; but it is now considered more judicious to place the patient in bed on the back or sides, with the legs drawn up, to employ water-dressing, and nothing else. No catheter, no canula, no other measure, is required.

Vidal recommends the operation to be performed "en deux temps." An incision is to be made in the median line, dividing all the tissues, and exposing the bladder; then the operation is to be set aside, and the wound filled with charpie, which is to be replaced

daily, so as to prevent union. If at the end of six, seven, or eight days there be abundant suppuration, the operation is to be completed by opening the bladder with a straight bistoury, and extracting the calculus.

In taking a general survey, or making any critical comparison of the various principal operations and modes of removing a calculus from the bladder, much will depend upon the age and condition of the patient, as well as the size and nature of the stone. In the first place, the great point will be to determine whether the case be fit for the operation of lithotrity. This subject, however, is alluded to in a separate section. When lithotomy is determined upon, there can be no doubt for a moment that in children under twelve years of age the lateral operation is the safest and most successful, the mortality being 1 in 17⅓ cases only. Of course this does not preclude the performance of the median operation, where the stone is small or even of moderate size. At puberty and adolescence, and in manhood and adults from twelve to forty-eight years, the mortality of the lateral operation rises to nearly one in eight, and from forty-nine to eighty-one years it amounts to one in four cases. It is in these periods of life, then, that some other modes of operating have been suggested to lessen the mortality. Statistics have not yet shown so much improvement as might be anticipated. Thus in Allarton's median operation on one hundred and thirty-nine cases at all ages, thirteen deaths ensued, being one in eleven; and when restricting this to adults, the mortality was one in seven; and in Mr. Williams' report the mortality over fifty years of age is nearly one in two and a half. Of sixty cases operated upon by Buchanan's method, the result seems to be the same as in Allarton's operation, except that in adults the mortality is one in eight.

The bilateral operation of Dupuytren bears a death-ratio of one in four and a half, the recto-vesical about one in five, and the supra-pubic one in three and a half. These latter proceedings are only had recourse to in cases of very large stone, and where complications exist preventing perineal lithotomy.

As far as our present information extends, the median operation may be performed with safety in cases where the stone is small; but the lateral operation is to be preferred in all other cases where lithotrity is inexpedient.

* See Thomson, op. ct. p. 72.

The main issue, as regards the success of any one form of operation, seems, after all, to be chiefly dependent upon the mode of enlarging the opening of the urethra through the prostate and the neck of the bladder. This resolves itself into one of two proceedings; either dilatation of the prostate and neck of the bladder, as in the median operation, or section of these structures, as in lateral lithotomy. Is it safer to dilate, bruise, and lacerate the prostate gland and neck of the bladder, or to make a clean, careful incision with the knife? Small stones are no test whatever as to the value of either mode of operation, nor are calculi in children; for in the latter, whichever mode is adopted, a recovery is expected.* It is in adults that we are always trying to lessen the mortality after the lateral operation, and none of the recent improvements seem to have supplied the deficiency. Even in Mr. Allarton's recent table, p. 499, 2d edit., his mortality is one in seven.

We should have gladly quoted the table inserted in that work, which consists of one hundred and seventy cases of median lithotomy, but these do not in the least represent the actual state of affairs; the cases are for the most part taken from all sorts of reports of a successful issue; many known cases of death after the median operation are unrecorded; in two instances the author himself has been obliged, in consequence of the size of the stone, to abandon the operation, and terminate it by section of the prostate gland; which latter proceeding undoubtedly led to the successful termination. Median lithotomy, therefore, necessitates the bruising and laceration of the prostate gland, in cases of stone above a certain size, and in consequence will almost inevitably lead to a fatal result. The lateral section still maintains its position as the safest; it was so with Cheselden, Crosse, and numerous other surgeons.

The most perfect and unique collection of cases of the median operation, performed at a hospital of well-established reputation for lateral lithotomy, will give more insight into the comparative merits of the two operations; and we gladly avail ourselves of the opportunity of presenting to our readers one that has been so formed. By permission of Mr. Williams, we are enabled to insert his tables, and thus compare the results of forty-four cases of

* Thus, in the last two years, at Guy's Hospital, fifteen children under fourteen years of age underwent lateral lithotomy, without any unfavorable result; and it is not improbable that median lithotomy might have been similarly successful.

median lithotomy with the last forty-four current cases of lateral lithotomy performed at the Norfolk and Norwich Hospital up to November, 1863.

Table of Cases where Median Lithotomy was performed at the Norfolk and Norwich Hospital; showing the age in years, the result, the number of days under care after the operation, the number of calculi removed from each patient, the dimensions and weight of each calculus.

No.	Age.	Result.	Time treated	Calculi	Dimensions in inches. Length.	Bre'dth	Depth.	WEIGHT AND REMARKS.
1	2	cured	22	1	¾	½	¼	14 grains.
2	2½	"	35	1	¾	⅝	⅜	34 grains.
3	3	"	23	1				14 grains.
4	3¾	"	29	1	1⅛	⅞	⅝	2 drachms.
5	4	"	29	1				35 grains; calculus broken in the extraction.
6	4	"	15	1				16 grains; calculus broken in the extraction.
7	4	"	29	3				Small calculi; all weighing 30 grains.
8	4	"	36	1	1	¾	⅜	47 grains.
9	5	"	50	1				15 grains.
10	5	"	22	1	¾	½	½	2 scruples.
11	5½	"	29	1				8 grains.
12	6	"	22	1				1½ drachms; broken in the extraction.
13	8	"	35	1	1	¾	½	5 scruples.
14	10½	"	16	1				3 grains.
15	11	"	21	3				3 drachms and 2 scruples; all of them broken during the extraction.
16	12	"	28	1				6 grains.
17	13	"	29	1				1 scruple; broken during the extraction.
18	19	"	56	1	1⅛	1⅛	⅞	3 drachms, 10 grains; a perineal fistula was established.
19	33	"	22	1	1⅜	1¾	⅜	2 drachms and 10 grains.
20	33	"	15	2	1¼ 1¼	1⅛	¾ ⅝	One calculus weighed 8 scruples, the other not quite 6 scruples; one calculus was pear-shaped and encysted.
21	57	"	29	5	1	1	½	Each weighed about 2 drachms, in all 12 drachms, 2 scruples; each calculus of the same dimensions.
22	57	"	29	1	1¼	1⅛	1	3 drachms.
23	59	"	16	1	1⅛	1	⅜	1 drachm, 13 grains.
24	60	"	15	4	1¼	1	⅝	Each weighed about 2 drachms, all weighed 8 drachms; the largest of the four had the dimensions given.
25	61	"	37	1				5 scruples; broken in the extraction.
26	61	"	31	10				All weighed 3 drachms.
27	63	"	69	1	2¾	2	1½	4 ounces, 5 drachms; a recto-vesical fistula remained.
28	66	"	42	1				22 grains; broken in the extraction.
29	66	"	36	5				All of them weighed 8 scruples. This was the second operation; a fistula remained after the 1st, which was cured by the 2d. The same case as No. 28.
30	67	"	30	1	1⅜	1⅛	⅝	3 drachms, 2 scruples.
31	68	"	29	2	1⅛	⅞	⅜	Both weighed 2 drachms, and both were of the same dimensions.
32	70	"	22	1				2 scruples; phosphatic, and broken in the extraction; a perineal fistula present from a former operation (lateral).
33	72	"	50	1				1 drachm; broken in the extraction. The same patient as No. 32. The fistula was not healed by either 1st or 2d operations.
34	1½	died.	1	2				Both weighing ½ drachm.
35	37	"	13	1	1⅝	1½	⅞	7 drachms.
36	55	"	3	2				Both weighed 7 scruples, and were broken in the extraction.
37	57	"	11	1	1¾	1½	1	1 ounce, 2 scruples.
38	61	"	9	2	1½ 1¼	1¼ 1¼	¾ ¾	One calculus weighed 5 drachms, the other 5 drachms, 2 scruples.
39	62	"	18	1	1½	1¼	1	6 drachms.
40	64	"	86	3				All broken in the extraction; together weighing 10 drachms.
41	66	"	4	1	1¾	1⅜	¾	5½ drachms.
42	66	"	2	1	2	1¼	⅞	1 ounce.
43	66	"	4	1	2	1½	1	12 drachms.
44	68	"	14	1				6 grains.

N. B—The weight of every calculus was taken on the day of its removal.

AGES OF THE PATIENTS.		DEATHS AFTER MEDIAN LITHOTOMY.	
Under 5 years of age	9 cases	Under 5 years of age	1 case
From 5 to 10	5 "	From 30 to 40	1 "
" 10 to 20	5 "	" 50 to 60	2 "
" 20 to 30	0 "	" 60 to 70	7 "
" 30 to 40	3 "		11
" 40 to 50	0 "		
" 50 to 60	5 "		
" 60 to 70	15 "		
" 70 to 80	2 "		
	44		

Table of the Last forty-four Cases of Lateral Lithotomy Performed at the Norwich Hospital.

AGES OF THE PATIENTS.		DEATHS OF THESE PATIENTS.	
Under 5 years	5 cases	From 50 to 60	1 case
From 5 to 10	4 "	" 70 to 80	1 "
" 10 to 20	4 "		2
" 20 to 30	3 "		
" 30 to 40	3 "		
" 40 to 50	1 "		
" 50 to 60	8 "		
" 60 to 70	10 "		
" 70 to 80	6 "		
	44		

Average number of days that each of the thirty-three cases of cure after median lithotomy was under care was thirty days.

Average number of days that each of the last thirty-three cases of cure, after lateral lithotomy was under care was thirty-seven days.

Table of the Number and Weight of the Calculi Removed from those who Died after Median Lithotomy.

Under 5 years	1 calculus, weighing ½ drachm.
From 30 to 40 years	1 " " 7 "
From 50 to 60 years	2 calculi, both weighing 2 dr. 1 scr. 1 calculus, weighing 1 oz. 2 scr.
From 60 to 70 years	1 " " 6 grs. 1 " " 5½ drs. 1 " " 1 oz. 1 " " 12 drs. 1 " " 6 drs. 2 " " 1 oz., 2 drs. 3 " " 10 drs., 2 scr.

Number and Weight of the Calculi Removed from those who Died after Lateral Lithotomy.

From 50 to 60 years, 1 case	1 calculus Weighing 2 drs.
From 70 to 80 years, 1 case	1 " " 3 ozs.

Remarks by Mr. Williams on the Cases of Median Lithotomy.

Two cases were cut twice by the median plan, at intervals of nine and four months respectively.

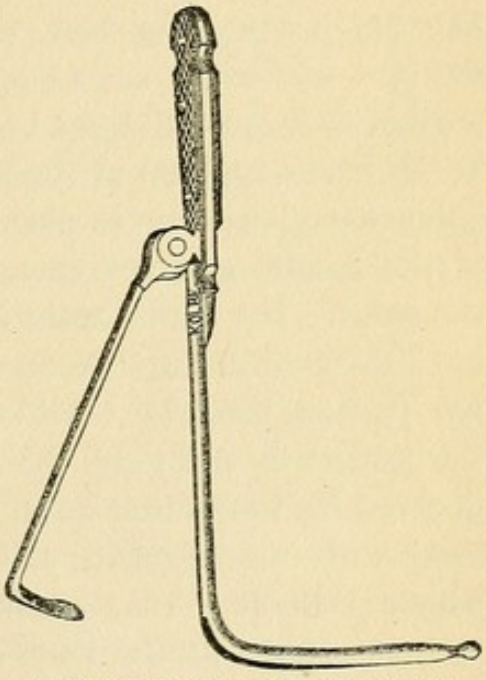
In no case did recovery result when the calculus exceeded three

drachms, two scruples; except in one case, in which the stone weighed upward of four and a half ounces, but a portion of the rectum and perineum sloughed, and a perineo-recto-vesical fistula was established.

In no case did a cure result when the long diameter of the calculus exceeded one and a half inches, and the short one and one-eighth inch, except in the case in which the stone weighed upward of four and a half ounces.

New Instruments for Lithotomy in the Male.

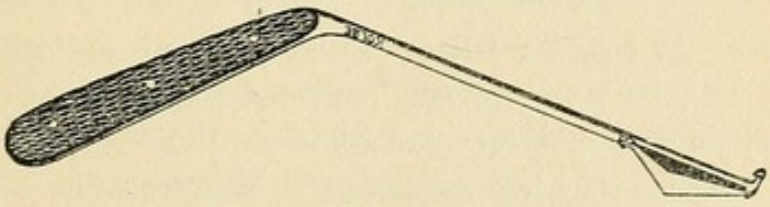
FIG. 43.



Staff and External Urethrotome.

Figures 43 and 44 show the instruments, as now constructed by Mr. Kolbe, of No. 15 South Ninth street, Philadelphia, and may be thus described: Fig. 43 is shaped like Prof. Nathan R. Smith's sound, and with his external urethrotome. At the point where the blade of the urethrotome strikes the staff, there is a slit for the blade to go entirely through the staff; and just in front of it there is a round hole for the entrance of the point of Fig. 44; and from this to the point of the staff there is a fenestra that allows the point, when passed through the hole, to slide toward the bladder, after the manner of the bayonet hitch, and will not allow the instrument to slip out, or to the right or left, being held there by its rounded point, which passes through the hole. Figure 44 is a double gorget, with movable blades; by

FIG. 44.



Gorget.

unscrewing the little screw at its base, either the right or left blade may be taken off, and then it becomes a lateral gorget, and can be used for either side. A gorget with the blade immediately under

its shaft, is made to perform the median incision. It is also made movable, in order to have it sharpened. With these instruments I can perform lithotomy well and safely, *blindfolded*, as the blades cannot get out of place, to the right or left, or downward, unless the point is broken off. Any one who can insert the sound, and has anatomical knowledge enough to know where the bulb of the urethra is, can perform this operation as safely as any lithotomist in the world. I claim nothing original with myself, except the modification of principles invented by others. The shape of the staff is, as I said before, Dr. Smith's. The *fenestrated groove* is the invention of Prof. Goodwin, of the Galveston Medical College; but his instruments had these objections: his sound was too straight, and could not be held well up under the pubis, and the median incision could not be made with it. His gorget was bent at the blades and not at the handle, as in mine, which bend pressed against the perineum in pushing it into the bladder, and the bend of the handle was not enough downward to allow free motion of the hand. His blades were immovable on the gorget, and did not have the external urethrotome attachment, which makes the internal incision just where we want it, and it is left in position until the gorget is fixed in the staff, the point of the blade being grooved for the sliding down of the point in the gorget. This does away with the necessity of the external incision with the knife, which is one of the most troublesome steps in the old plan of operating. If the urethrotome does not make a large enough incision for the gorget, it can be easily enlarged with a probe-pointed bistoury. These instruments are better than Prof. Post's (of New York) arrow-pointed lithotome, for this reason: the staff does not have to be taken out and another guide put in.

REPORT OF CASES.

Operation with Instruments of the Author's Invention—Mr. ——, of Liberty county, Texas, applied to me for treatment in 18—. He had, for some months previous, experienced much difficulty in urinating; and on one occasion, the difficulty being so great, the itching, burning sensation so disagreeable, he pulled a small, green vine, and introduced a foot of it into the urethra with hope of obtaining relief. From this time he grew rapidly worse; micturition and defecation were attended with violent, spasmodic straining, often passing blood from the urethra. Had been under

the treatment of several physicians, who gave him various medicines but no relief. One had made a careful examination and pronounced his suffering due to stone in the bladder, and attempted its removal by crushing, but failed.

I introduced the sound, and without difficulty detected a stone. After withdrawing the sound he suffered much, and passed a small quantity of urine, pus and mucus. His condition was unfavorable for an operation, being then anæmic and the subject of malarial cachexia, with harassing cough. After a full statement of his situation and chances of recovery—which were most doubtful—he decided to have the operation performed. He was placed upon suitable preparatory treatment, and the operation deferred one week.

Operation.—Having the students present and the patient chloroformed, the bilateral section was made with the instruments shown in Figs. 43, 44. As can be seen, they are almost self-acting, and with them the operation can be made as safely with the surgeon's eyes blindfolded as he can with the ordinary instruments when his eyes are open. All the skill required is to know where the bulb of the urethra is, and how to introduce this staff. As will be seen, the curve of the staff and urethrotome is the same as that used by Prof. N. B. Smith, of Baltimore, with the exception of a fenestrated groove instead of his hollow groove and cup for the bistoury. The staff is grooved at the point where the urethrotome cuts into the urethra, and on the back of the blade of the urethrotome is a groove, into which the knob on the end of the gorget passes in its way to the fenestrated groove in the staff. Having once introduced the gorget into the groove, it is *impossible* for it to slip out, or turn to the right or left; therefore, there is no danger of cutting the rectum or pubic artery, unless it is abnormal in its course. Having made the incisions the gorget is pulled back to the point of entrance, and withdrawn with care and safety.

The stone being of the phosphatic variety, crushed in attempting to remove it, consequently, had to be taken out in fragments. There was but little hemorrhage, the patient reacted well and quickly, as it took but a few minutes to complete the operation. The following night he was taken with a chill; double pneumonia followed, and he died on the eighth day after the operation.

A post-mortem exhibited a large abscess on both sides of the prostate. The one on the right was packed with minute particles

of stone; the incision passed through the one on the left. The bladder was found much contracted and in folds; entirely denuded of its mucous coat in places, with the muscular coat very dark, almost black. The lungs were not examined, as all present were agreed that he died of pneumonia. However, the condition of the prostate and bladder were sufficient to have caused death.

From an experience of twenty-three years in the practice of surgery, it is believed that facts will warrant me in saying that urinary calculi are of rare occurrence in Texas; owing in part, no doubt, to the general use of cistern water. During the practice of a number of years in the counties of Brazoria and Gonzales, when there were but few cisterns, no cases of stone in the bladder were seen, but treated three old men, natives of Kentucky and Tennessee, for gravel; one of whom died from infiltration of the perineum. The second recovered entirely by the use of twenty grains of bitartrate of potassium, three times daily, in conjunction with a liberal quantity of onions, lettuce, parsley and carrots, as articles of food. These vegetables, it is thought, exert, to a limited extent, a dissolving influence on urinary calculi. Case third was often relieved from attacks of gravel with the bitartrate of potassium and anodynes, but finally died, as did the first case, with infiltration.

Mr. P., a native of Tennessee, applied to me in 1858 for the removal of a calculus of the oxalic variety, which had lodged within the glans penis. He had, for several years, suffered with symptoms of gravel. The penis was much swollen and painful; had made an attempt to remove it himself. After putting him under the influence of chloroform, an unsuccessful attempt was made to extract it with a pair of forceps. A scooped-end probe was then passed down under and behind the stone; with some manipulation and difficulty its removal was finally accomplished.

In 1863, Mr. H., a German by birth, aged eighteen years, was brought to me by the late Dr. ——, of this city. Upon examination it was ascertained that this young man had a small stone lodged in the urethra, just anterior to the scrotum. Anæsthesia having been induced, a small scooped-end probe—as in the case above stated—was passed beneath and behind the stone, and its removal accomplished without difficulty.

Surgeon Fisher brought me, in 1864, a boy aged fourteen years, a native of Houston, who had been afflicted with stone for four or

five years. His general health was very much impaired; was the subject of chills, fevers, dropsy and prolapsus ani. After restoring his health in part, with appropriate treatment, an operation was decided on. Suitable instruments could not be obtained—it was during the late war—therefore, recourse was had to a sound of the old staff style, a straight bistoury and forceps. Assisted by Surgeon Fisher, assistant Surgeons Rugely and Francis, the patient being chloroformed, the lateral incision was made, and a stone the size of a filbert, extracted. While making the incision in this case, and just as the prostatic plunge was made, the rectum was forced down by the sphincter and severely cut. This accident was a source of much annoyance, and greatly retarded the patient's recovery. Fecal matter passed for several weeks through the urethra; every effort to produce union was futile, until the septum was cut into the rectum—as in fistula in ano—after which the patient gradually recovered.

Cutting the rectum in the case above reported, suggested the modification of Dr. Goodwin's fenestrated staff to that of Dr. Smith's. The curvature in the staff of the former was insufficient to prevent pressure on the rectum, and his gorget was bent at the blade, almost to an acute angle. When the author's staff is introduced, it produces no more pressure than an ordinary catheter, the urethral part of which can, if too large, be replaced by a smaller one; the urethrotome answering for any sized staff. His gorget is curved at the handle, the blades are movable, and larger or smaller ones can be put in. With it can be made the lateral, bilateral and median incisions. In all cases of perineal lithotomy, these instruments are undoubtedly the safest and best.

In 1865, I removed a stone the size of an almond, from a negro girl aged nine years, a native of Colorado county, Texas. In this case the incision was made on a grooved director, the sphincter divided sufficiently with a little dilatation to admit the forceps and remove the calculi. She recovered and remains well.

A messenger summoned me quite hurriedly one morning in 1868, in Galveston, to see a child aged fourteen months, who, as he said, had retention of urine with convulsions. The little fellow was found in great agony—penis swollen out of all proportion. In trying to introduce a No. 4 child's catheter, a stone, the size of an English pea, was discovered three-fourths of an inch from the meatus. Having no scoop or forceps present that could be used, a

hair-pin was inserted under and behind the stone. With this improvision it was extracted very readily.

Mrs. A., aged forty (negress), came to me from Grimes county, in March, 1870. She said she had been afflicted for months with almost constant vomiting, soreness of the bladder, and that her urine deposited a quantity of sediment resembling brick dust in color. I sounded her, and detected a rough, grating surface within the bladder. Upon withdrawing the sound she passed, with much difficulty and pain, a small amount of urine, which, when examined, was found to contain a quantity of minute particles of calculi. The patient being in good condition, an operation was determined for the following evening.

Operation.—In the presence of the students, and assisted by the professors of the Galveston Medical College, the patient chloroformed, a catheter inserted in the urethra, and the vagina dilated with Sims' speculum, a straight incision—large enough to admit the forceps—was made through the vesico-vaginal septum, and three drachms of soft particles of calculi, much resembling elaterium, were removed. The bladder was then thoroughly washed out with a Davidson's syringe, and the finger introduced, but finding no particles remaining the incision was closed with Sims' suture for vesico-vaginal fistula. On the eighth day the ligatures were removed and the patient put on ten drops of nitro-muriatic acid in a glass of water, three times daily. She was discharged, well, on the 20th of April following.

The particles of calculi in the case above reported were analyzed by Prof. Goodwin, who pronounced it phosphate of lime and soda. Last summer I was informed that this patient was suffering again with the symptoms she had prior to the operation. She was placed on the acid treatment again, and her family requested to notify me if she did not improve; as yet, have heard nothing further from her.

Strictures of the Urethra.

To fully comprehend the nature of the urethra, it will be well to premise with the surgical anatomy of the urethra. The urethra, in its natural and healthy condition, is from five to seven inches in length, and is an irregular tube with longitudinal folds, and formed by muscular fibres; there are no transverse folds in its natural state, but it contracts by its own resiliency. The penis is composed of the urethral canal and the corpus spongiosum, corpora cavernosa,

and the glans penis, with skin and cellular tissue. The gland is the least resilient, and causes a contraction in the urethra where it joins with the corpus spongiosum. The urethral canal then enlarges and forms a striated structure; the membranous portion is but a continuation of the corpus spongiosum, where there is a slight sinus, and an enlargement from the former portions of the canal in the proportion of three to five inches, forming what is called the membranous portion of the urethra, which terminates at the prostate gland, forming the prostatic portion. Strictures occur in these positions according to the following table:—

Glandular portion	17 per cent.
Gland to bulb	16 "
Membranous portion	67 "

Prostatic stricture very rarely, if ever, occurs; perhaps only by an enlargement of the gland.

The causes of stricture are various, but all originate from inflammation of the mucous coat of the urethral canal, common or specific causes, as the inflammations produced by cantharides, turpentine, gin, etc.; also from the passage of calculi, injuries from bougies, bruises and contusions, specifics, as syphilis, gonorrhœa and gleet.

Symptoms of Stricture.—A slight obstruction to the full flow of urine is almost the first symptom of stricture. A frequent desire to urinate, stream forked, twisted, and at times entirely obstructed; urine drops away without any stream; bladder rarely emptied; pus and mucus drip away after urination; urine unusually ammoniacal, and has a whitish, sticky sediment; patient's general health bad, and spirits depressed.

Strictures may be years forming, or they may occur in a few hours; the stream may be only slightly checked, or entirely suppressed. Stricture may form in various parts of the same patient. From one to seven strictures have been found in the same patient. They may be longitudinal, or formed by a simple band, produced, in both instances, by deposition of coagulable lymph beneath the mucous membrane.

Stricture may be permeable or impermeable—spasmodic, remittent, or permanent—incontractile.

Strictures from contusions and wounds are liable to produce fistulæ in the perineum, spadiæ, or hyperspadiæ, and sometimes the urethra is closed so as not to admit the passage of a bougie. I consider those strictures that a No. 1 catheter cannot pass to be

impermeable, not meaning by that phrase that no urine passes along the urethra, for there are tortuous canals or cribriform openings in the membranous portion of the urethra that will permit the passage of urine, but will not admit the passage of a bougie, or at least I have met several in which I could not pass a bougie or a sound.

Sounding for Stricture.—This is a delicate surgical operation, and requires experience and skill. The rules are simple and plain, but it requires an educated hand to perform it well. The best instrument is a curved one, either silver, lead or steel, and curved about one inch from the point. No. 8 is, perhaps, the best, and should be inserted without force, beginning with the curve *pressed up under the pubis, gently pressed along; and if it will not pass in this position, the curve should be turned first to the right and then to the left, and finally downward.* If there is an opening in any side, this examination will find it, and the point will enter. If a No. 8 is too large, take a smaller size, say No. 1, and use it in the same way. In nearly every instance, if the opening will admit the point, it can be passed. There are frequently several passages to the bladder, and the sound may pass through one and afterward through the other. If it pass toward the rectum, the sound will be more easily felt through the rectum, and will appear to be out of the urethral canal, which is the fact; the canal being closed or obstructed will form a passage below.

It is thought not to be necessary to understand the anatomy of the parts to pass a bougie. This, I grant, with a flexible instrument, is not absolutely necessary, but with a solid instrument, and not flexible, I think it very dangerous; and if the least force is used, a false passage will be formed. In using the catheter or sound I have found it more satisfactory if my patient was under chloroform, but to one not well acquainted with the anatomy of the parts, I would not advise this, for fear too much force might be used. If the curve of the instrument is kept well under the pubis no serious danger is liable to occur, but should it be turned to the right or left, and especially downward, there would be formed, in all probability, a false passage, and perineal infiltration, gangrene and fistulæ as the result.

If the patient is very nervous, and there is much hemorrhage, it is best to apply local applications to the urethra and antiphlogistic remedies for a few days, then try again.

The endoscope is a good instrument in diagnosing strictures of the annular kind, and they can be well seen, as shown in the case of Engineer Stone, but is more useful in the examination when the stricture is forming, than when it has formed. By its use we soon stop the inflammation, by direct application of nitrate of silver to the part inflamed, thus preventing the effusion of coagulable lymph that makes the stricture.

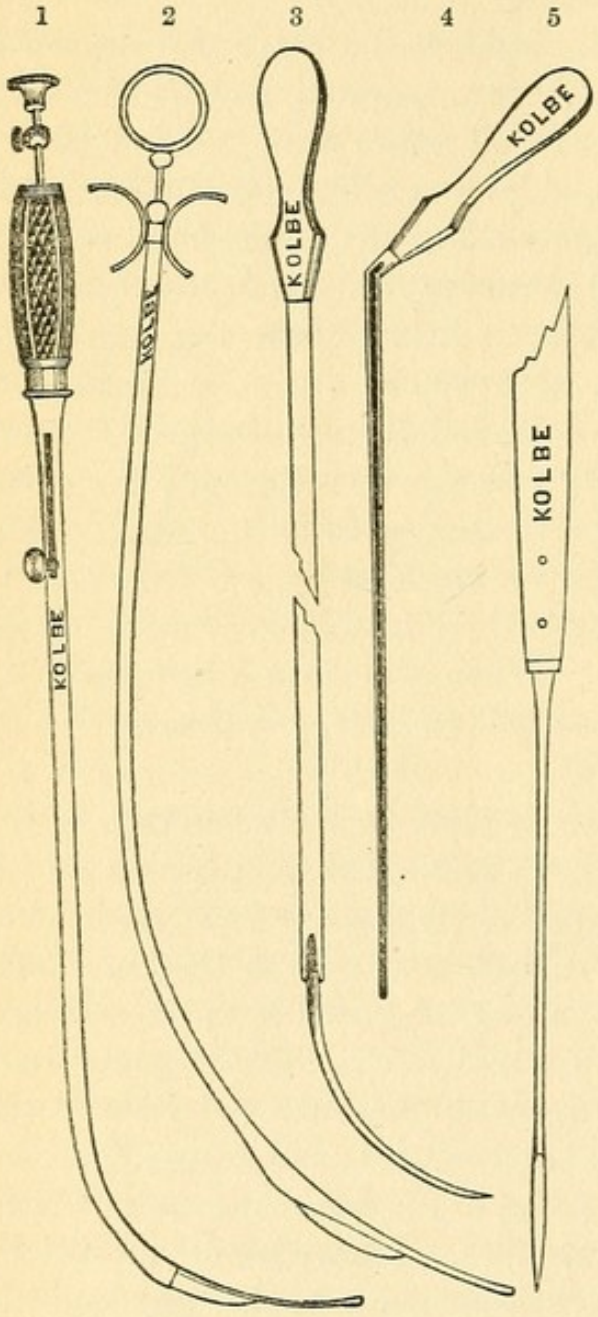
The instrument should be well oiled before using, and if the canal is small, and the instrument fits tight, it would be well to inject the urethra with a drachm of sweet oil before using the bougie.

Bougies.—The silver bulb sound is an excellent instrument, but I prefer the lead bougies, that I can bend to any angle, to all others; and the lead, I believe, is useful in the cure of any acute inflammation that may exist. They are sufficiently firm to bear any amount of pressure that ought to be used, when we use above No. 9, French scale. The French scale is the best, and all manufacturers should use it. We have now great confusion, every instrument maker having his own. We shall use this scale entirely, see Fig. 51, page 165. The lead bougies will not break easily, and from four to twelve are large and small enough; these may be graduated to any size, but six is amply sufficient. When you have put in a No. 4, and let it stay two hours, or even half an hour, you can, on taking it out, insert No. 6, and so on.

When inserted it should be left in place for a few hours, and if a catheter, may be kept in for twelve. After that time I think it best to give the urethra rest, as there will be more or less pain in the bladder. I *tie the catheter to the testicles with a tape*, and this does not prevent the patient from moving, and I have never found any inconvenience. Putting an adhesive strip to the penis or a bandage around the body is entirely unnecessary, and I am really surprised that surgeons ever recommended it; but I find the great Malgaigne has devoted several pages to the different modes of confining the catheter in the male urethra. I have never resorted to any other mode than tying the catheter down to the testicles with tape through the two eyes of the ordinary catheter, and when I have used bougies, I have put eyes to them or bent lead eyes into the loop or hole in the top, through which I passed the tape and around the sides of the penis to the base of the testicles, where it was tied lightly, but not loose enough for either testicle to pass through the loop.

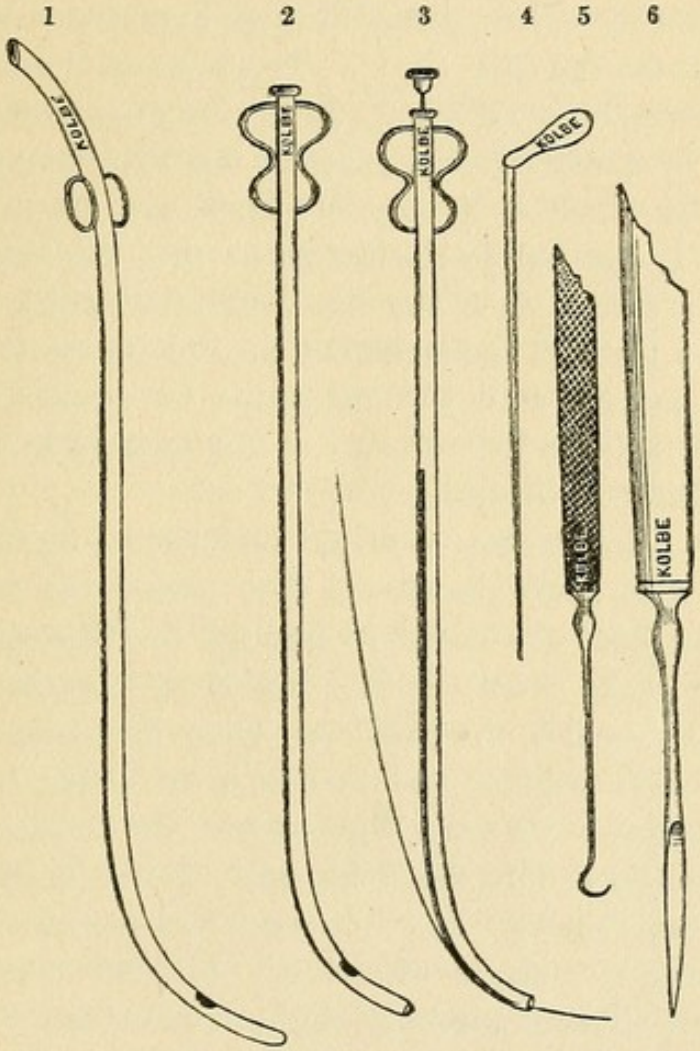
Treatment of Stricture.—Resilient or spasmodic stricture may be cured by internal remedies and the warm bath, but it often becomes necessary to pass a catheter to remove the urine, which is irritating and increases the symptoms. *Cold,* venereal excess, morphine and various other causes produce spasmodic strictures without venereal taint. Warm fomentations to the perineum, warm bath, and the moving of the bowels with cream of tartar, citrate of magnesia solution, or any mercurial, will often effect a cure, or at least give immediate relief; but these are liable to return, and when it occurs I usually operate by internal incision with a common urethrotome, as shown in Westmoreland's, Fig. 45, 1. I have used internal urethrotomy, cutting through the muscular coats with the urethrotome while they are contracted, and then inserting a No. 27 catheter, tying it in until the urine begins to run along its line, when it is removed, reinserting it each day for several hours, and continuing its use once a day for eight days, and once a week for several weeks. This has proved entirely successful in cases where I have followed this plan. When I have been able to pass the stilet into the bladder, I have invariably used—as the attached report of cases will show—internal urethrotomy with entire success. But when no sound can be passed, I have used external incision upon a common grooved director (Fig. 45, 4), or a Sims' sound (Fig. 45, 3), passed as far as I possibly could, cutting down directly over it and through the stricture with the bistoury (Fig.

FIG. 45.



45, 5), and then passing the sound further on, until I reached another stricture, or into the bladder, hooking up with a tenaculum (Fig. 46, 5), all hard or indurated tissue, and cutting it out at various times, not all at once, for fear of hemorrhage and perineal infiltration, and gangrene.

FIG. 46.



1. Catheter, for Retention, old style. 2. Filiform Catheter. 3. Filiform Bougie and Catheter. 4. Grooved Director. 5. Tenaculum. 6. Bistoury.

For perineal fistulæ there is no remedy but to cut down on the urethra, and open up all the fistulous canals, excising all the hardened, indurated parts, letting them fill up by granulations, which has proved successful in all my cases, the patients enjoying perfect health, who were a nuisance to themselves and all about them before the operation was performed.

INTERNAL INCISION.

Engineer ——, of Revenue Cutter Delaware, applied to me in 1866, for treatment of a stricture at the bulbous portion of the

urethra, of several years' standing. He had tried dilatation with only partial success, and it had returned in March, 1866, much worse than ever. Upon sounding him I found that a No. 27 passed to the bulbous portion of the urethra, about four inches from the meatus. I succeeded in passing a No. 5, which admitted the director of the urethrotome I used, which is made the size of a No. 21, with a central staff passing through the catheter with a slight enlargement at the end (Fig. 45, 1). This is made to protrude about three inches beyond the catheter. In this same catheter is a convex blade moved by a staff, also running on the former staff and fixed to a button, by which it is moved. These are drawn within the catheter, and it inserted to the stricture; then the director passed through the stricture into the bladder; after which the bladed staff is pushed through the stricture, cutting its folds. After examining this patient with the endoscope, he consented I should operate, which I did in the presence of and assisted by Dr. Mintzer and Medical Director Taylor.

The patient being on his back and under chloroform, I inserted the catheter, with staffs drawn up, then passed the director into the bladder and cut the stricture through and through with the convex-bladed staff; after which I pulled up the two staffs and passed the catheter into the bladder. Then removing the same, I inserted a No. 30 catheter and tied it in as above, passing tape through its eyes and down the penis around the testicles, and then tying it, put a stopper into the orifice and left him in bed ten days. The catheter was removed daily, cleansed and reinserted. Patient was not allowed to urinate without the catheter being in place, for eight days. There was only slight hemorrhage and no bad symptoms. Patient continued to pass mucus, and had to insert catheter occasionally for nearly a year. The upper portion of stricture remained and could be seen through the endoscope, and produced a burning sensation when patient used the catheter. The stream was full and free, and the patient never suffered from retention of urine afterward.

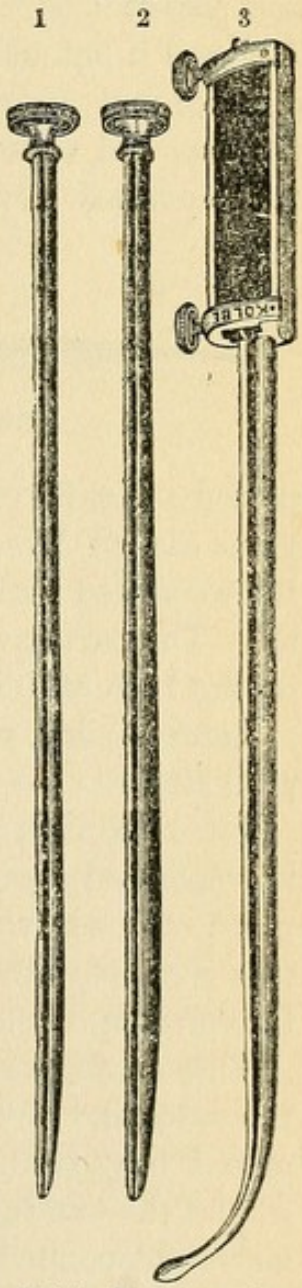
Case 2.—Mr. T. R. N., aged thirty-six, of Brazoria county, applied to me in September, 1866. This was a longitudinal stricture with three contracted heads, of fifteen years' standing. Had suffered much and often had to resort to the catheter, especially after taking cold, or any irritating drinks. I used the same instrument on this as on case No. 1, but there was excessive hemorrhage and

much pain, which was subdued by opiates, and cold cloths to the perineum. The catheter had to be removed several times and re-inserted, but the patient continued to improve, and in three weeks was well enough to return home; is in fine health. I operated three times in the Island City Hospital, after this plan, with entire success. I do not remember any peculiar symptoms, and no bad ones, developing themselves. (See Table of Cases, page 166.)

HOLT'S INSTRUMENTS.

Where the urethrotome does not make an opening in the urethra large enough for my retention catheter, after incising with the urethrotome I insert Holt's dilator (Fig. 47, 3), which is the best of any I have seen, and, as I think, a perfect instrument; perfectly safe without the urethrotome, provided it can be inserted into the bladder before putting in the dilators. But I have met with many cases in which I could not insert it, but could pass the sound on the end of Westmoreland's urethrotome, and when even this cannot be done, we may pass the filiform bougie (Fig. 46, 2, 3, page 157). But when these become necessary it is far better and safer to perform external incision, if the operator knows what he is about. No one should attempt it unless he is a good anatomist. *The retention catheter is indispensable, whether you incise or rupture,* to prevent infiltration or contraction, and even pain, after urethrotomy.

FIG. 47.



Holt's Instruments, Improved.

STRICTURE WITH FISTULA PERINEI — EXTERNAL INCISIONS.

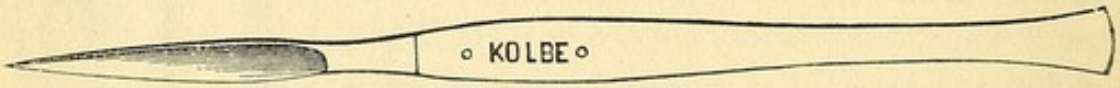
George Smith, aged twenty-five, nativity United States, was operated upon for stricture of the urethra, November 19th, 1867; stricture at bulb of the urethra; swellings from contusions numerous; the wound healed by December 18th; patient is considered well.

I proposed to lay the parts open at once, upon his admission to

hospital, but to this he did not consent, yet on the 19th of November he consented to my cutting down on a probe and opening the two fistulæ, which were well formed by this time. I could not pass any sound; the urethra was impervious to all sizes.

Operation.—Patient being under chloroform, and assisted by Dr. Wilkerson and the medical students, I put down to the first stricture an ordinary grooved director for hernia, and cut through to its point, then took it out and passed along the line of stricture and under it, and cut through the stricture; took a No. 21 bougie, and passed it on to the second stricture beyond the testicles, where I turned it out and cut down on its point. I then took the grooved director and inserted it from the fistulæ toward the testicles and between and under them, cutting all the indurated portion with a probe-pointed bistoury (Fig. 48). I then took out the sound, and

FIG. 48.



Bistoury for External Incision of Strictures.

passed a No. 30 catheter into the bladder, and tied it in, as in previous cases. Every few days I would hook up, with a tenaculum, the indurated portions, and cut them out, until I had removed them all. The parts healed up by granulation. Patient was discharged on the 18th of December.

James Kelley, aged twenty-five. I copy the following from Hospital Register:—

James Kelley, admitted Februrary 11th, nativity New York, was operated upon for stricture. Urethral incision one inch anterior to the scrotum, stricture laid open, catheter passed through two complete strictures into the bladder; four fistulæ anterior to the scrotum, two of them in glans penis. Discharged April 22d.

These notes were made by House Surgeon Wilkerson, and give the dates and the locations of the strictures. This was the worst case I have seen. The gland, as above stated, had two fistulæ in it, and the external meatus would not admit a probe. I first took a straight-pointed bistoury, and opened the gland, above where the urethra ought to be, to the first opening or fistula, and then cut them all into one. I then took a No. 26 catheter and inserted it to the third fistula and second stricture, cutting it open and down so I could pass it to the fourth, and from it to the bladder. Con-

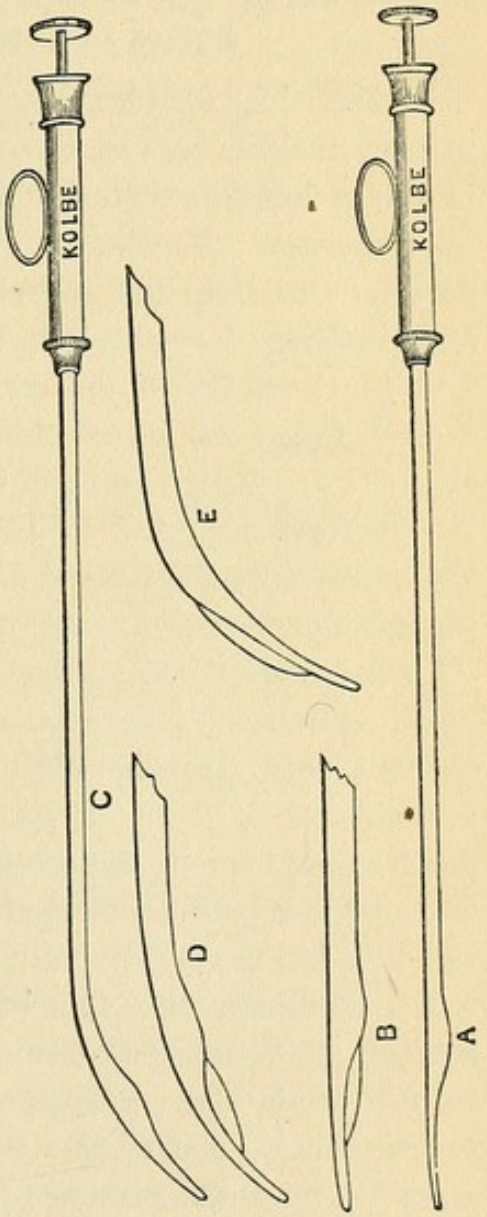
tinued to cut out indurated portions for a month, and healed up all the fistula, except one just in front of the testicles, which was not entirely closed when patient left. Same patient returned, looking well. Had had the yellow fever the summer before, been on the city police, and at work since he left the hospital. Still small opening, through which a drop or two of urine passed, and matter forming pus. Touched the opening with a hot wire; did not close from its cautery, but was finally closed by a plastic stitch—cutting out the mucous surface, and stitching it up with silver wire. I operated on two other cases with fistulæ after the above plan, with entire success.

Edward Murphy, aged twenty-seven, nativity Ireland, was operated upon for stricture of the urethra. Admitted March 1st and discharged July 11th. Wounds healed by first intention.

Henry Foster, aged twenty-six, nativity Texas, was operated upon for stricture in urethra. Admitted June 5th, and discharged August 14th.

Remarks.—I have not said anything of dilatation, for I have almost abandoned this form of treatment, because, in the first place, it is more tedious and painful; secondly, it is more uncertain, leaving a mucous epithelial discharge—is always liable to return.

FIG. 49.



Various Forms of Urethrotomes. A, B, C, D cut upward. E cuts downward. B used in the Meatus, bulbous portion.

I have not used the urethrotome-cache of some authors—because where it can be passed, the other kind I use is more easily inserted, and will cut either backward or forward, and is better suited to every case. I believe all strictures are curable, and without danger, if treated prudently and skillfully. I do not think external incision ever necessary when the No. 1 size

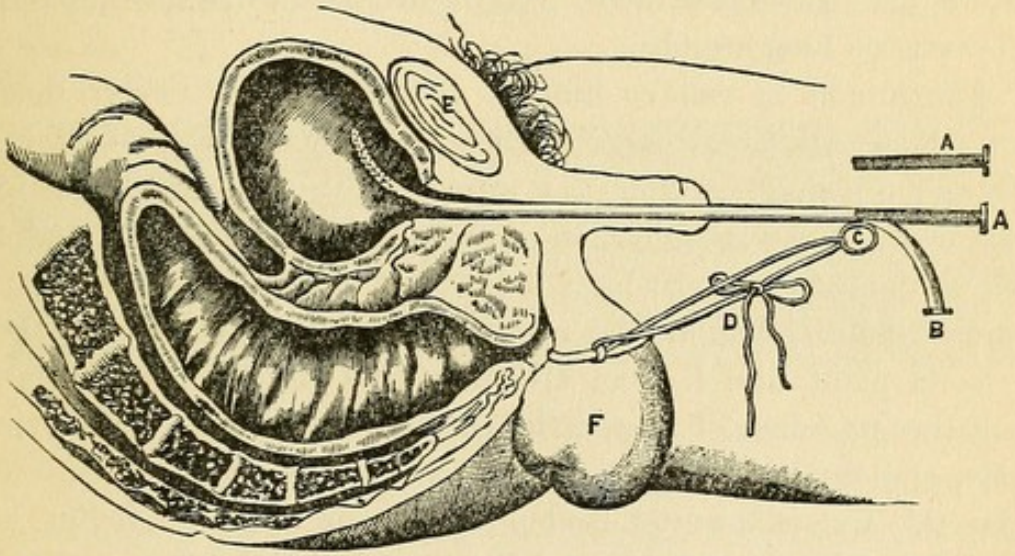
sound can be passed into the bladder, preferring internal incision. When there are several passages, then external incision becomes necessary, to form them into one. I do not believe in the rupture treatment of Dr. Holt, except in resilient strictures, and after the cutting of the strictures with the urethrotome. It is more dangerous and tedious than internal incision.

A New Form of Male Catheter for Stricture of the Urethra, and a New Method of Retaining it in the Bladder.

In 1858 I had under treatment a bad case of hypospadias with urinary fistulæ; one in the raphe between the testicles, the other in the perineum, posterior to the testicles (see report of the case in *Galveston Medical Journal*, 1866). Finding it absolutely necessary to keep the catheter in the *urethra*, to prevent closure after incision, I resorted to the method of tying it in by means of tape in the rings of the catheter, and then around the testicles. This I found to be an admirable method, and I have used it ever since. Malgaigne and other surgeons have written pages on the different modes of retaining the catheter in the male, none of which are satisfactory, and all attended with danger of penetrating the fundus of the bladder by pressure, producing slough, as they all take their "*point d'appui*" from an immovable position, and when attached to the penis itself, it does not allow of erection without pain and distention, and the flow of urine softens up the attachment, or wets it, producing irritation and pain. Finding much annoyance in the dripping of the urine over the testicles, I first used a plug or stopper in the orifice of the catheter; but as the bladder filled with urine it became painful; I then resorted to a gum-elastic tube, placed over the mouth of the catheter, and leading into a urinal or basin. This worked admirably, and seemed to fulfill all the indications; but finding a large discharge of mucus, blood, epithelial cells, and crystals of calculi, I saw the necessity for a still further improvement, which is shown in Fig. 50, which answers all purposes; by partially unscrewing the stop-cock, we can let the urine flow down the tube into a urinal or basin or by taking out the stop-cock, and screwing in the nozzle of a syringe, we can completely wash out the bladder without removing the catheter. I make it *an invariable rule* to keep the catheter thus tied in until the urethra becomes so relaxed as to permit the flow of urine along its sides, when it is always taken out. I deem

this of great practical importance in treating all kinds of strictures, whether the stricture is broken down, as in Holt's method, or incised, as in Pancoast's and others, and absolutely necessary to good results in all cases of external urethrotomy. I have treated, in this simple way, thirty-one cases of external urethrotomy, and eighty-six cases operated on by the internal urethrotome, with only one death, and perfect cures in all the others (see Table, page 169, No. 7, and *Texas State Medical Reports*, for 1871). In the case of death the man had hiccough when he was first operated on, and was in a comatose condition from uræmic poison, with gangrene of the prepuce and the cellular tissue in the perineum. He removed the catheter in his delirium, and the urethrotome

FIG. 50.



New Retention Catheter for Stricture of the Urethra. A. A Screw, and Nut for its Insertion. B. Discharge Pipe, when the Screw is withdrawn. C. Ring of Tape tying the Catheter around the Testicle. D. Knot of Tape. E. Symphisis Pubis. F. Testicle.

had to be used again, before his bladder could be reached with the catheter, and by leaving the catheter out one night, he again became comatosed, and finally died. I firmly believe he would have recovered if the catheter had been kept in. The same difficulty has occurred in several other cases, hence the universal application of the catheter in these cases. There is a further advantage in keeping the catheter in after incising a stricture; your patient is not so liable to rigors, and he does not suffer from difficult urination; is not near so liable to infiltration. With my present experience, I would consider myself criminal if I did not use the catheter in all cases, in the above manner. The catheter produces no irritation as (when the bladder contracts) it

moves up and down as it fills with urine; the testicles draw the catheter back, and it is thus movable at all times, relieving tension and irritation. My success in treating strictures requiring external and internal incision is greater than any statistics published, and I attribute it alone to the use of the catheter, and the mode of its retention.

REPORT OF CASES.

In the summer of 1858 a negro man, property of T. J. Sweeny, of Brazoria County, Texas, was sent to me for treatment for perineal fistula and hypospadias of the penis, caused by a fall across the gunwale of a boat. But little urine was discharged through the natural channel, but the greater part passed out behind the scrotum, from several orifices. His constitution was good, and the injury was of long standing.

I determined to relieve him by an operation, or rather, operations. So I took a common tenotomy bistoury (see Fig. 46, 6, page 157), and a female catheter; I inserted the catheter in the first fistula down to the stricture, the cause of the hypospadias, and cut down on the catheter, reaching it through the fistulous opening. I then tied the catheter in by a string through its eyes and the opening in its point, and let the stricture heal up over the catheter. When this was done, I passed the catheter on to the second hypospadias, and cut the stricture as before, again tying in the catheter. When this was sufficiently healed up, I took a male catheter, and passed it to the stricture beyond the scrotum, and cut all the fistulous openings into one. I then tied the catheter in, letting its point come out at the fistulous opening, and retaining the catheter in this situation by a piece of tape through the eyes of the catheter and through the holes in its point. This healing up, I then passed the catheter into the bladder and tied it in with a tape in the eyes and around the scrotum and testicle, as seen in Fig. 50, page 163, the common two rings used instead of the one without the screw. I believe this was the first effort ever made to tie a catheter in the urethra or bladder, by fastening it around the testicles instead of the penis, or by belts around the body.

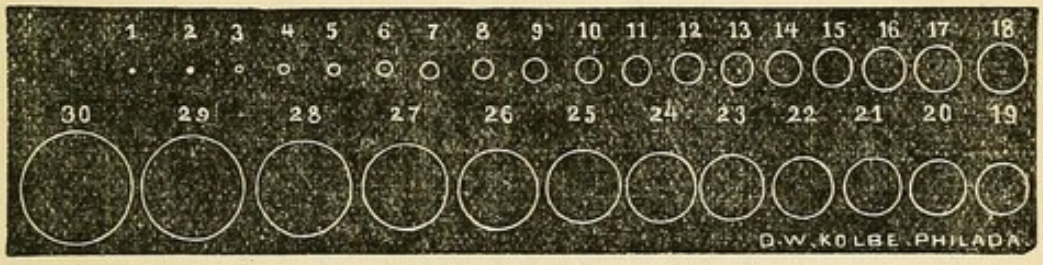
This I claim an invention of great value, and one I have used successfully ever since. See *Galveston Medical Journal*, and Table of Cases, page 166.

The man took measles while I was absent, and died from flux

while at this stage. In treating other cases, I found that the urine passing off on the legs and clothes was very annoying. I, in my next case, stopped up the mouth of the urethra with a plug, and pulled it out when the patient wished to urinate. The next case I applied a tube of india-rubber to the mouth, and let it run out into a basin. This acted well, and kept the patient perfectly clean; by this means, and its attachment to the scrotum, I could keep the catheter in indefinitely, as there was no power to press it back, to produce lacerations or sloughing, as occurred when fixed to the body, and it could not get loose and come out, as it often did when fixed around the penis; it made the retention more simple, and prevented any dripping of urine, allowing the patient to turn over on his side, or to the right or left.

The catheters are made in sizes from fifteen to twenty-one American scale, or twenty-three to thirty-two French (Fig. 51), and after

FIG. 51.



cutting a stricture or lacerating it, this catheter is put in (usually No. 30) and tied in with a tape tied around the scrotum and in the eye or ring of the catheter, and kept in until the urine burrows along the catheter, when it is taken out and inserted every night, and tied in for half an hour to two hours, until the incision heals up and the stricture is absorbed. When the patient wished to urinate, a cup or bottle was held under the open tube, and the screw A (Fig. 50) unscrewed to the mouth of the tube, when the urine flowed into the cup or bottle without wetting the bed. If it becomes necessary to wash out the bladder, the screw is taken out and the point of a syringe inserted in the screw end of the catheter, and water is pumped in and run out at the tube B. Solutions of any or all salts were also used when necessary, with no injury to clothing, using my catheter instead of the usual double cannula, which has some advantage, as we have a constant stream, but has the disadvantage of being inserted each time.

Operation on the Urethra, by Greensville Dowell, for Impermeable Stricture.

NO.	NAME.	AGE.	CONDITION, ETC.	OPERATION.	FEATURES.	RESULT.
1	C. S.	38	Hypospadia. Three fistulæ, two in raphe of scrotum, one anterior to it; urethra nearly closed by phimosis; stricture impassable. Cause, fall on the gunwale of a boat.	July 8, 1858. First for phimosis; put down to first stricture—grooved director of the pocket case—cut down through the second fistula to the point of the probe; catheter inserted and tied in; same operation repeated in third stricture.	Catheter tied in the first opening for 24 hours; taken out and seton used; catheter inserted to last incision every day; was up to last stricture when patient took measles.	But little swelling of penis or scrotum; great deal of suppuration along the line of the urethra. Died 5th Aug., from measles, followed by diarrhœa hemorrhagica. *Gal. Med. Jour.*, Vol. I, No. 1, pp. 55 and 56.
2	T. F.	34	Four orifices beyond testicles; impermeable to catheter; one on left side of anus, two on right side of raphe, anterior to anus, one on centre of raphe; whole space hard and callous. Cause, fall on a plank.	I could not pass probe to first opening; great hardness about this point and around all the openings. I cut down on grooved director until I could push it out at the orifice; cut out all the callous parts, a little at a time for weeks: put catheter in every day and drew off the water.	Bled a good deal at times, but continued to improve.	A perfect cure by the 20th of Jan., 1866. Is now a drayman in Galveston. *Gal. Med. Jour.*, Vol. I, No. 1, p. 58.
3	G. S.	25	Nov. 19, 1867. Impermeable stricture at bulb of urethra, with fistula; numerous callous points.	Cut down on grooved director and inserted catheter.	Some fever, with rigors at various times; good deal of suppuration.	Dec. 18. Patient considered well, and left hospital without discharge.—*Gal. Med. Jour.*, Vol. III, No. 4, p. 266.
			1868. Returned with stricture remaining and fistula still open.	Operated as before, and treated as before.	No bad symptoms after operation. Took rheumatism; could not turn over; fistula still open, but nearly closed; bed sores.	Died from effects of rheumatism and bed sores, at City Hospital, 1868.

4	J. K.	25	Feb. 11, 1867. Two fistulæ in gland, one fistula one inch anterior to scrotum, four fistulæ in all, anterior to scrotum; impermeable to all bougies.	Meatus externus enlarged by incision; catheter inserted to third stricture; cut down on probe through callous opening. Operation continued from day to day until the catheter entered the bladder.	No bad symptoms; great pain in inserting catheter; testicles swollen very much; gland natural, except orifice a little too high on gland.	Deserted from the hospital April 22, 1867. Recovered except a small opening one inch anterior to scrotum; makes water well and free, but some comes out at orifice, if not pressed on.—*G. M. Jour.*, Vol. III, No. 4, pp. 25–8.
			Came to hospital April, 1869. Small orifice one inch below scrotum and anterior to it; has a pocket which fills with urine when he urinates, and a little pus at every discharge; says that he is impotent or cannot have an erection.	Operated June 9, 1869. Made an incision over the orifice; took up with tenaculum all the ulcerated surface and cut it out; brought the parts together with silver wire.	June 27, 1869. Left hospital to-day, with a slight discharge at orifice; went to New Orleans; reported well by friend and nurse.	Cured.
5	E. M.	27	Fistula rises up and closes behind testicles; impermeable to all instruments.	March 1, 1867. I cut down on grooved director and opened the stricture and let out the pus from small abscess; passed a catheter to bladder and tied it there.	No bad symptoms. Discharged July 11th.	Cured.
6	H. T.	26	Fistula side of testicles; stricture impermeable.	June 5, 1869. Cut down on grooved director as above.	Recently from abscess and urinary fistula.	Cured August 14, 1869.—*G. M. Jour.*, Vol. III, No. 4, pp. 269.

Operation for Fistula—Internal Incision.

NO.	NAME.	AGE.	CONDITION, ETC.	OPERATION.	FEATURES.	RESULT.
1	Lt. S.	32	Stricture at bulb of urethra, of several years' standing; had tried dilatation; returned March, 1866.	Internal incision with urethrotome; catheter No. 28 inserted immediately and tied in by the testicles; some hemorrhage.	Bled freely during the night after the operation; clots formed in urethra; catheter taken out and reinserted each day for eight days.	Cured.
2	W. S.	36	Stricture in membranous portion; had, previously, abscesses and fistulous opening, but they had healed up; made water with a very small stream and with great pain.	Internal incision before the class, 1867, with urethrotome; catheter inserted and tied in by testicles.	No bad symptoms.	Cured.
3	T. R. N.	36	Sept., 1868. Oblong stricture of fifteen years' standing, within the gland; makes water with a small stream and in great pain.	Internal incision; catheter tied in as before; pain very great; catheter taken out and could not be inserted again until patient was put under chloroform.	Catheter kept in and only taken out to be cleaned each day.	Cured.
4	P. M.	54	Stricture almost impermeable, anterior to scrotum, and three distinct bands; had, previously, fistula and sloughing.	1869. Internal incision.	No pain; no hemorrhage; catheter not removed for two days even to be cleaned; reinserted and tied in for eight days.	Cured.
5	H. R.	36	Stricture anterior to scrotum and two still further on; has suffered a great deal; had been treated by dilatation, but without success.	Internal incision; catheter inserted and tied in; removed third day; pain very great and fever; reinserted the catheter and kept in fifteen days.	Had an abscess on the thigh, from an irregular physician's putting a flexible bougie down the thigh.	Cured.

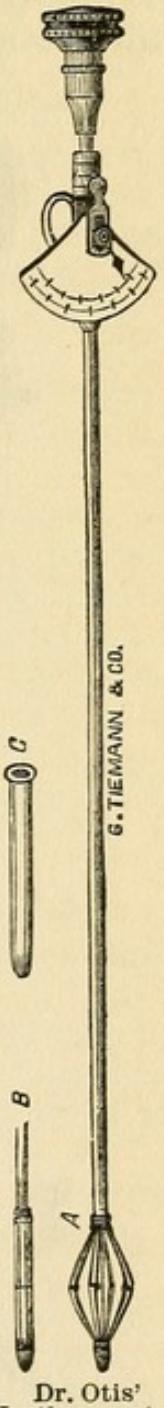
6	R. H.	28	Negro man. Of 13 years' standing; testicles swollen as large as a cocoanut; penis as large as a man's arm; fistula small, but urine continues to dribble and keep the parts wet, and infiltrates the cellular tissue.	Internal incision; catheter tied in; parts covered by adhesive straps and collodion, and suspensory bandage worn.	No pain; no bad symptoms; effusion lessens each day.	Cured.
7	W. D.	65	Sept. 18th, 1869. Of 25 years' standing; phimosis; prepuce much swollen; complete retention of urine; stricture impermeable; one about an inch from meatus; one inch further a general stricture to prostate; abscess to left side; has hiccough; mind wandering, from uremia; no urine since the 16th.	Put grooved director down through prepuce to glands, and excised the entire prepuce; cellular tissue gangrenous; pass grooved director to first stricture; cut through first stricture with straight-pointed bistoury; put down No. 28 bougie; cut through second stricture; passed urethrotome to last stricture and incised the prostrate portion; took out urethrotome and inserted No. 28 catheter and tied it in; urine flowed all the time after incision.	Suffers a great deal; partially delirious all the time; is better on morning of the 19th; worse at 6; had to take out catheter, which had kept the urine free; excessive pyæmic fever; catheter removed to allow abscess to discharge; penis continues to swell. Morning of the 21st—puncture the penis for infiltration, and cut cutaneous artery; bled freely, but was compressed; continues comatose; catheter could not be passed.	Morning of Sept. 22d, 1869, died from mortification and pyæmia, hiccough continuing all the time during the treatment; anodynes and purgatives used during treatment, without success.
8	S. W.	46	Good health and constitution; stricture of 11 years' standing; caused by injection for gonorrhœa; 2 strictures, one about 1½ inch from meatus, other at the bulb; makes water with a small stream.	Patient under chloroform; Dr. Wilkerson assisting; put in urethrotome and cut through both strictures; took out urethrotome and inserted No. 28 catheter and tied it in; rigors and some fever.	Rigors first day; catheter removed, cleaned and re-inserted; patient given morphine in ½ gr. doses until relieved; seventh day, hemorrhage profuse; pain on inserting catheter, of burning sensation.	September 28th, 1869. Doing well; no difficulty in urinating; is walking about; catheter inserted every day.

GENERAL REMARKS ON STRICTURE OF THE URETHRA.

For twenty years of my professional life I used only catheters and bougies for the treatment of strictures, scarcely thinking of making a radical cure; but meeting with the case reported, No. 1 in the above table of external incisions, I was compelled to make the subject a special study, and by accident, as has been seen, I discovered the mode of attaching the catheter to the testicles, and thereby a safe and easy mode of retention. This enabled us to keep bougies in as long as we wished, and we treated, during the war, several cases with bougies made out of bars of lead, putting in one size after another until we enlarged the urethra to about No. 27, which gave entire relief in several cases which are still perfectly cured. After the war, as soon as we could, we obtained a complete stricture case, having Westmoreland's urethrotome, and six sizes of steel sounds, with triangular ridges on their curved portion. These we used with great difficulty, and ruptured the mucous membrane without dilating the urethra, so we abandoned them, and sent them to a manufacturer to exchange for others. We then received two forms of dilators moved by screws at the end; but these we found useless, for when we could insert them, we could use our urethrotome, and after its use put in a catheter, and cured our patients in eight days by internal incision. But we met with some that we could not enlarge with these means without resorting to the old plan of gradual dilatation, which was painful, tedious, and filthy, so we procured Holt's, which, as now improved, *is perfect*, and very simple. Yet we did not have as good success with it alone, as when we used the urethrotome before Holt's dilator, first cutting the stricture, then further dilating it, and finally putting in our retention catheter, all under one etherization, keeping in the catheter until the urine burrowed along its sides, which it did usually by the fourth day, giving the incision and ruptures, if any, time to heal up. By the fourth day it would become loose, and would move up and down as the bladder filled, and if the holes in the bladder end choked up, it was taken out, well cleaned, and put back after the fourth day; we tied it in for two hours each night for some six or ten days, keeping our patient easy with morphine while confined to his bed, and this was rarely over six days, when he could make a full stream, and usually returned to his business, whatever it was. By this time patient was taught to

insert the catheter himself, and to do it once a week, and let it stay for two hours. By these simple means I have radically cured all cases brought to me for the last ten years, that I could insert the end of Westmoreland's urethrotome (see Fig. 45, 1, page 156), and have never resorted to external incision unless there were fistulæ, when I have invariably cut the strictures on a grooved director, or Fig. 45, 4, page 156. If in the body of the penis cut in the membranous portion with the urethrotome, and then tie in my catheter, and let the parts heal up over it. After the urethra enlarges so the catheter can be put in easily, it is taken out and inserted daily, as in cases of internal incision. In the thirty-one external operations, no deaths, and but one death in the eighty-six internal incisions, being a mortality of one in one hundred and seventeen cases since I began the use of my retention catheter; and certainly my cases were as bad as any ever seen, as will be found by reading the cases reported in the tables. With this catheter no infiltration can take place, and consequently no sloughs or abscesses have formed when it was used; and hence the great success I have had in both internal urethrotomy and external urethrotomy, having cured all except one case — eighty-six internal incisions, and thirty-one external. Then, to treat all cases, I need and use only a few instruments. I have never annoyed my patients with the filiform bougies, though I think they should be used by timid surgeons, and by all who have not a thorough knowledge of the urethra and its annexes; but while getting the urethra large enough for dilators and urethrotomes we can cure our patient with the simple means we have used, and without half the pains. To diagnose a stricture we have found the catheters alone sufficient, but we use the olive sound, or Dr. Otis' instrument (Fig. 52), called by him the urethra-meter; it is an admirable instrument, and simple in its use. I wish I could say as much for his dilators, but in *my opinion*, they are not to be compared to Holt's improved, either in efficiency, facility, or *safety*. The sides will spring, and will pinch or tear the mucous membrane in its withdrawal, as did the two I used, and aban-

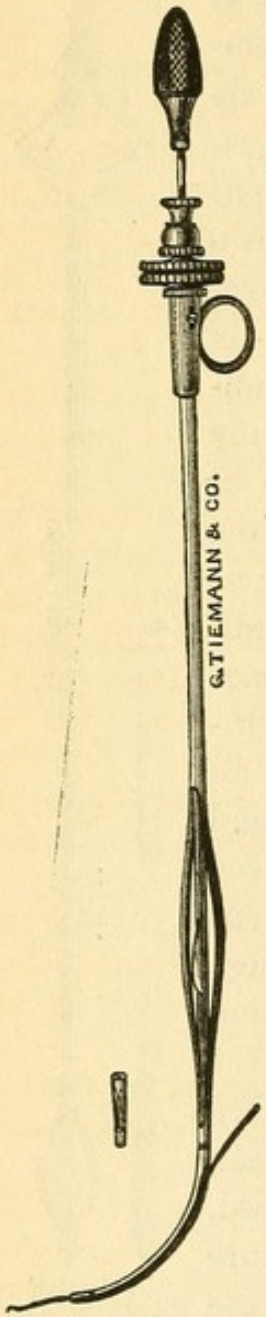
FIG. 52.



Dr. Otis' Urethra-meter.

doned as useless, in comparison with Holt's. Dr. Gouley's urethrotome (Fig. 53) is a good instrument when one has a very tight stricture, and wishes to avoid external incision, especially if the stricture is in the part anterior to the bulbous portion; beyond that it is not half so safe an instrument as Westmoreland's. With the latter one cannot do any harm if he be a good anatomist, and holds the instrument with its point to the pubis, and handle in a line with the umbilicus. The only objection to this instrument is the weak point at the part that moves the blade, and the blade sometimes gets out of its director, both of which I have proposed to remedy by adopting Otis' sliding staff for the screw, and putting a ring round under the blade so it cannot leave the staff. We are having these improvements made.

FIG. 53.



Dr. Gouley's Urethrotome.

Dr. Otis has done a good work with this instrument, in establishing the length and size of the urethra, and has given us a table of strictures varying so much from those we have given, that we quote him in full on these points, showing that these facts are not settled, and require more examination to settle the disputed points.

"I have said that there exists a constant relation between the size of the flaccid penis and the capacity of the urethral canal. During the past year I have subjected more than one hundred urethræ to a careful examination on this point, with the following results, to which there has not been found a single exception, viz.:

"That, when the circumference of the flaccid penis was three inches, the circumference of the urethral canal was found to be at least 30 of the French scale. When it was $3\frac{1}{4}$ inches the urethra had a capacity of 32. When it was $3\frac{1}{2}$, the capacity would be $34—3\frac{3}{4}=36$; 4 inches=38. When it was $4\frac{1}{4}$ to $4\frac{1}{2}$ inches in circumference the capacity of the urethra would equal 40, or more. In every case the urethral calibre was over rather than under the figures above given. In a considerable majority, contraction of the meatus (either congenital or from previous inflammatory changes) was present, and in these cases the measurements were made with the urethra-meter or after division of the contraction. The value of the urethra-meter in ascertaining the actual calibre

of the urethra, notwithstanding the presence of stricture or contraction of the meatus, cannot be overrated; it is with this instrument that the proportionate relations of the urethral calibre and the size of the flaccid penis have been confirmed. With it and the metallic bulbous sound, the thorough examination of any presenting urethra may be made, and the precise locality and value of every deviation from its normal calibre be positively determined. Having then, in any given case, made out the number, size, and locality of strictures, the desideratum is to find an instrument which will completely divide them, with as little injury to the adjacent healthy structures as the possibilities of the case will admit."

"One hundred cases of urethral strictures, comprising two hundred and three operations, upon two hundred and fifty-eight strictures, have been carefully collated, from my books of daily record, by my assistant, Dr. J. Fox, and subjected to a subsequent critical revision by myself.

The careful tabular analysis of these cases, which is presented with this paper, embraces the following points: 1. Age of patient. 2. Cause of stricture. 3. Locality and size. 4. Number in each case. 5. Normal calibre of urethra. 6. Complicating diseases or conditions at date of operation. 7. Symptoms at date of operation. 8. Accidents following operation. 9. Results of operation, as determined by a subsequent re-examination with the full-sized bulbous sound, at periods varying from three weeks to three years. 10. Results as shown by continued relief from all symptoms, where no instrumental re-examination has been practicable. Not to absorb too much time, I will only allude now to a few points of greatest importance in connection with the facts which are developed by this summary:—

"1st. It will be found that out of the 258 strictures, 52 were in the first quarter inch of the urethra; 63 in the following inch, viz., from ¼ to 1¼; 48 from 1¼ to 2¼; 48 from 2¼ to 3¼; 19 from 3¼ to 4¼; 14 from 4¼ to 5¼; 8 from 5¼ to 6¼; 6 from 6¼ to 7¼.

"Authorities claim that the great majority of urethral strictures are found in the vicinity of the bulbo-membranous junction, and cite various possible causes for their frequency in this locality.

"By the above statement it will be seen that they occur, as would naturally be expected, in greatest frequency where the inflammation begins the earliest, and rages the hottest, and gradually diminish in frequency in the deeper portions of the canal.

"2d. Of the normal calibre of the urethra:—

22	Mm.	circumference	1	36	Mm.	circumference	1
28	"	"	3	37	"	"	2
29	"	"	1	38	"	"	6
30	"	"	18	40	"	"	1
31	"	"	25	Not noted			4
32	"	"	19				100
33	"	"	3				
34	"	"	16				

"Thus, it will be seen that in ninety-nine carefully measured cases the *average* normal calibre was 31.84 (deducting the case of child of ten years, 22 m.), nearly 32 of the French scale.

"3d. Of the accidents following operations: Hemorrhage in four cases; prostatic abscess in three cases; curvature of penis during erection in three cases; urethritis in two cases; diphtheritic deposit of wound in three cases; urethral fever in seven cases; retention in one case.

"4th. Slight urethral fever has followed the operation but seven times. Six times, when for stricture in the curved portion of the urethra; once only, when the operations were in the pendulous portion of the organ, and this occurred in a malarious subject. This leads me to remark, that, in my experience, operations confined to the pendulous urethra, are, as a rule, *never followed by constitutional disturbance*, even when six or seven strictures are divided at the same sitting. But, to insure this result, no instrument, not even a sound for exploratory purposes, should be passed into the bladder, during, or immediately subsequent to the operation.

"5th. Three operations were followed by prostatic abscess. In one of these cases, the patient, who was a physician, sailed for the West Indies in about a week after the operation (which was for a single stricture near the meatus), and reported trouble of the prostate coming on soon after, he, meanwhile, using a sound himself, to prevent recontraction.

"6th. Curvature of the penis downward followed in three cases where numerous strictures were divided, but this trouble occurring during erections was unattended with pain and passed off entirely within from two to six months after the operation, in two cases. In one case, at the end of a year, there was slight curvature, but gave no trouble.

"7th. Urethritis in two cases; one followed an operation at the meatus, and was set up by forcible use of a tube, by the patient, to prevent recontraction. It lasted acutely for three weeks, and was followed by a gleet, lasting four months, which finally ceased after a second operation, required by the recontraction which had taken place.

"The second followed an operation upon four strictures, and occurred within a week. This was complicated by the presence of a diphtheritic deposit upon the wound, near the meatus. It was supposed to have resulted from a similar action in the wound of the deeper portions of the canal.

8th. Diphtheritic deposit occurred upon the wound in two other cases, lasting, under treatment by iron and quinine generally, and applications of the strong acetic acid locally, about two weeks, and was followed, in both instances, by a recontraction of the stricture.

TABLE.

Time after Operation.	No. of Cases.	No. of Strictures	Time after Operation.	No. of Cases.	No. of Strictures.
3 years,	1	4	5 months,	1	7
2½ "	1	7	4 "	1	3
1½ year,	2	8	3 "	4	15
13 months,	3	14	2½ "	1	10
1 year,	4	7	2 "	4	11
10 months,	1	2	1 month,	1	1
9 "	1	1	3 weeks,	1	5
8 "	1	1	2 "	1	1
7 "	2	10			
6 "	7	21		37	128

In thirty-one cases none of the strictures had recontracted. In six cases most of them had been absorbed, while some remained.

RESULT.

Cures. Re-examined. No recontraction,	31 cases.
Cures. Patient perfectly well when last heard from. No re-examination,	52 "
Perfect relief for a length of time. Return of symptoms. Re-examination. Stricture found to have recontracted,	4 "
Perfect relief for a length of time. Return of symptoms. No re-examination,	5 "
Relief of most symptoms. Some remaining. Patient still under treatment,	4 "
Partial relief,	3 "
Results not known,	1 "

It will be seen from these statistics that the results of treatment justify in the completest manner all that has been heretofore claimed by me for the method. In point of gravity it will be seen that cutting operations for the division of stricture in the pendulous portion of the urethra (where the great majority of strictures are found) compare most favorably with all other modes of treating stricture, and cannot be considered as exposing the patient to more peril or inconvenience than simple gradual dilatation by means of graduated soft bougies or sounds. In regard to the advantages of operations as quoted, they are manifold, to the patient as well as to the surgeon; comparatively painless, except near the meatus; speedily performed, involving at most but a few days' loss of time (often not even a day, where the stricture is single and recent). The after treatment, consisting only of separation of the wound throughout its extent by the easy passage of a full-sized steel sound daily, or every other day, until healing is complete.

Speaking of the retention of a catheter, Prof. Gouley, of New York, uses the following language, which, we must say, does not correspond with our experience:—

"I believe that the retention of a catheter in the bladder, after

perineal urethrotomy, even for forty-eight hours, is not only unnecessary, but harmful. Unnecessary, because it does not fulfill the supposed indication of preventing the flow of urine through the wound, and because the contact of the urine with the fresh-cut surfaces does no harm, as is exemplified by lateral and median lithotomy, and also by the cases which have been detailed. Harmful, because the presence of the instrument—a foreign body—in the bladder, sometimes causes ulceration and perforation of that viscus, and does give rise to inflammation and to urethral fever."

This is no doubt true with the gum catheter retained in the old way and of small size, but with the full size, retained by our mode, this does not occur.

We have given a table of some of our cases after his formula, so the reader can compare statements. We had trouble whenever our catheter was taken out and allowed to remain out for the first ten days; being difficult to reintroduce and very painful. Our general plan was to remove it every day and clean it out, then reinsert it, tying it in by means of tape in the eyes and around the testicles. By this means the catheter was pushed down by the bladder into the urethra, and there it remained, and could not wound the bladder itself. By pushing it up, the urine would flow, and there was no trouble. When we did not keep the catheter in, we put it in daily and kept it there for at least half an hour, and whenever we violated this rule we had trouble. In case four, P. M., a distinguished lawyer, the catheter was removed only once in ten days, and there was a perfect cure with no bad symptoms. In case three, T. R. N., when the catheter was taken out, it was difficult to reintroduce and very painful, but by reinserting and keeping it in, there was no more trouble, and the case was perfectly relieved, and when we wished to take it out, he was unwilling, for fear of like suffering. In case five, when taken out, pain was severe and fever set up; but on reinserting the catheter, the fever subsided and the patient did well. He, too, was unwilling to have it taken out to be cleaned. From this, we conclude that the retention of the catheter is best and safest, and can do no harm if not tied in immovably. If tied to the testicles, no great pressure is possible; but if retained too long, it will cause suppuration, and its removal will give great relief.

We make further quotations from Dr. Gouley that we highly approve of, and they speak for themselves:—

"The rough use of the sound [we use the catheter alone], will,

sometimes, bring on orchitis. The too frequent introduction of the instrument also occasionally produces this result. Another fact, worthy of remembrance, is, that the sound should not be retained in the urethra longer than five minutes. There are patients who are liable to attacks of orchitis in spite of the greatest care and gentleness in the use of the sound. This may sometimes be averted by advising them to take the following precautions: 1. Use a diluent drink through the day preceding and the one following the introduction of the instrument. 2. Take a warm hip-bath immediately after. 3. Support the testicles with a suspensory bandage. 4. Remain in the horizontal posture for twelve hours.

"In the case of working men, or others who are obliged to be about through the week, it is well to recommend them to pass the instrument every Saturday evening, after working hours, that additional rest may be had on the day following, if necessary, without loss of valuable time."

This we warmly recommend.

"The term large instrument is only relative; the diameter of the sound should be proportionate to that of the uncontracted part of the urethra, and, if the meatus is abnormally narrow, it should be freely incised longitudinally along its floor, and the caliber of the canal then estimated. Some urethræ will only admit No. 30, while others are sufficiently capacious to permit the easy introduction of No. 36, an instrument of nearly ten and a half millimetres (over three-eighths of an inch) in diameter.

"To arrive at a correct appreciation of the value of the operation of external division of strictures of the urethra, it is necessary to consider: 1. Under what circumstances the operation is justifiable. 2. What amount of danger attends its performance. 3. How far it is entitled to be considered as a means of cure.

"Sir Henry Thompson, after whom the last two inquiries are phrased, says: 'It has been stated that the hazard to which the patient's life is exposed by it (the operation) is too great to be incurred for the sake of obtaining a cure of his complaint. This view has not improbably arisen, in some measure, from the still common but erroneous habit, already alluded to, of confounding external division of a permeable stricture upon a sound with the operation upon an impassable one without it.'

"Professor Van Buren, in a published lecture, remarks: 'The dangers of this operation depend upon the conditions which necessitate its performance, rather than upon the proceeding itself. If, as is always desirable, its necessity has been foreseen, and time secured for the examination of the internal organs, and ample preparation made, *the danger is trivial;* but if, on the contrary, as often happens in hospital practice, the patient falls into the surgeon's hands with prolonged retention or extravasation of urine, from

recklessness or neglect, the operation is likely to be much less favorable. And if, in addition to these serious complications, the stricture should prove to be impassable, and the operation is necessarily undertaken without any guide to the bladder, it becomes *one of the most difficult and uncertain proceedings of surgery.* The alternative of puncture of the bladder from the rectum, or above the pubes, may, in rare cases, be adopted from necessity; but these measures afford only temporary respite, inasmuch as they leave the stricture, the cause of all the trouble, unrelieved.'

"Dr. Markoe says: 'It must be evident to you that the success or failure of it depends upon the condition of the patient for which the operation becomes necessary; that the dangers of the operation itself can hardly be separated from those of the disease for which it is performed. Being a last and only resort for a desperate condition of things, we cannot select our cases nor prepare them for the operation.'

"Professor S. D. Gross observes: 'The operation is by no means free from danger, and requires the most consummate skill for its successful execution. None but a madman or a fool would attempt it, unless he had a profound knowledge of the anatomy of the parts, and a thorough acquaintance with the use of instruments.'

"I have quoted the opinions of these distinguished surgeons—pertinent to the estimate of the operation—as fairly mirroring the advanced mind of the profession, and that I may express my general accordance. But I must insist, most emphatically, upon a correct interpretation of the words 'the operation being a last resource.' While, beyond all question, the conscientious surgeon must propose to himself all other available and justifiable means of relief, yet, when these have been tried and have failed, the knife is not only the 'last resource,' but the *only* resource, and must be promptly and resolutely applied. The operation has often been deferred so long, that the bladder and kidneys have become irreparably damaged by the action of the frequently-retained urine, and finally the knife is used when all operative procedures are contra-indicated. This long delay accounts, in a great measure, as I believe, for the large percentage of mortality which has followed the operation, and has brought it into disrepute.* So great was formerly this mortality, that, toward the end of the last century, such authorities as Desault and Chopart positively condemned the operation, and it fell into disuse. Its revival in our country is due to the late Dr. Alexander H. Stevens, who performed it 'with entire success, after the common modes of treatment had failed,' in the year 1817.

"The advances that have been made in our knowledge of the pathology and treatment of stricture of the urethra indicate a moderate and middle course to be pursued. It is now believed, by

[* Case seven is a case in point.]

conservative and judicious surgeons, that the class of cases which require the operation is small, and that, even in these cases, before resorting to the knife, gradual dilatation and all other available means of relief should be thoroughly and faithfully tried. Impermeability, resiliency, or great irritability of strictures, are indications by which these surgeons are influenced in the adoption of this mode of treatment. In impassable strictures, attended with retention or extravasation of urine, or where there exist obstinate urinary fistulæ, few now entertain any doubt of the propriety of the operation. Narrow strictures, from traumatic lesions, are, it is thought, sufficient, as a general rule, to warrant the external perineal division."

We have before given our opinion on this, as opposed to all external incision, when the smallest bougie can be passed into the bladder, and know that unless there is an open external fistula, as the result of stricture, all cases may be cured by internal incision.

"On the other hand, those extremists, who maintain that permeability to instruments necessarily contra-indicates the operation, meet with very few supporters. The aim of the majority of surgeons, in our day, is to endeavor to pass in a conductor, but, when this is not practicable, they operate without it, for the double purpose of dividing the stricture, and of relieving or averting retention of urine.

"In three hundred and forty-five operations of external division of strictures, performed by American surgeons, two hundred and thirty-three of which were done without a conductor, there were forty-one deaths, about twelve per cent. The assigned causes of death were: advanced disease of the bladder and kidneys in twenty-two cases; pyæmia in fifteen cases; erysipelas and pyæmia in one case; intra-pelvic abscess and pyæmia in one case, and thrombosis in two cases.

"According to the late Prof. Miller, of the University of Edinburgh, the following are the dangers which attend the performance of the operation: 1. Hemorrhage. 2. Infiltration of urine. 3. Abscess in or near the wound, leading perhaps to fistula or irritative fever. 4. Intra-pelvic abscesses. 5. Erysipelas. 6. Pyæmia."

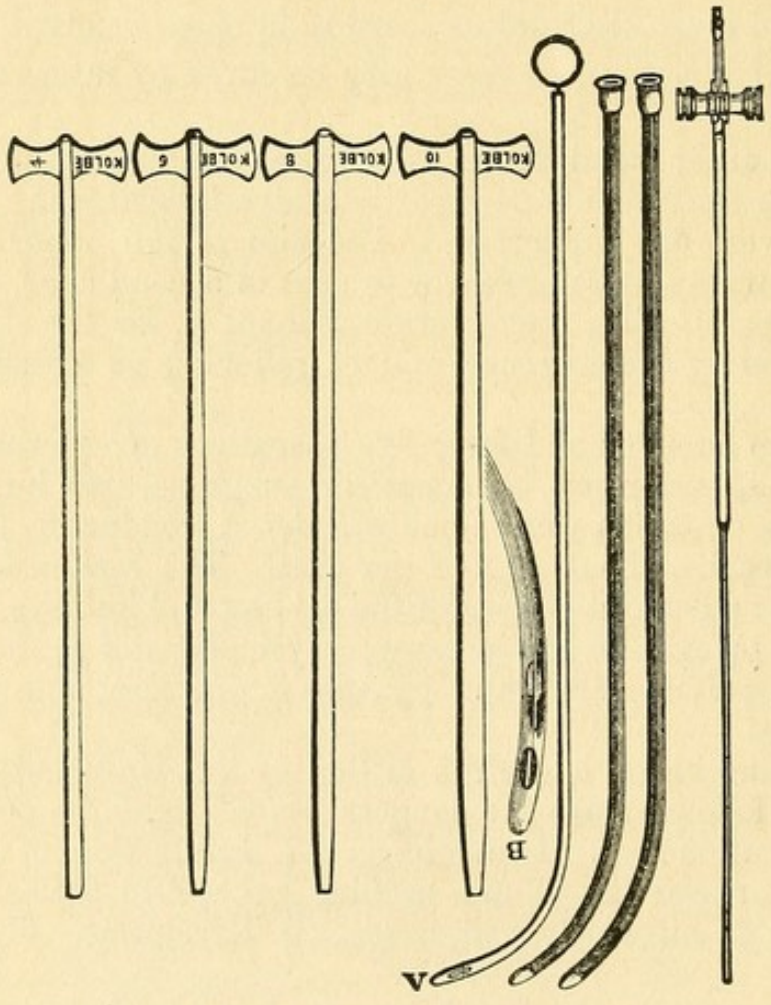
We fully approve of all said here, and think there is but little danger in the disease or from the operation, when well performed. In our thirty-one cases, six were impermeable to all instruments, and the strictures were removed. Of the three who died, two came to their death by entirely foreign causes—one measles, the other rheumatism; so we may say all six were cures so far as their strictures were concerned, even of those that were impermeable. Of

the others that were permeable, in three there were no bad symptoms, and all but one recovered. In all the internal incisions, abscesses were prevented, except in two cases. The seventh case died from gangrene produced before the operation.

INCISION AS A MEANS OF CURE.

"The third consideration must now come up for investigation, namely—how far the operation is to be considered as a means of cure. Sir Henry Thompson makes the three following points: 1. It may fail to afford relief. 2. It may be cured for a short period, and afterward be followed by a relapse. 3. It may effect a permanent cure.

FIG. 54.



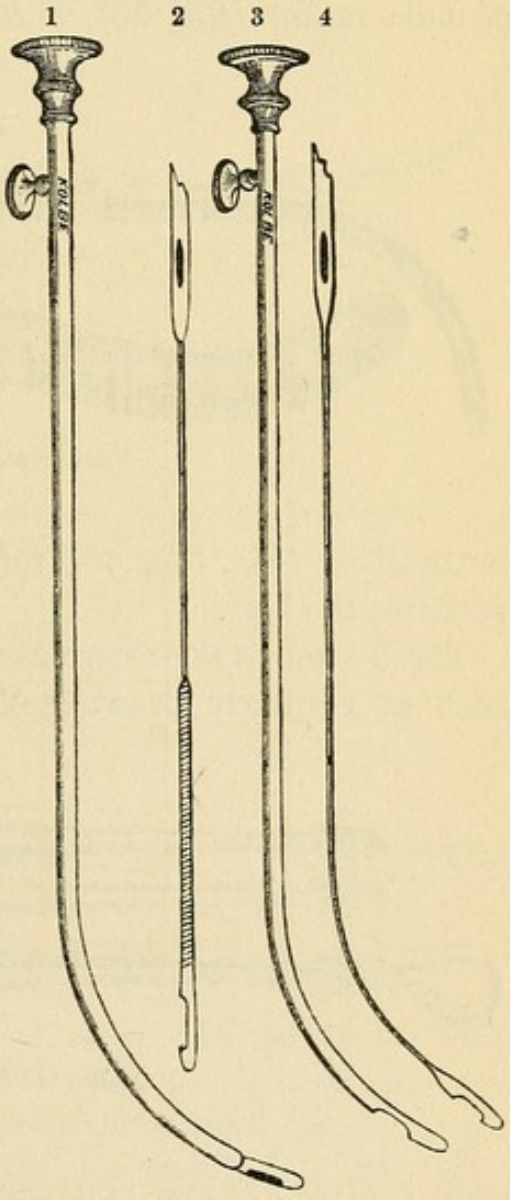
Holt's Original Instruments.

"It is now believed that the operation will afford permanent relief only so long as the patient continues to use a full-sized instrument at intervals of a week or two; and, as far as I am aware, there is no method of treatment as yet devised, for obstinate stricture of the urethra, which will effect a permanent cure, without the occasional use of a sound."

In our cases, all are perfectly well, up to the present date, and have never suffered from any inconvenience since, except case five, who says he has no difficulty in making water, but there is a slight discharge and some pain. He is still using a catheter once a week. We operated on this case by external incision, but were discharged the day after we operated, and he is still a sufferer.

Holt's original dilators are shown in Fig. 54. Seldom used now, as the curved instrument used by us is far better. Fig. 55 shows the canulated sound for cauterizing the urethra and prostate gland. The sounds 2 and 4 are made to slide out with a caustic at their end, and slide out at the point needed. Fused nitrate of silver is usually used; should only be kept in a few seconds, and withdrawn in its cannula, as 1 and 5.

FIG. 55.



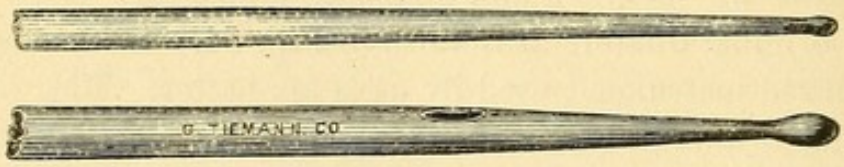
Canulated Sound, for Cauterizing Urethra and Prostate Gland.

ENLARGEMENT OF PROSTATE GLAND.

Probably there is no form of disease of the urethra or its annexes that is more troublesome or dangerous than mere enlargement of the prostate gland. Old persons are especially liable to it. It is known by a retention of urine; the bladder can never be entirely emptied, even with a catheter. Upon sounding, a straight sound or even a common sound cannot be carried to the bladder. The enlargement can be usually felt through the rectum by the finger. Sir Henry Thompson teaches that the gland is composed of only two lobes, and not three, as usually taught, and that the enlargement is central and fills up the space formerly occupied by the urethra, bulging out into body of bladder, making, as it were, a backwater, over which the urine cannot flow, unless the bladder is very full,

and then it often presses up so as to entirely prevent any discharge. A common catheter cannot be inserted without the finger in the rectum to push the point up. This necessitates a flexible catheter

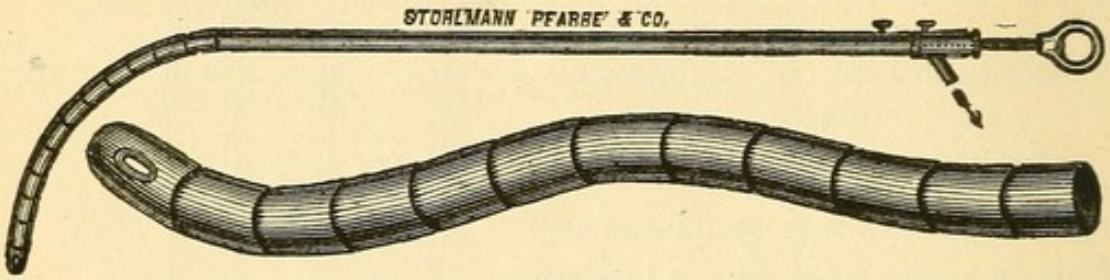
FIG. 56.



Bulbous-pointed Flexible Catheter.

of india-rubber (Fig. 56), with a small, bulbous point, or a verte-

FIG. 57.

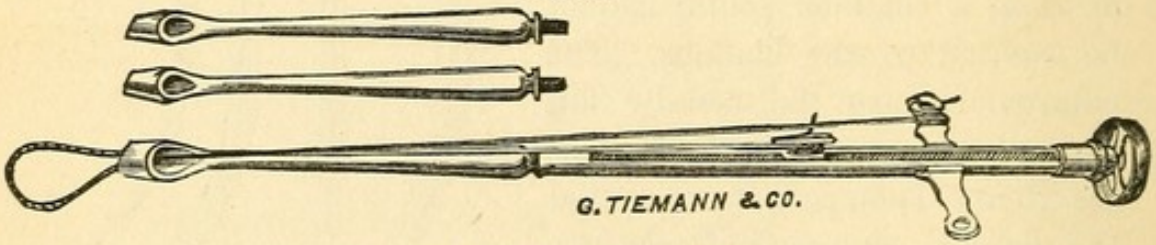


Vertebrate Silver Catheter.

brate silver (Fig. 57), or Prof. Gross' prostatic catheter, which is, perhaps, the best.

The treatment is precarious and uncertain, and mostly palliative, such as regularly drawing off the water with some one of the

FIG. 58.



Gouley's Ligating Instrument.

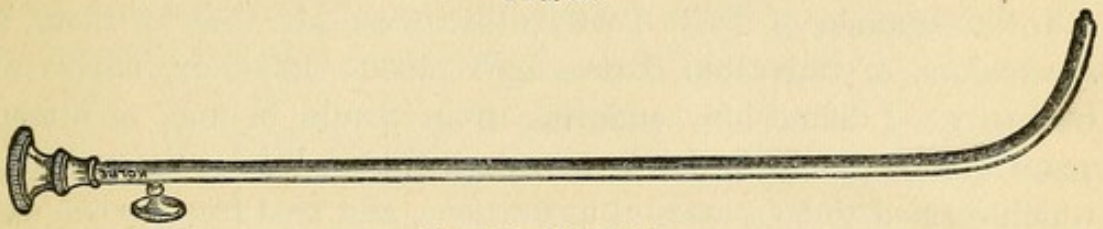
catheters above named. Prof. Gouley ligates the posterior part, as we remove a polypus, with an instrument of his invention (Fig. 58). I pass the sound into the bladder by the urethrotome, and cut the

enlargement back and forth, right and left, with the urethrotome blade, then put in my No. 30 retention catheter, and keep it in for ten days. This gives relief, but the catheter must be then used once a day.

CASE OF SUPPURATION OF PROSTATE GLAND.

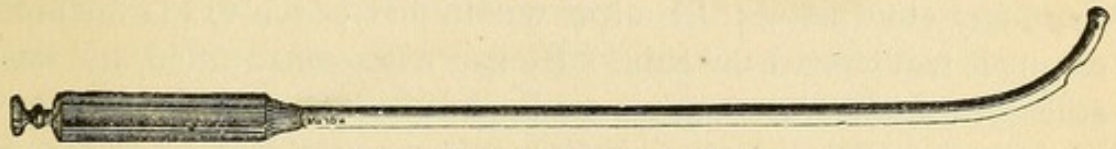
Mr. ——, aged forty-five, of Danville, Va., traveling in Texas last winter, was taken with a discharge of pus and mucus, with heat and a burning sensation in the urethra, with difficulty in making water; supposed he had gonorrhœa, for which he was

FIG. 59.



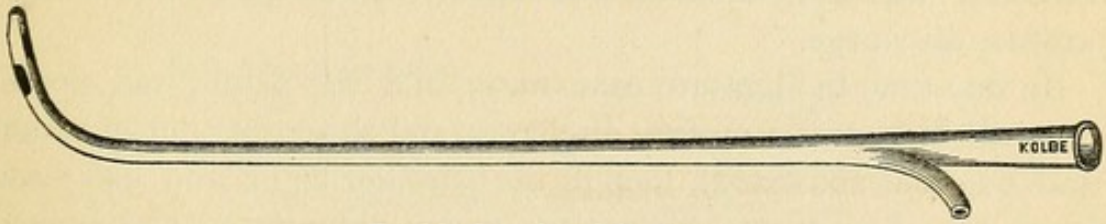
Sound, with Guide.

FIG. 60.



Exploring Catheter and Sound.

FIG. 61.



Double Canulated Catheter.

treated, and a flexible catheter given him to draw off his water. In this condition he came to Galveston, and put himself under Dr. R.'s care. He had fever, and complained of heat and burning in the prostate; was catheterized by Dr. R., who had no difficulty in passing a No. 17 catheter, and drawing off his water. He did not improve, and Dr. R. called me to see him. Had fever, and much pain; passed catheter with no difficulty; got worse and could not pass his urine; put catheter in, and a great deal of offensive pus

and urine passed; was relieved, and thought much better. In a few days became delirious; pyæmia well developed; died in three days. Post-mortem showed the gland entirely suppurated away. No sign of either lobe of prostate.

We believe he could have been saved if we had performed external perineal urethrotomy when we first saw him, and would undoubtedly treat a similar case in this way, and we recommend this course in all similar cases.

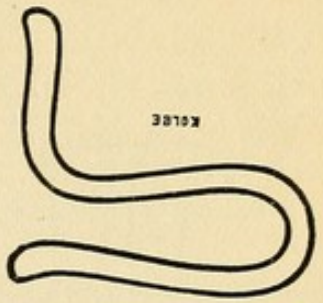
A New Wire Speculum for the Vagina and Rectum.

In the summer of 1870 I was called to see Mr. Charles Bong, a shoemaker, of Galveston, Texas, aged about fifty-four, native of Germany. I found him suffering from fistula in ano, of fifteen years' standing. This fistula was easily probed into the rectum, which seemed to be a mass of ulcerations, and bled freely when examined by the finger or speculum. The whole buttock was ulcerated for nearly three inches around the anus, and appeared to ooze out a sanious serum with pus, but the skin was not broken, nor was there any other fistula; the ulcer was in folds; even to the furthest extent it had effaced the skin. He had a fine constitution, and was still working (at times), at his trade; but had to wear cloths under him to prevent the profuse discharge from wetting his pants. I ligated the fistula in the ordinary way, being afraid to use the knife. I then used the perchloride of iron in solution, as strong as he could bear it, in the anus and outside, where there was such a profuse discharge.

In due time the ligature came away, and the fistula was closed, but still there was a profuse discharge, and the oozing out of serum and pus had not ceased, though the perchloride of iron had been kept up. I now put my patient under chloroform, and incised the sphincter, and applied chloride of zinc, forty grains to one ounce of water, over its entire surface. This did not seem to act so well as the chloride of iron, so I returned to it. This continued to improve him and to lessen the discharge, but he had great pain in stooling, and there appeared to be a considerable contraction again of the sphincter. I made another digital examination, and found little granular lumps; I tried every variety of anal speculum I could find, but none would give me any satisfaction. I took a pair of scissors and trimmed off all the little granular

bodies I could reach; cut off all the external folds, down through which the discharges flowed; applied the iron again. Under this treatment he improved and became much better, but the ulcer did not seem to heal. I was anxious to get a full view of the ulcer, and one day returning to my office, I saw a piece of No. 6 wire, and it at once struck me that I could bend this wire so as to accomplish my object. I did bend it, in nearly the shape shown in Fig. 62. This gave me a full view of the entire ulcer, and I diagnosed it colloid cancer, and putting my patient under chloroform, I applied to the entire surface (with a sponge mop), the following:—

FIG. 62.



Wire Speculum.

℞. Acidi chromici,
Aquæ pluvialis, āā ʒj.

The mop was saturated with this solution, and every part being exposed with the speculum, I made the application complete. It turned the ulcerated parts a whitish color, and contracted the little gelatinous cells to a considerable extent. He was kept under chloroform for fifteen minutes, to keep off the pain, when the ulcer was washed out with warm water. Patient given one-half grain dose of morphine as soon as out from under the influence of the chloroform. This application was made (under chloroform) every week for several weeks, and, in the meantime, patient used a suppository of sugar of lead, morphine, tannin, and extract of belladonna. Thus—

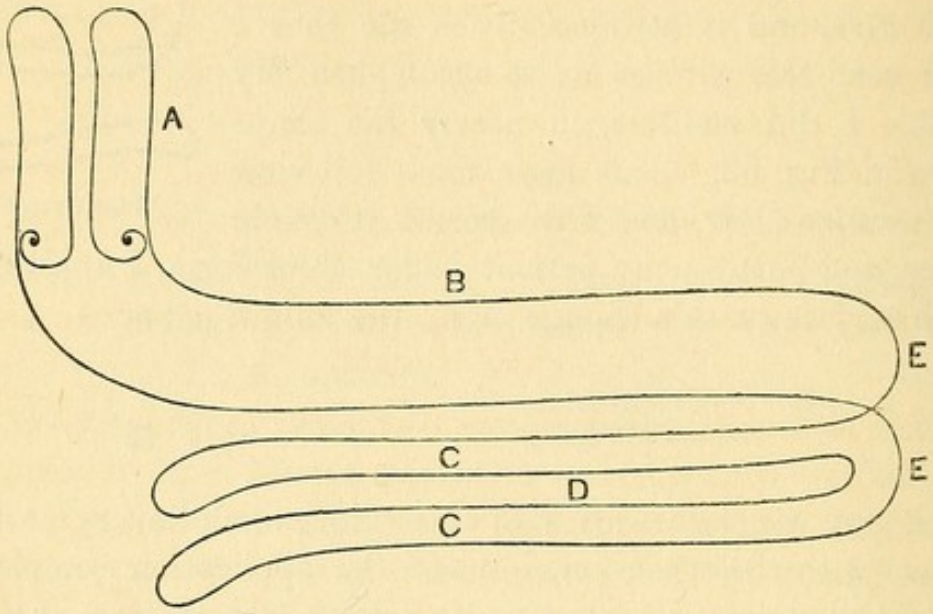
℞. Plumbi acetatis, ʒj
Tannin, ʒss
Extract belladonnæ,
Morphiæ sulphatis, āā gr. xx.
Ceratæ simplicis q. s. fiat supposita No. xx.
Sig.—One every night.

He continued to improve under this treatment, and all ulcerations around the anus, externally, ceased, and he was able to go out to church and about town, which he had not done for ten years. He was, April, 1872, quite well, except a contraction of the sphincter, which will require laceration, as it produces difficult and painful defecation.

Having had such good success with this speculum in the anus, we had two sizes larger made for the vagina, which we find, for

ordinary use, better than any speculum we have ever used. When we wish to examine a woman with Sims' speculum, we insert the handle (A, Fig. 63), which answers every purpose, and equally as

FIG. 63.



Improved Wire Speculum for Vagina and Anus.

well as Sims'. In a few cases, we have found the vaginal walls disposed to fall in between the tines of wire, but this has been remedied by wrapping it with thread or gum elastic cords, or by a double bending of the wire, as in Figure 63, D. We can expand the mouth of the speculum to any desired extent, by getting an assistant to hold the speculum with the handle, while we push down the end marked (C). The advantages of this speculum are:—

1. That by pressing the two tines of wire together, it is easily introduced.

2. When introduced, the tines expand, and one goes to the right and the other to the left of the neck of the womb, fully exposing the os and neck, and all sides of the vagina.

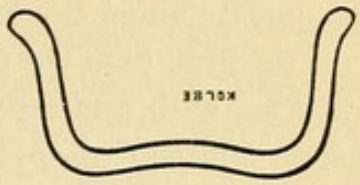
3. The uterine sound can be used with the speculum in place, without the guide of the finger or a tenaculum to pull down the os.

4. Sponge tents can be inserted, and sponge or other compresses made to the mouth, and the speculum removed without disturbing them.

5. It only costs two dollars, and can be had for even less, while Sims' costs seven, Bozeman's twelve, Knott's eighteen, Bivalve, German silver, five.

I am using in my vesico-vaginal case a speculum made of No. 8 steel wire, galvanized, shaped exactly like Sims' (Fig. 64), and it answers my purpose, and only costs $1.50. I used Davis' tractor before I invented these specula, in two cases of operation for vesico-vaginal fistula, with entire success and satisfaction with its use.

FIG. 64.



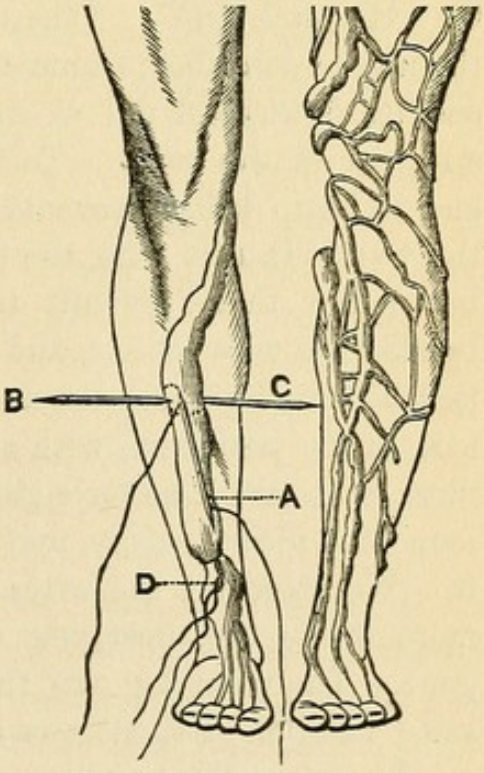
Wire Speculum, Sims' Patent.

Messrs. George Tiemann & Co., 67 Chatham street, New York, make these improved instruments, of three sizes. Two for the vagina and one for the rectum. All of my instruments can be had of this firm.

Ligation of Varicose Veins with a Shuttle Needle, Double Spear-Pointed and Straight.

After having invented the needle for the radical cure of hernia, and finding it to work so well, we invented the needle shown in Fig. 65, B. It is straight, about four inches long, with an eye in each end. It is threaded with silver wire at one end, and the threaded end is then held up by the right hand of the operator, and steadying the vein with the left hand (the vein being fully distended, by a ligature above, to the highest point of dilatation), the operator puts the point unthreaded directly down over the vein, through the skin, into the cellular tissue; then turning it, it is passed under the vein, and the threaded end is then seized with the right hand, and pulled on until the unthreaded end is just beyond the vein; its point is then elevated above the vein, and pushed out where it was first started, throwing a ligature entirely around the vein, without inclosing anything but the coats; the ends of the wire are then twisted, or tied over a bougie, which is better, as they can be taken out more easily than when twisted, and the bougie helps to compress the vein, until the vein is completely closed. I have used a roll of adhesive plaster in place of

FIG. 65.



Ligating Varicose Veins.

the bougie. We continue to put in ligature after ligature, downward, until all the varicose veins are strangulated; the limb is then put up in a roller-bandage, and wires left in until they begin to suppurate when the wires are untwisted and taken out.

The first case we used this needle in was a very bad one, complicated with a large varicose ulcer; and before the ligatures were taken out the ulcer had nearly healed up, and looked perfectly healthy, having lost all of its livid and indurated character. I now apply this method to the cure of *varicocele*, and I always ligate in *varicose ulcers* before attempting any other treatment. So far I have had no unfavorable results, and but little pain or suppuration.

REPORT OF CASES.

CASE 1.—Irish sailor; varicose veins in both legs, as seen in Fig. 65, from which the cut was drawn. He had a large ulcer over the whole of the outer side of leg, for which he was admitted to the City Hospital, 1867. I ligated the varicose veins on that side, by the needle described, commencing at the highest enlargement and coming down, and not as in figure, from below upward, which is an error of the artist. To begin above causes the vein to swell, and to begin below prevents the operator from seeing and feeling the vein. In this case, the first operated on, I twisted the wires, but found them difficult to remove, for in untwisting them I twisted the wire too far, and it would not come out. After having tied all the ligatures necessary, we surrounded the leg, from the foot to the perineum, with a roller bandage, putting lint over the ulcer, and left it so for eight days. On removing the bandage we found the ulcer healthy, and nearly healed up; all lividity had left it. We took out the wires and reapplied the bandage. In two more weeks the ulcer was perfectly well, and the varicose veins gone. The other leg was then operated on in the same way, with same results. Patient was discharged, cured. Four years afterward he came to see me at my office, still *perfectly well.*

CASE 2.—Mr. E. L. B., Jonesville, Texas, April 20th, 1876, aged 48, called me to see him; found him with two varicose ulcers on left leg, of seventeen years' standing; suffered from chills and fever when it first broke out; was dropsical and had an enlarged spleen. Patient at present healthy, except the ulcers and varicosed veins. Not having my straight needle with me, I operated on him

with my hernia needle, putting in nine sutures, using a roll of adhesive plaster in place of the bougie, and tying the wires instead of twisting them. Put lint saturated with chloride of zinc solution, two grains to ounce of water, over the ulcer, and applied over this a roller bandage from foot to thigh. After he came out from under the chloroform, gave him half-grain doses of morphine, to keep him easy.

April 22d. Removed dressing of rollers and lint, washed the leg and applied a solution of nitrate of silver, twenty grains to the ounce, along the line of and over the ulcers; re-applied roller. Leg not much swollen and ulcers more healthy. April 25th, stitches partly taken out; patient doing well; redress as before; did not see him again until the 25th of May, owing to a spell of sickness. Found Mr. B. walking about; had been plowing; leg much swollen; took out all the old ligatures on the 26th; put two more new ligatures in. May 28th, redressed the leg; ulcers better; veins obliterated; dressed leg with adhesive strips over ulcer, nitrate of silver wash, and roller bandage. Have not seen him since; sent him an elastic stocking. When last heard from ulcer healed up, Mr. B traveling out West. I prescribed for him

℞. Iodide of potash, ʒvj
Aquæ, qt.j
Hyd. chlo. corrosivi, gr.j. M.
Sig. Tablespoonful three times a day.

℞. Tinc. cinchonæ,
Tinc. columbonis,
Tinc. gentianæ, āā. ℥ij. M.
Sig. Tablespoonful every two hours each day, until four doses were taken every five days.

This patient did not follow directions while I was sick, or he would have recovered sooner. It is next to impossible to cure an old ulcer without rest, and I have been unable to cure varicose ulcers without ligating the veins, or putting on elastic stockings, as seen in Fig. 38, page 115, J, K, L, M, N.

Dislocation of the Humerus at the Shoulder Joint (Scapulo-Humeral).

Scapulo-humeral dislocations are divided by recent writers into two varieties.

1. In front of middle of glenoid cavity.
2. Behind the middle of glenoid cavity.

1. I. Medio-glenoid.
   1. Extra-coracoid.
   2. Sub-coracoid.
   3. Intra-coracoid.
   4. Sub-clavicular.
   II. Sub-glenoid.
   1. Scapula.
   2. Costal.
   III. Super-glenoid.
2. 1. Sub-acromion.
   2. Sub-spinous.

Professor Gross divides them into three.

1. Axillary—into the axillary space.
2. Thoracic - on the chest.
3. Sub-spinous.

No doubt there are nine positions the head of the humerus can take in reference to the centre of the glenoid cavity.

Anterior and Posterior.

Anterior.
1. Outer side of coracoid process.
2. Under coracoid process.
3. Inside of coracoid process.
4. Sub-clavicular.
5. Costal—on the ribs.

Posterior.
1. Sub-acromion—under acromion process.
2. Sub-spinous—under the spine of scapula.
3. Sub-scapularis—under the edge of scapula.

The division into anterior and posterior is important in reference to the position of the elbow-joint. In the *anterior* varieties the elbow lies outside of a straight line drawn from the centre of the glenoid cavity to the anterior superior spine of the ilium; and *vice versa*, when the head is in the posterior position, the elbow is in front, or on that line.

Fig. 66, page 191, represents the arm in its natural position, with the hand resting over the right shoulder, with the elbow touching the chest.

According to Dugas, this position *cannot* be obtained voluntarily by the patient, or forcibly by the surgeon, in any of the dislocations at the scapulo-humeral articulation, provided the body is kept straight and the shoulders level.

Fig. 67, page 191, shows the head of the humerus between the

two heads of the biceps muscle, and resting against the clavicle, and posterior and superior to the coracoid process, and above its coraco-clavicular ligament. The arm is thrown back and pressed to the ribs, being the *medio-gleno sub-clavicular position.*

This dislocation is very difficult to reduce by any of the usual means, such as heel in axilla, knee in axilla, extension by bandages around arm and under and in arm pit, or by manipulations as shown in most of our text-books. I have seen four cases of this dislocation that defied all the usual means, three of which were reduced by the process shown in Fig. 68.

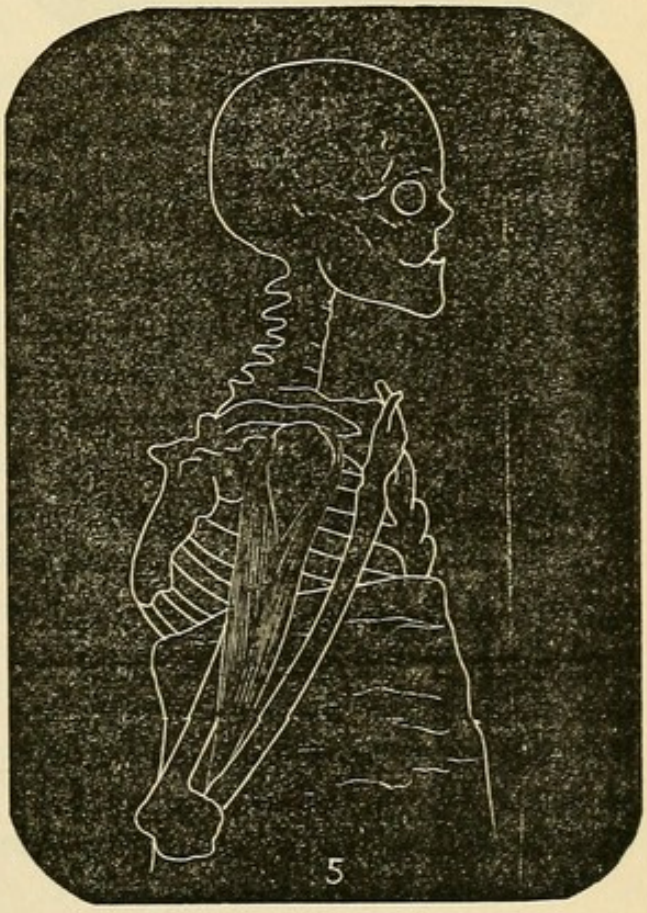
Report of Cases.

Case 1.—An Irish sailor in City Hospital, Galveston, 1866; dislocation sub-clavicular extra-coracoid. I tried the heel in axilla, with powerful extension by assistants, until my foot became numb and I was forced to remove it. I then got the rolling pin out of the kitchen, and held this under the axilla while powerful extension was made; still failed.

Seeing the bone was held

Fig. 66.

Fig 67.



in its position by the two heads of the biceps, the pectoralis major, latissimus dorsi and teres major locking the head of the humerus between the coracoid process and clavicle and on the coraco-clavicular ligament, I proposed to elevate it from its fixed position by a *porter bottle*, which would roll, and not be so fixed as the rolling pin. I procured the bottle and placed it in the position seen in Fig. 68, holding it by the neck with the left hand, and with the right making extension backward, outward, and downward. By so doing I raised the head out of its imbedded position. Then the latissimus dorsi, pectoralis major, and teres major assisted me in pulling it in position, the bottle rolling to let the head come down.

FIG. 68.

CASE 2.—While in Philadelphia, in 1872, I saw a case of this dislocation in Prof. G's clinic, and he tried all the usual means for its reduction and failed, but remarked, before he begun, that all surgeons had failed in some of the dislocations, and if he failed he would not feel ashamed, as Dr. L. had failed on this man at the hospital. Dr. P., of Illinois, was present, a stout, strong man. He tried to reduce it with two sheets, and also failed.

I remarked to Prof. G. that I had seen a similar case, and reduced it at last with a porter bottle in the axilla, after failing with all other means, which he reported to his class, remarking he was too much exhausted to try it, and I was so feeble I could not.

CASE 3.—Emigrant, at Austin, Texas, January, 1873. Was called to see this case, by Drs. M. and L. of that city. They had tried all the usual means and had failed. I told them of the cases reported above, and that I would try the porter-bottle again if they would put the patient under chloroform, which was done, and

without the least trouble I reduced it, as described in case 1, February 3d.

CASE 4.—White woman. Galveston, Texas, December, 1875. I was called to see this case by Professor R., and Demonstrator S., of the Texas Medical College and Hospital. They had tried all the usual means under chloroform, and had produced, on the hands and under the arms, abrasions, by the powerful extension they had made, but had failed. I made a clinic of this case, and reduced it in the presence of the class and professors Rankin, Burroughs and Dr. Sunburg, without the least trouble. Professor Burroughs was a student at the time I reduced the first case, and assisted in its reduction.

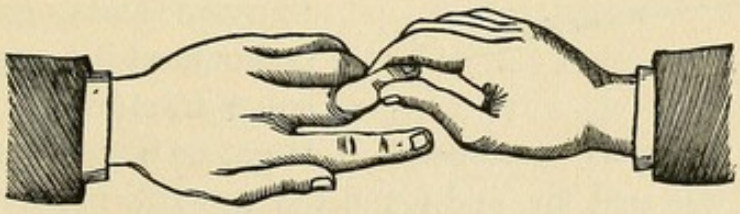
All the other varieties of dislocation at the scapulo-humeral articulation are easy to reduce by any of the usual means, but I have found the latter better than the heel and knee holding it, while assistants make extension and counter-extension.

Before closing this article, I wish to say more about Dugas' pathognomonic sign of dislocations of the shoulder, as some cases are very hard to diagnose, such as contusions of the deltoid, fractures in the neck of the humerus, and lacerations of the long head of the biceps. In all these cases the arm can be brought into the position as seen in Fig. 66. This is impossible in all dislocations, but can be done in all fractures and lacerations or contusions.

A New Method for the Reduction of the Phalanges of the Hand and Foot.

In October, 1856, I had the misfortune to get my left second finger dislocated, by attempting to hold a man by his coat collar, and it was twisted almost to a right angle (see Fig. 69). Knowing

FIG. 69.

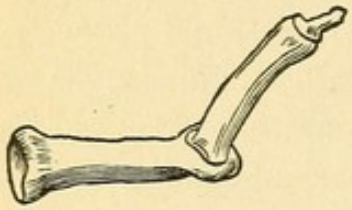


Mode of Reducing Dislocated Phalanx.

how difficult these dislocations are to reduce, I felt considerable uneasiness about my case. But after examining it for a while, I

thought I could reduce it by manipulation, in the following simple manner:—Taking hold of the point of my finger with my right hand, I gave it a slight extension, and at the same time twisted it down on itself, until I made the two corners of the distal and proximal bones of the finger catch, one against the other, and still keeping the point in a twist, I gradually pulled it straight, reducing it without the least trouble. Fig. 69 represents the manner in which the finger was taken hold of, and shows the twisting motion. Fig. 70 shows the position of the dislocated bones. Levis' splint may be used, to give greater extension, but I think this will usually be found unnecessary. Bending "the bone at a right angle, and then pushing the head of the distal point down," will, I apprehend, be found much more difficult, but this is now deemed the best of all methods.

FIG. 70.

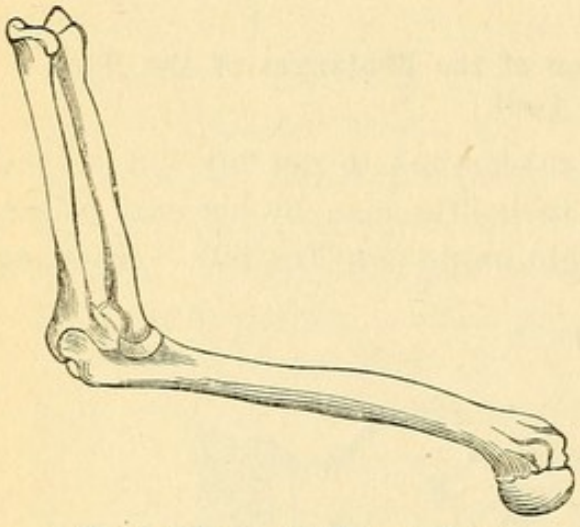


Second Phalanx Dislocated.

A New Diagnostic Symptom of Dislocation of the Head of the Radius, Without Fracture of the Ulna.

Mrs. W. R. H., in Panola county, Miss., A. D. 1850, was running from the house to the kitchen, and fell, catching on her hand, and twisting her arm outward; the head of the radius was thrown out of its natural place, rupturing the annular ligament, the biceps muscle pulling it up, lodging it above the clinoid fossa of the humerus, as seen in Fig. 71. She immediately sent for Dr. McMullin, who came and examined it, and pronounced it a contusion, and not a fracture or dislocation. It got no better, and about the tenth day I was sent for, and found the arm still much swollen and livid. There was complete pronation, supination, and flexion to a remarkable degree. The parts were so much swollen I could not feel the head of the bone in its abnormal position, so I pronounced it a contusion. The patient did not get any better for a long time.

FIG. 71.



Head of Radius in Clinoid Fossa.

So, finally, Mr. H. took her to Memphis, and the doctor there pronounced it a fracture and dislocation, but did not resort to any means of reduction. He brought her back to me, and immediately upon seeing the arm, after the swelling had gone down, I discovered the head of the radius in its abnormal position; the lady *could not flex her arm so as to comb her hair or feed herself. This is the* PATHOGNOMONIC SYMPTOM. *The arm cannot be flexed. Patient cannot touch the nose.*

We made some ineffectual efforts to reduce it, but failed.

Mr. Brise Collins, Memphis, Tennessee, was, in the spring of 1852, thrown from his horse, catching on his hand, and producing exactly the same dislocation as that of Mrs. H.; he came to me with it still unreduced. Remembering the above case, I immediately diagnosed it as a case of dislocation of the head of the radius, and as quickly reduced it by getting my brother, Dr. Alep. Dowell, to make extension, and to twist the head outward, completely *supinating it, while I, with my thumb and fingers, pressed the head back in its place, flexed the arm, and put it into a sling,* and kept it in a sling for six weeks, when it was completely united, and remained reduced as long as I knew him.

In 1870, a little boy, twelve years old, was brought to me with an old dislocation, that had been set with the arm extended, and kept in that position for a month. The ulna and radius had been dislocated, with a fracture of the clinoid process, and the radius was lying in the clinoid cavity of the humerus. He could pronate and supinate his hand, but could not *comb his head or feed himself,* as his arm would be pushed off by the head of the radius pressing against the anterior surface of the humerus. I reduced it by twisting and flexing the arm around my knee and over it, until he could touch his nose and comb his head. I put his arm into a sling, but it did not retain it, so I applied angular splints and bandaged it in a flexed condition, and kept it so for a short time. As he was unruly, and would take the bandage off, I had to set it several times; but it never became firmly united at the annular ligament, and he could not use it well in combing or feeding himself, yet was greatly improved.

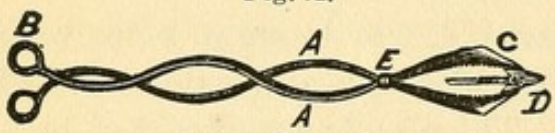
Remarks.—At the time I saw my first case, the accident was scarcely mentioned in works on surgery, and it was presumed to be barely possible for the radius to be dislocated anteriorly without fracture of the ulna; there were no diagnostic symptoms given.

These cases have convinced me that, at the time of dislocation, inability to flex the arm to the head can only be relied on as a diagnostic sign, as the swelling obscures the position of the head of the radius. It is easily seen that this dislocation could not take place in any other way than by twisting the forearm, as described in the two cases given above, where there was no fracture, *owing to the interosseus ligament*, which will not admit of its being separated in any other way. In the last case there was a fracture of the clinoid process of the radius, and the ulna was pressed backward, while the radius was pressed upward anteriorly on the humerus. Extension and pressure reduced it, but I could not get union of the annular ligament or clinoid process; hence its partial return.

Arrow and Bullet Extractor.

In studying arrow wounds, I found there was not in any surgery I could find a good and efficient arrow extractor. Surgeon Bill's was believed to be the best, but it was to my eyes impracticable and unscientific. So, with a few hours' thought I produced one, represented by Fig. 72. It is from six to eight inches long, or a little longer than an ordinary bullet forceps, and the blades are made flat and cross each other, so as to be only of the same width of the full opening of its claws. The claws are made hollow in the inner side and serrated; the outer edge is made sharp, like a perforator, and the points are made sharp and cutting. The forceps closed, the two jaws come together, and the handles are touching each other. The forceps thus closed are inserted into the arrow wound, and pushed down like a bullet forceps until the head of the arrow is struck, and then the blades are opened their fullest extent, and pushed down over the arrow, as seen in the figure. With this forceps, it will be easier to remove an arrow than a bullet. This, though lately brought out, will prove a valuable instrument to the United States Surgeon, especially at this time, as it is a very difficult operation to remove an arrow-head, frequently requiring a deep incision. One-third of the inhabitants of the globe use arrows, and every surgeon on our western prairies should have one of these instruments in his case. I commend this forceps to the

Fig. 72.



Arrow Extractor.

western surgeons, and the United States Army Surgeon in Indian districts, for the extraction of arrows and bullets.

EXTRACTION OF AN ARROW HEAD FROM THE FEMUR AFTER SIX YEARS AND EIGHT MONTHS' RETENTION.

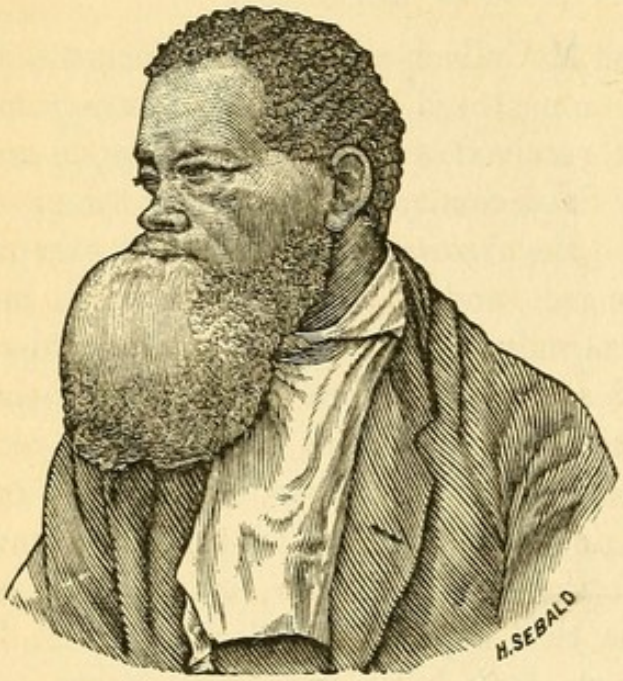
William Miller, aged 35, from McCulloch county, Texas, consulted me, in 1873, for running sores on his thigh, which he said were from a wound from an Indian arrow, received over six years before, in an Indian fight at Bee Creek, San Saba county. He was shot twenty-seven times. He pulled out all the arrows during the fight, except six. One cut the side of the face, and an artery, from which he bled for several weeks, and was only stopped at last, by a powder of dry horse dung put on by his brother. Three arrows had their heads pulled off, and ulcerated out, which his father gave me. One entered his back, and he thinks it is still there; one struck him in the thigh, where the discharging holes were. With this statement I believed the femur was fractured by the arrow, and that there was a piece of caries of bone that kept up the discharge. So I proposed to turn up a flap from both holes and chisel it out, to which he consented. We then put him under chloroform, incised a V-shaped flap, and found the bone ulcerated, and under a shelf of the bone we struck an arrow head bent on itself, the point sticking into the body of the femur, and the body bent down on the bone, and a shelf of bone covering it. I tried to pull it out with a dressing forceps, but could not. I then took a chisel I had ready, to pare the bone and pried it up loose, breaking off one corner of the chisel. I then pulled it out, finding it bent almost at right angles. The wound was closed, leaving the piece of chisel in. It healed up finally, the piece of chisel came out, and he wrote me from Kansas that his leg was entirely well but he had a bad cough after it healed up. He was very stout and healthy; had no tendency to consumption, and I presumed he had taken cold from being up in that climate. I sent him a cough mixture, and have not heard from him since. I presume he is quite well, or I should have heard from him.

Osteo-Fibroid Tumor of Inferior Maxillary Bone—Excision—Cure.

Jacob Yancy, aged fifty-three, colored; laborer; stout built; in good health. Fifteen years before he had a blow on the chin from the rebound of an ox bow, which he was bending.

From this a tumor commenced to grow. It is now, April 12th, 1876, as large as a child's head. An exact picture of it is given in the engraving, taken from a photograph before the operation. We proposed to remove it by excision, and on the 12th of April, assisted by Drs. Orman Knox, W. W. Perry, and S. F. Vaughn, we excised it (patient being under chloroform, and neck over tumor shaved) in the following manner; an incision was made from the angle at the clinoid process of the inferior maxillary, under the tumor, to the opposite side and angle, being twelve inches long; from this another incision was made above the tumor, one inch from the inferior lip, across to the other angle, being seven inches in length. The lip or flap was then dissected up from the bone; the tongue cut loose from its attachments to the inferior maxillary, cutting in two the genio-hyoglossus muscles, turning up the tongue and carefully separating it from the inferior maxillary; a ligature was now put through the inferior part of the tongue, and the tongue pulled out and held out of the way. The inferior maxillary was then sawed in two at each angle, and the tumor pressed down and dissected from the inferior flap and entirely removed. Two teeth were left in one side, the other had none. Several small arteries were twisted, but none required to be tied; two were tied on the tumor while it was being removed, as it bled profusely while the incisions were being made. Several veins were compressed; about three pints of blood were lost. The incisions were then closed with interrupted sutures. The tongue when let loose fell back, and would have suffocated the patient, but it was firmly secured by ligature to the lower flap, so it could not fall back, also to secure adhesions to the base of the tongue where it was dissected from the tumor. Patient came well out from the chloroform, and was able to speak in two and a half hours from the commencement of the administration of

FIG. 73.



Jacob Yancy, Osteo-fibroid Tumor, removed 12th of April, 1876.

the chloroform. The mouth was then washed out by means of an elastic tube, one end in a basin and the other held in the mouth, the head bent to let it run out. Half grain doses of morphine and a little toddy of whisky were given. Pulse feeble, but regular. April 13th. Patient doing well; pulse good; drinks milk, coffee and water, through the tube, used as a syphon. April 16th. Dr. Knox took out some stitches. April 17th. I removed all the stitches on the fifth day after operation; dressed with adhesive strips and collodion; washed out his mouth with chloride of zinc, one and a half grains to one ounce of water. This was directed to be done often, and always before taking water or milk. Patient well and cheerful; complete reaction but no fever; bowels moved with enemas; incision united so firm as to hold well when the stitches were taken out. Ligature holding the tongue taken out on the fifteenth day; one or two sutures unseen were removed on the thirtieth day. Patient was out in his field, hoeing cotton, on the twenty-sixth day after the operation. Talks plainer than before the operation. Feeds himself with the elastic tube, with milk and coffee; eats mush and soup. Came to see me on the 26th of May; looks nearly as stout and healthy as before the operation. Tumor was composed of osseous cells, filled with clear serum in some, yellowish serum in others, and one very large, of dark bloody matter, the color and thickness of molasses. Preparation in Texas Medical College.

Fibroid Tumor of Thigh, Left Side, Large as a Cocoanut—Excision—Cure.

May 30th, 1876, was called to see Mr. C. F. Johnson, aged forty-three, native of Alabama, school teacher; fine constitution; wheelwright by profession. Has a large tumor, about the size of a cocoanut, immediately over the femoral artery, about the bifurcation of the superior profunda artery. In 1859 it began to grow; was not larger than a shot when first perceived; has been growing for seventeen years, but lately has grown faster, and is now so large he cannot get on horseback without lifting it out of the way. No known cause of its growth; supposed to be from the kick of a horse, but really does not know that it had anything to do with it. Was supposed to be connected with the thigh bone, and to involve the artery, by physicians that had examined it. Upon a close examination we believed it to be a fibroid tumor, and not connected with the bone; so we proposed to remove it by excision. Patient being

chloroformed by Dr. Knox, of Jonesville, we made a straight incision, eight inches long, over the tumor, avoiding the veins. There were several very large ones over the tumor, and the femoral nerve, which was plainly seen in the dissection, as large as a goose quill, was on its outer side.

The attachments were torn loose with the fingers and the handle of the scalpel, and the tumor removed without the loss of two ounces of blood. Tumor, when removed, weighed three pounds and a half. Wound was closed, without tying an artery, with silver sutures, and adhesive plasters covered with lint and collodion. After patient came out from under chloroform, was given a dose of morphine. Dressing left to eighth day; incision partially closed, but suppuration occurred in the centre; part washed out, and dressed with adhesive strips; patient well in three weeks.

Specimen in Texas Medical College; was not opened. Patient returned to his duties in thirty days. These two cases had been examined by several surgeons who pronounced them incapable of removal, assuming that if it was attempted immediate death from hemorrhage would likely be the result. We have no apprehension of the return of either.

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INDEX TO THE SECOND PART.

CONTRIBUTIONS TO OPERATIVE SURGERY AND NEW SURGICAL INSTRUMENTS.