5-1-1935

History of the treatment of inguinal hernia

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The History of the Treatment of Inguinal Hernia

Senior Thesis

by

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April 26, 1935

Introduction

In considering an introduction for a paper of this type, a lengthy dissertation seems rather futile. In most historical papers very little that is new is introduced, as each seeker of bygone happenings must take the recorded events made by another historian and elaborate upon them. I have rounded up most of the desirable material on the subject, the History of the Treatment of Inguinal Hernia, adjusted it into its proper place, and tried to make an interesting, concise paper, and yet adhering to a strictly historical background.

The History of the Treatment of Inguinal Hernia

Rupture was most certainly recognized with the beginning of man, and the subject of its treatment an ancient one. In its association to earliest medical and surgical thought the two are in all probability contemporary. There is little doubt but that the first person afflicted with hernia was the first to seek relief from it. He probably learned to find relief in recumbent positions and by manual pressure, and possibly methods used today.

The art of herniology no doubt started with the Egyptians about 4000 B.C. Until recently all we knew of them was derived from Ebers Papyrus, but with the translation of the Edwin Smith Papyrus there is new information. Its practical handbook for treatment starts from the head downward, but unfortunately stops at the breast. However, considering they did lithotomies (3) cataracts and other operations it seems logical to suspect them of doing some sort of herniotomy. It is known that they recognized and treated the condition extensively with trusses. (13) Bass cites an interesting comment on the standing of the Egyptian healer. "Their profits are large, they eat cooked offerings and receive every day many geese and much beef. Wine also is given them. So they have no very bad time."

The Babylonians had no regular physicians. The unfortunate was placed in a public square and passers-by were forced to stop and give consul if they had suffered a similar condition. Cases of strangulated hernia probably received

but little consul, as a goodly percentage of those previously afflicted had probably passed beyond.

The attainments of the Jews were scanty in surgery. As regards hernia they were particularly backward. Anyone having such a condition was, instead of given sympathy, expelled from the congregation.

The Hindus were quite pregressive in surgery. They tried most everything. Repaired hairlip, laporotmy, removed ovaries and even cataract. Some mention is made of herniotomy, but with no reference to the technique.

Hippocrates, one of the most noted ancients in medical thought recognized the condition. He, however, was rather conservative and preferred to care for hernia chiefly through trusses, rather than surgery.

About 100 A.D. lived one of the greatest of the Roman surgeons, Celsus. He operated extensively on hernia, especially umbilical, excising sacs and closing the openings with sutures. Paulus of Aegina cites Celsus as saying " If the patient be a child, make an attempt in the first place with bandages. In more advanced ages, if a large portion of the intestine has fallen down, and attended by pain and vomiting, which symptoms usually arise by the retention of feces, it is clear the knife is not applicable." (27)

This is probably the first description of a strangulated hernia. The ancients treated this very conservatively, and never operated. Celsus recommends venesection, tepid bath,

warm cataplasms, and spare diet, but disapproves of purgitives.

Celsus is probably the first man to operate extensively, and Paulus cites him as saying: "When operation is done, make an incision in the groin down to the middle tunic, the lips are to be separated with hooks and the membranes freed. When the tunic is removed the testicle is carefully cut out. This is to be done in children of mild hernia. When the patient is grown and the disease greater the testicle is left.

Celsus speaks of practitioners who treated inguinal hernia by reducing the contents of the sac and applying pressure to the scrotum between two blocks of wood. Inflamation and gangrene caused obliteration of the sac.

Heliodorus modified Celsus' operation about 100 years later. He separated the sac from the cord and cut it off replacing the testicle in the scrotum.

Probably the next authority of any merit in the treatment of hernia was Galen, who lived about 200 A.D. While he treated the condition extensively he made two mistakes as regards its anatomy;

First he thought a hernia was not only a rupture of the peritoneum, but of the aponeurosis of the muscles as well. This belief lasted many years and is still prominent among the laity of the present day.

The Greeks did not believe in dissection of human bodies, and Galen's second error came from the dissection of monkeys. He found the processus vaginalis patent and reasoned this to be true in humans. He then argued it was the orifice of the processus vaginalis that ruptured or dialated in hernia. This error was not discovered until Fernilius in the 16th century proved the peritoneum was not open in the inguinal region.

Galen preferred to treat hernia by bandages and used taxis in cases of strangulation. However, he did describe a method of operation. (27) "Intestinal and omental hernia are to be cured by pressing up the intestine or omentum and removing as much as possible of the spermatic vessels, and otherwise drawing out the peritoneum, fomenting it, and then cutting it off." He mentions it was customary to bleed the patient when he was plethoric.

With the passing of Galen progress stopped for many years, as is demonstrated by the method of Aetius of Amida, who lived in the 6th century.

Aetius wrote an extensive medical work, the Tetrabiblion, dealing briefly with hernia. He is thought to have been a Christian and accomplished his treatments with charms and prayers. In preparing a plaster he recommended the physicians should repeat: " The God of Abraham, the God of Isaac, the God of Jacob give virtue to this medicament."

In regard to hernia he was a conservative, stating that operation was dangerous, and that surgical intervention, when strangulation was present should always be avoided. He preferred to treat his cases with a plaster, a bandage, and a prayer.

In the seventh century Paulus of Aegina came into the picture. He studied in Alexandria before its capture by Omar (641 A.D.) Paulus was an itinerant physician, who spent a great deal of time in Egypt and Asia Minor. He wrote extensively on surgery, used cautery for empyema, and even went into dentistry, he presented some very interesting angles on hernia. Paulus classified inguinal hernias into two groups, the enterocoele and the, bubonocoele.

He described the enterocoele, as a descent of the intestine into the scrotum, either by rupture of the peritoneum or by pushing it forward. Being caused by blow, leap or otherwise stretching a weakened portion of the body. The procedure of the operation was to put the patient in a recumbent position, and the skin was then stretched by an assistant. "A transverse incision was made, and the skin fixed with hooks to such a degree as to afford passage of the testis. Then passing a number of hooks proportionate to the size of the wound and dissecting the membranes and fat with a blind hook cut across them. After laying bare the peritoneum and introducing the finger into the sac at the back part of the scrotum between the darti and peritoneum we free the posterior process (the epididymis ?)

and then with the right hand doubling its' extremity to the inside of the scrotum, and at the same time stretching the peritoneum left hand, we bring the testicle and tunica vaginalis to the incision and direct the assistant to stretch the testicle, whilst we completely clear the posterior process, ascertain by the fingers if a fold of intestine be comprehended in the vaginalis, if so it must be pressed down into the belly. Then we take a large sized needle containing a double thread of ten pieces and pass it through the middle at the extremity of the peritoneum close to the incision and cutting the double, make four pieces of them, and bind the peritoneum securely, being sure none of the nutrient vessels are stopped, another ligature far out was put in."

After making these ligatures the size of a finger was left in the peritoneum, the hole was cut out and at the same time the testicle. An incision was made in the lower scrotum to favor the discharge. Then an oblong pledget and embrocations of oil were introduced and the wound bandaged.

Some of the surgeons, who after the incision into the vaginalis cauterized the end of it, to stop haemorrhage. They would then bathe them in hot water five times a day for seven days. Paulus says " They had wonderful success and very little inflamation and rapid healing.

As to the Bubonocoele or actual inguinal hernia he

states " The enterocoele arising from a distention commences as a bubonocoele. For at first the peritoneum being stretched the relaxed intestine is protruded as far as the groin. Forming the disease the ancients operated on in this manner.

After making the incision to the extent of three fingers breadth transversely across the tumor in the groin and removing membranes and fat and the peritoneum being exposed in the middle, where it is raised up to a point, let the knob of a probe be applied and the intestine pressed down, and the prominences of the peritoneum be united by suture, and then extract the probe neither cutting the peritoneum nor removing the testicle, but curing it with the applications for fresh wounds.

But since burning is preferred by the moderns and account is given. The man undergoes moderate excercise and having coughed violently, then mark the place of the swelling by triangle, with ink. Lay the patient down and burn out the triangle, the ichorous discharge being wiped away with a rag by an assistant. In people of moderate weight the burn is carried down to the fat. In lean people take care not to burn the peritoneum. After burning, salts were applied and an X shaped bandage put on, and the following days the wound dressed with honey." (27)

Hippocrates says " Those diseases which medicines do not cure, the iron (the knife ?) cures " Those which iron

cannot cure, fire cures: and those fire cannot cure are reckoned wholly incurable. "

Paulus does not give us any data as to the degree of his success in permanent cures, but modern experience has shown that his results could not have been very satisfactory.

About this time the Mohammedans began to attain power. These arabic speaking nations inherited medical learning from the Greeks. It was chiefly through them that the Greek thought was preserved and championed through the tenth and eleventh centuries. Such names as Ali Abbas, Avicenna, and Albucasis and Rhazes appeared.

Rhazes (27) states correctly that hernia generally arizes from the dialation of the passage which leads from the cavity of the abdomen to the testicle. In ordinary cases he says there is no rupture of the peritoneum. He states the omentum is the intestine most commonly found in ruptures and that the peritoneum lines the whole intestine and surrounds the testicle.

The Arabians, however, seemed leary of surgery and consequently contributed very few new principles.

Medicine itself more or less flourished in the Mohammedan countries, yet elsewhere in Europe there was no progress during the early Middle ages. The work of Celsus was entirely lost and those of other great teachers, such as Hippocrates and Galen were rapidly forgotten.

With this began the era of true medical superstition many monkish orders arose, various sects and priests took over the healing art. Relics and prayers became the common treatment of all ills.

The Jews seem to have retained their medical reputation above all other races and were frequently called upon by royalty and wealthier classes, during the 10th and 11th centuries. This faith seems to have continued for sometime, as late as the 16th century, Francis the 1st of France sent to Charles the 1st for an Israelite physician. When this doctor arrived in France, Francis found he was a Christian and immediately lost all faith. He then asked Solyman the 2nd, the Ottoman Sultan, for a medical advisor. An old hardened unconverted Jew was sent, who rapidly effected a cure by prescribing asses milk. (28)

Surgery of the middle ages fell into disrepute and became separated almost completely from medicine. It was a handicraft and abandoned to barbers and mechanics. It is here that surgical specialists first arose, who were known as "Incisors" or "Cutters". One operated for cataracts, another stone, another for hernia. They traveled about Europe keeping their methods secret and handing it down father to son. In Italy there was a famous family of herniotomists by the name of Norsini, Horace of Norsia is reported to have done 200 operations in one year. (28)

These wandering specialists were always on the jump and

had best be termed " hit and run " surgeons, and as often as not their work would not qualify. They were always ready to leave town if necessary just a little sooner than planned.

In Ferraris' book (28) we find an interesting account of a traveling incisor who performed an operation on a lady's eye for the relief of pain. The operation seemed to accomplish less than the desired relief, and the hapless surgeon was forced to spend the night fleeing from the lady's infuriated husband who pursued with sword in hand.

Many of these itinerant surgeons were of ill repute and a good many had a bag full of tricks at his disposal. Some lithotomists hid stones in their sleeves. After making a skin incision the surgeon slipped out a stone, and showing it to the patient, stated he had just taken it from the bladder. After collecting his fee he hastily departed.

Ferrari tells the story of a herniotomist who was always accompanied by a dog, which was put under the table during the operation. Even though the patient requested that the procedure should not include a removal of the testis the surgeon generally preformed the radical operation. The evidence was slipped under the table to the dog, the wound closed and the surgeon and dog made their escape before the patient discovered his loss.

Henri de Mondeville was one of the 14th century

physicians. It is evident from his comments that surgery was considered an inferior occupation by the medical men of the day. His advise to surgeons is to stay in their own field and not to meddle in medical matters. For he says a surgeon in doing so was not only apt to encourage the rage and malevolence of the medical doctors, but if his treatments were not successful he would have a bad reputation with the public, which would be justly deserved. Mondeville treated hernia very conservatively , preferring to use trusses and bandages in most cases. He slyly intimates that most herniotomists were for the surgeons benefit more than the doctors. (28)

The greatest of the 14th century surgeons was Guy de Chauliac. He studied in Montpellier, Paris and Bologna. He published a surgical work in 1363. Garrison says "He was a writer of rare learning endowed with fine critical and historical sense, and indeed the only medical historian of consequence between Celsus and Haller."

Guy was a very conscientious physician and made hernia his specialty. He differed from most physicians in that he would not turn his work over to the strolling mountebanks, but preferred to do it himself. In his operations he revised the system of Celsus, laying the sac bare and ligating it. Guy was the first to distinguish between ventral and inguinal hernia.

While de Chauliac performed operations for hernia he

was essentially a conservative and preferred to treat most hernias by trusses (21), and emphasized the fitting of each truss individually. Guy was the outstanding medical authority of the day, and probably threw back the progress of medicine many years, by promoting the idea that a surgical wound must be healed by surgical interference, plasters and other meddling matters rather than by nature. Manley (21) in his book cites de Chauliac' plasters for a certain type of hernia. It was the white of an egg for a vehicle mixed with crushed nut gall, alum, antimony, yellow amber etc. On another type the following mixture was supposed to be of great virtue: It was composed of turpentine, litharge, the faeces of an eagle freshly roasted, human blood, the hair of a ram, all blended together in rain water and vinegar. While Guy may have been a little mixed up on the value of some medicaments, he is generally recognized as the greatest physician of the 14th century, and was probably exceeded only by Pierre Franco.

Even though barber surgeons were scorned by the medical profession, nevertheless one of their members was destined to become a revolutionary factor, not only in the treatment of hernia, but in surgery in general.

Pierre Franco was born in 1500 in the village of Turriers. He received his early training at the hands of wandering lithotomists, herniologists, and cataract healers rather than in a medical school. He fled from France

to Switzerland probably because of religious persecution, and was for a number of years the city surgeon at Berne. It may be said for Franco that he did more than any other man up to his time to remove the operation for hernia from the hands of the wandering practioneer to those of a respectable surgeon.

The first operation for strangulated hernia is supposed to have been done by Maupasius in 1559, yet it was Franco who perfected and popularized the procedure. Although the symptoms of strangulation were known to Hippocrates, no one had previously dared to operate. While many a surgeon did more harm than good, it seems that the view of the people was unjust in the case of strangulation. If a patient died while being treated with medicines, the fault was considered to be with nature, but if death should follow operation, the surgeon might have to take to his heals or be held for murder. Consequently prior to Franco, the strangulation was treated locally, and the patient either lived or died. Sometimes the strangulated loop suppurated and the process broke through to the surface, causing the patient to be left with a discharging fecal fistula.

Franco evidently spent a good deal of his time writing, and made two publications. The first appeared in 1556. In his study of hernial anatomy he dwelt almost entirely on the sac and its contents missing the influence of muscular and aponeurotic walls of the canal. He supported the

ancients in their belief that in a complete hernia the peritoneum was ruptured, (7), but in the bubonocoele that it was only stretched. He pointed out the difference in an incarcerated hernia and the strangulated type, In the former the contents are adherent to the sac and gave the details for an operation in this case. He opened the neck of the sac by an incision over the external ring.

Franco described the operation of the time where the testis and the sac were removed by crushing the neck of the sac and cord, and removing all the material beyond the crushing clamp, and then applying actual cautery burning the stump... This was done only in unilateral cases. (7)

In bilateral cases he advocated against it, and did not believe in bilateral castaration. His operation differed from those now in use chiefly in that the muscle layers were not sutured to strengthen the weakened spot. Pierre Franco is remembered principally for his work on strangulated hernias and in his advocating against the practice of bilateral castaration in double inguinal hernias.

The 16th century brought Ambroise Pare, who was most noted as a military surgeon, but contributed a good deal to herniology. He was a conservative and used trusses extensively. Pare was one of the first to describe dia-

phragmatic hernia. His patient sustained a wound in the chest, but seemed to recover rapidly. Later developed gastro intestinal symptoms, and at autopsy the colon was found in the thorax.

Pare introduced and described an operation called the "Punctum Aureum." It consisted of dissecting down to the sac in the inguinal canal and twisting a gold wire about the neck of the sac so that the bowel could not protrude through and yet the loop was not tight enough to cause a strangulation of the cord.

About the time of Louis XIV of France the surgery was still in the hands of the unskilled. Most people could not obtain a reliable surgeon. Besides they themselves were ignorant and superstitious, and quite willing to believe in charms, magic cures and witch craft.

It happened that Louie himself became interested in curing of hernias. It was rumored about that Prior of Cabrienes in Languedoc had knowledge of numerous secret remedies, one of which was for ruptures. His services were sought, and he arrived at the court about 1680. For some mysterious reason he requested the king's promise not to publish the receipt of his cure until after his death. Louie not wanting to betray the Prior and yet anxious to help the people at last decided that he himself would become pharmacist, mix the remedy and charitably distribute it. Great care was taken to guard the formula and many

different drugs were sent to Louie's private rooms. Most of them were discarded as the remedy consisted of only a mixture of wine and spirit of salt.. To obtain the remedy a note was required stating the name and age of the patient. A few days later the patient returned receiving a basket containing three bottles of the mixture, along with plasters consisting of nine different drugs. Instructions for the application of the plasters and sonsumption of the wine and salt were given. This service was continued for four years. Some patients reporting cures, others not.

On another occasion Madam Devoux, a widow of a Paris surgeon appeared at the court stating that she had found among her husband's papers an infallible plaster receipt for the cure of hernia. She was given permission to try the plaster on some of the patients. Several testified a cure for which she received 400 pistoles, and a pension of 500 livres to cure soldiers of the malady. Dionis states however, that this cure was no better than the others.

In 1716 Dionis published his " Cours d'operations de Chirurgie" (28) stating that conservative treatment of hernia was the best, but in order that the surgeon might be acquainted with the good and bad, he would describe the operation practiced at that time. Among them he described the "Golden Stitch" inwhich the golden wire was used as described by Pare.

Another method was the "Royal Operation", consisting of an incision parallel to the cord and spermatic vessels and suturing the sac as it lay in its place. This was called the "Royal Operation" because the man was left intact so that thereafter he could furnish the king with more subjects. Dionis condemed the removal of the testis as being contrary to devine and human laws. He said it should never be practiced except perhaps in the case of a monk or a priest.

Littre discovered and described two cases of hernia of Meckles Diverticulum, which still bears his name. In 1710 he devised a method for a new anus. He described Tyson's glands. Littre was a great student of anatomy and physiology, but not being interested in theraputics, he contributed but little in the treatment of hernia. (2)

Petit was another who was interested in herniology and said of a large irreducible hernia of long standing that they, " Had lost their right of domicile in the abdomen."

In 1731 de Garengeot described a hernia inwhich the sac contained the appendix. In the same year he describedthe first lumbar hernia on record. In 1742 he reported a case of obturator hernia and discussed ventral hernia in some detail. (2)

Shortly following this Percival Pott, a leading English surgeon, published his " Treatise on Ruptures" in 1756. It deals with the anatomy and surgical aspects in-

troducing some new angles and contributing considerably to the knowledge of hernia.

Gimbernat, in 1768, described the ligament that bears his name. He gives advice in treating strangulated femoral hernias, stating that the devision of this ligament was less likely to cause danger from hemorrhage than in cutting directly upward as was the custom.

Richter in 1785 described a hernia inwhich only a part of the circumference of the intestine had herniated. This is now called a partial enterocoele, or Richter's hernia.

About the beginning of the 19th century one of the greatest English surgeons, Sir Astley Cooper, published his work. It considered both the surgical and the anatomical aspects of hernia. Cooper was very interested in the taxis of strangulated cases. His method for reducing them has never been changed materially. In his book he states that if he were afflicted with a strangulated femoral hernia, he would prefer it to be first treated with taxis and if not reduced, would request immediate operation. Cooper exerted more influence than any man in England on herniology. (9)

Scarpa, an Italian, contributed extensively at about this time. He was a real anatomist, and did some remarkable work, a good deal of which even prevails today.

Even considering the great contributions made by Scarpa and Cooper and others operative repairs during the first half of the 19th century were notoriously a failure. At this time all the all the anatomical structures involved in a hernia were understood. Yet only slight improvement can be seen over the methods of Celsus and Paulus, of Aegina. Centuries brought but minor changes and one is improved by the lack of change in operative technique. Recurrence was frequent and mortality high, so before the days of antiseptics and anesthetics the prognosis was well down toward the zero.

It was during this time the physicians realized the hazards of operations and there was a marked increase in the popularity of the truss. Surgeons were generally unsatisfied with their art, and connived all sorts of methods for treatment of hernia.

Gerdy, a French physician about 1820 devised the idea of invaginating a fold of skin into the neck of the sac as far as possible. Then the skin was denuded by ammonia after it had been sutured in place. The inflamation and adhesions following this were supposed to obliterate the sac. This method was very unsuccessful and cures rather rare. The infection which set in could not be controlled and the method was discarded.

It is interesting to note that some surgeons refused to operate on strangulated hernias. One method of treatment

was to administer tobacco clysters or enemas. Frequently tobacco smoke was blown into the bowel by bellos. The stronger the tobacco the better. Often this would cause a relaxation of the muscles, and a reduction of the hernia could be accomplished, however, sometimes the patient died of nicotine poisoning. (28)

Bonnet of Lyons in 1836 attempted to cure unstrangulated hernias by introducing pins into the sac. The underlying principle was inflamation and adhesions caused by the irritation of these foreign bodies. If suitable ulceration followed the sac would sometimes close off. Pressure was applied to help in the formation of these adhesions. Eleven cases were reported, four were cured, in five the hernia returned, and two died. This method was not generally accepted or practiced.

Doctor Wutzer of Bonn in 1838 described another method. The skin was invaginated into the inguinal canal and held there by a wooden cylinder with a curved needle in the end. When in place the needle was pushed through all structures including the sac into the hernial canal and out through the skin on the anterior abdominal wall. A cover was placed on the outside of the inguinal canal and screwed in place so that pressure was applied between the cylinder and cover. This was left in place six or seven days after which the patient remained in bed about one week.

Professor Agnew of Philidelphia invented a bivalve

speculum, which roughly corresponded to Wurtzer's apparatus, in that the lower blade invaginated the skin into the canal and the upper blade could be screwed down to apply pressure. Sutures of silver wire held the skin in place.

These three methods were all based on the same principle, namely inflamation and adhesions. They did not in any way go after the fundamental etiological factor in hernia.. The attempt was made only to obliterate the sac, and not to strengthen the abdominal wall which in most hernial cases is congenitally weak. The danger of infection was also great as antiseptis had not been accepted.

The next attempt to cure hernia by obliterating the sac and canal was the injection method introduced by Velpeau in about 1835. (22) He injected tincture of iodine into the sac. The idea was the result of his having treated hydrocele by the use of iodine. This lead him to adopt it in the cure of hernia. An assistant compressed the inguinal canal so as to prevent the fluid entering the abdominal cavity. Six drachms of iodine in three ounces of water was introduced into the canal. It was then massaged into all parts of the sac and then removed through an aspirating tube. Before doing the injection it was quite necessary to reduce the contents of the sac. Velpeau reported excellent success.

In 1844 Doctor Pancoast, of Philidelphia published an

account of the injection of tincture of iodine or tincture of cantharides, half a drachm introduced into the sac by means of a fine canula carried free into the sac. The canula was withdrawn and a compress placed under a truss, directed to be worn. He had performed a series of thirteen cases in 1836. Some of these patients had worked a year at farm labor with no return of the rupture in any case. (31)

The injection method of by far the widest repute and general success was that of Doctor George Heaton of Boston. His irritant consisted of the fluid extract of oak bark. It is quite probable that Doctor Heaton did his work even before Pancoast as he claimed to have experimented as early as 1832.

Doctor Heaton first started his practice in, Alton , Illinois, soon went to St. Louis and from there to Boston, where he tried to interest the profession in his operation. Here he was received very coldly and went abroad to London. Sir William Ferguson and others introduced him to the profession there. Here he received great honors and was made a member of several societies. He next went to Paris and was well received and in a short time returned to Boston. The locals hearing of his success abroad welcomed him home, and he attained great success and recognition there. He continued his practice in Boston until the time of his death in July, 1879, and as Doctor Warren says; "Affected cures in hundreds of cases as many now living can now testify."

The next strong advocate of the injection method was Dr. Warren, who began using Heatons method shortly after his death. Warren introduced new technique as well as improving the old. He also introduced new instruments, including a syringe, and special needles. Only minor changes were made in the irritants. Warren's chief contribution was that he did not inject directly into the sac but around it and also injected into the rings.

He was quite successful and gained a good deal of recognition. Following the publication of Dr. Warren the operation was performed quite extensively both in Europe and America. H. O. Marcy in his book on hernia says: "That the exudations which supervened were considerable, and that the pain and suffering were not severe, also the danger in competent hands was but slight. However, the results were certainly not as satisfactory as the profession was lead to expect."

There were two serious objections to the earlier methods of the injection method in treating hernia.

1. The solutions were decidely irritating, and sometimes causing much discomfort and pain, and it was usually necessary to give a large number of injections so that the course of treatment often extended over a period of many months.

2. It was necessary to wear a truss during and for a long time after the interval of treatment.

For these reasons and for the general lack of practical knowledge by the average physician the injection method of treatment fell into disrepute, and was taken up mostly by the lower class of medical men and quacks.

In 1757 Doctor John Wood of London published his method of subcutaneous operation by suture in 1857. In made an oblique incision in front of the scrotum and over the fundus of the rupture, about ¾ of an inch long. It went through the skin and superficial facia. The facia and sac were invaginated into the canal with the finger. The needle was passed behind the conjoin tendon and directed so it would join this with the aponeurosis of the external oblique. The needle was then brought out about 1-½ inches external to the puncture. One end of a piece of wire was hooked on the needle being brought out at the scrotal puncture, and the needle detached. The finger was again put into the canal and the needle directed along its outside and pushed through Pouparts ligament and a wire then attached and brought through the scrotal puncture. The inner end of the wire which transversed the conjoin tendon was drawn down across behind the sac. The two scrotal ends were twisted together. The upper loop was pulled upward to invaginate the facia into the canal. It was then twisted down firmly. These two ends were brought together and twisted so as to hold a pad firmly down on the canal. The only dressing applied was a small carbolized pad. The patient was placed

in bed, with the knees together, and the scrotum well supported. The wire sutures were left intact from eight to twelve days, depending upon the amount of inflamation. Doctor Wood reported excellent success in over 200 cases, but Doctor Cheever of Boston (22) says : " It will cure a certain number of children and young adults, it will fail in others. Doctor Wood however claims seventy per-cent success. We can barely show twenty-five percent."

Doctor Thomas Wood of Cincinatti presented a paper on the radical cure of hernia by closure of the external range, by subcutaneous suture, in 1861. He used a specially constructed needle, pointed on both ends with the eye in the middle. The eye would admit a silk braid one-eighth inch wide. The needle was about as long as one-third the diameter of a two inch circle.

The operation consisted of reducing the sac, and carrying the finger into the ring through the invaginated scrotum and placing upon it the needle. The needle was then carried through an a suture was made enclosing the ring, the sutures were brought out on the opposite side. These were tied on a compress which was left on ten or fifteen days. Doctor Woods reported three cures by this operation. Doctor Dowel improved this method but it did not work out to anyones satisfaction.

While the above operations were not a huge success yet they proved to be a stimulus to spur on new surgical thought.

Surgeons everywhere became more interested and herniology in general was benefited.

With the coming of Lister and antiseptics, and the development of more practical and perfect anesthetics there was a great change in the operative technique of hernia. The peritoneal sac could be opened, with the danger of infection reduced to a minimum. A clean and quickly healing wound could be established. In the days before anisthetics the surgeon had to operate rapidly on a wildly shrieking kicking patient. These two principles made it possible for the open operation to come into prominence.

As would be expected the first application of antiseptic measures for the surgical relief of hernia, is recorded in the early experience of Lister. It was a case of an operation for strangulated hernia.

"H.R. ,age 21 was admitted to the royal infirmary at Glasgow, July 30th, 1869. After an successful effort at reduction under chloroform, Professor Lister proceeded at once to operate. The parts having been shaved, and washed with a solution of carbolic acid, 1;20 of water , and incision 2½ inches long extending into the scrotum was made, through the skin upon the neck of the tumor.

The external ring being found to form a constriction, was devided with a probe pointed bistoury, and taxis again tried without success. Mr. Lister proceeded then to open the sac. A considerable quanity of serrious fluid escaped, and a piece of omentum six inches long and five or six wide,

and very black in color was exposed. A testicle slipped up into view from the lower part of the wound. Mr. Lister, introducing his finger now discovered a second very tight and firm constriction, apparently to the conjoin tendon, which he devided with a probe pointed bistory, the tissue crying under the knife. The neck of the sac, forming a third constriction, very tight but thin, yielded before the finger tip.

The intestine having been well washed with a 1:40 solution of carbolic acid, was now returned and the omentum uncovered and examined. It had assumed a rosy vascular appearance, circulation evidently having been reestablished. One part however, about an inch wide, considerably echymosed, and somewhat detached from the rest was ligated and removed. The remainder was returned. The wound was thoroughly sponged with a 1:40 solution of carbolic acid, and closed by points of interupted cat gut suture. All the instruments and hands of those engaged in the operation were dipped in a 1:40 solution.

The dressing consisted of a piece of antiseptic lac plaster, as recommended by Mr. Lister was coated with gum copal to prevent irritation to the wound, overlapping about an inch, this in turn being overlapped for three or four inches of lac plaster without copal coating. A pad was placed over the region of the wound and the whole secured by plaster."

"July 31st-pulse 72, temperature 100.7. Dressing not disturbed."

"August 1st-pulse 62, temperature 99.."

"August 2nd-wound dressed for the first time under a constant stream of 1:40 solution of carbolic acid. The wound not quite united, as between the stitches, in nearly its whole length an altered clot is visible. There is some fullness about the incision as if from a discharge retention, but no irritation or tention."

"August 4th-wound dressed: on firm pressure two or three drops of orange colored serrous fluid escaped from the lower angle of the wound, otherwise unchanged."

"August 7th-some of the stitches absorbed in their deeper parts and have been lifted off. Some others have been devided. There is a layer of lymph over the wound concealing the amount of cicatrization. No pus squeezed from the incision, but the testicle has been dragged from the scrotum and is lying beneath it accounting for the fullness already mentioned and the sickening uneasiness produced by pressure. "

"August 11th- the wound found to have been stretched considerably and the edges are cicatrizing and there is no odor."

"August 16th-the wound is perfectly sweet and cicatrizing beautifully."

"Sept. 8th-patient dismissed, the wound almost wholly cicatrized." (22)

This account marks the beginning of a very different era in herniology. Up until this time those being afflicted with a strangulated hernia had little chance of recovery and if they did were often afflicted with a discharging fecal fistula. This is probably the first wound of the type ever successfully treated without the formation of sepsis. Nothing was said about the sac, and probably a permanent cure was not the goal of the operation. In this particular case the wound was made more troublesome by the tendency of the testicle to be drawn up into the canal. In modern operations the difficulty is avoided by suturing the external ring.

From this time on the new ideas appeared rapidly. Doctor Steele is no doubt the first to close the canal by animal suture. In his original article (30) he cites the case of Doctor Gross who had done it previously with wire.

"On the subsequent search I find that Professor Gross in his excellent System of Surgery, states that in 1858 in a case of ventral hernia he made a direct incision pared the edges and united the deep parts by silver wire sutures, and the case did well; Also that in 1861, he performed a similar operation in a case of scrotal hernia and that though a sharp attack of erysipelas followed, the result was satis-

factory."

In May of 1873 George Barwell, age 8, was admitted to the Bristol Royal Infirmary under Doctor Steel's care. The child had a large inguinal hernia on the left side. An incision and inch and a half long was made down to and parallel to the pillars of the external ring. Their edges were roughened and brought together with two cat gut sutures, leaving room for the cord. The operation was performed under the carbolic spray. There was no sepsis and the boy went home in three weeks, without a truss or a support of any kind. Six months later he was back with a strangulation. Doctor Steel again performed the same operation but this time put in three cat gut sutures, and a truss was worn for a period of one year. Doctor Steel performed this operation from his original thought but admits he was not the first to use it as is seen by the work of Doctor Gross.

The work just noted is the beginning of the trend toward modern surgery for hernia. It is interesting to note the progress that followed. More was accomplished in the next thirty years than in the centuries that preceeded. The two main obstacles of successful surgery had been surmounted, these being antiseptis and anesthesia. The field was now open to uncomplicated experimentation and reasonable surgical judgment.

Czerney was the first to present a paper on the open cure of hernia, this was done at the Berlin Congress in

1879. The surgeons all over the continent were willing to listen to him, as they realized his ideas were based on the teachings of Lister and his germ theory.

A brief description of his method is as follows; (23)

The operative field was first cleansed with a mercuric solution 1:1000, and then washed with soap and ether. The area was covered with towels leaving only a space large enough for the incision uncovered. A six inch incision was made over the tumor and the sac dissected and exposed, the haemostasis being performed by Kochers cat gut ligature. The sac was then dissected out and pulled down so that it could be ligated as high as possible, thus obliterating the pouch of peritoneum at the mouth of the sac. Next the sac was opened and the contents inspected, and if sound were returned into the abdominal cavity and the neck of the sac transfixed by a needle, which contained a double ligature of silk which was tied and the sac cut away below. The pillars of the inguinal ring were scarified and brought together by silver wires. By these sutures and a few points of cat gut suture the canal was obliterated. A drainage tube was introduced and the skin carefully closed by Kochers juniper cat gut. An iodoform bandage was applied and not changed unless the temperature went over 100. The wire sutures were removed on the 12th day.

This paper and the contents upon it made such an impression that it might be considered the first real step

forward in hernial treatment since the days of the ancients. It not only introduced a rational method of hernial treatment but further aroused surgical interest on the subject.

From this time on articles, statistics and data, began to flow in from everywhere. Victor Cunoud (22) gives the work of Professor Socin in the hospital at Basile. The technique is practically the same as those described previously, but Professor Socin states that in only a very few large hernias, is it necessary to suture the pillars. He gives a table showing his results in 22 cures.

Age of Patients --------Patients Cured---Patients operated upon		
1-10 years	2	2
10-15 "	1	1
15-20 "	2	2
20-30 "	1	3
30-40 "	3	7
40-50 "	5	5
50-60 "	5	11
60-70 "	2	2
70-80 "	1	1

In France J. Lucas Championniere was the first to perform the radical operation for hernia, under the antiseptic method. He practiced it extensively and out of 120 operations had only one fatality, this being on a man who had long been affected with emphysema. Championniere is

chiefly remembered for the paper he presented in 1887. (23) He very closely followed the plan outlined by Czerney. He championed the idea of safety in the operation and thought if the patient was not cured he certainly would be no worse off for the operation and presupposing a recurrence of the hernia, that it would be necessarily smaller than before and more easily controlled by a truss. This stirred up a heated discussion at the meeting. Championniere was enthusiastic in defense of his method while others of some distinction were radically against it. He advocated the early closure of the wound while others declared that healing by granulation was the surest method of cicatrixation.

The conclusions drawn from the discussion and offered by L. S. Richelot were to the effect that;

1. In inguinal hernia as in all others the resection of the sac is the main factor in radical cure.

2. The operation is of easy execution unless there are adhesions with the intestine, or in cases of old hernae, which have become strangulated .

3. The resection of the vagino-peritoneal canal is always possible in congenital hernia with atrophy of the testicle.

4. That resection of the vagino-peritoneal canal in hydrocele of the cord when existing without hernia should always be performed to prevent the descent of a hernia.

5. The simple operation without mutilation, which will preserve a young person from all the infirmiries of the disease, should always be donein hydroceles, and congenital hernia, just as it is done in acquired hernia.

An interesting article by Mr. W. Mitchel Banks of Liverpool appeared in 1882. (4) Inwhich he removed the sac and sutured the pillars. In Aug. 1887. (22) he reported a tabulated list of 106 cases. At this time he dissected out the sac and sutured the two pillars together with three sutures of silver wire, which were left in place. Mr. Banks was able to follow up 66 cases 44 of which were cured. In his article he prefers not to operate if the mass can be retained by a truss.

In 1887 Mr. F. T. Heuston wrote an article (22) inwhich he twisted the sac sutured it in place and excised it. It was not successful and C. B. Ball modified this method somewhat. (3) The peritoneum was loosened about the ring and the empty sac twisted by forceps until tight. This was held in positin by a cat gut suture and the end of the sac excised. Then two sutures were passed thru the skin and outer pillar of the ring thru the twisted sac and then out thru the inner pillar of the ring. A cat gut drain was inserted and brought thru an opening at the back of the scrotum, and the sutures closed over lead plates which lie at right angles to the wound. He reported very excellent success, and states that the

twisted sac makes a slight projection rather than a depressinn in the abdominal cavity.

The above were but slight modifications of the work of Czerney. It was not until Macewen published his paper in 1886, that anything new was introduced. (19) Macewen in introducing his article states that the difference in his operation and others preformed at about the same date, was that he while preserving the sac returned it back into the abdominal cavity, where it would act as a pad or a valve in preventing the return of the vicera into the canal. He is of the opinion that to leave a sac or its stump in the canal causes it to act very much as a wedge and that pressure from coughing or straining on it is a very considerable factor in weakening the rings. While he says that in his method the sac is put back into the abdomen after having been thrown into a series of folds, it hereby acts as a bulwark with its convexity pointing toward the abdomen and its base resting on the abdominal walls, thus protecting the internal ring. He also states that it is quite necessary to give some thought to the strengthening of the canal.

The technique of his operation is as follows:"Free and elevate the distal extremity of the sac, preserving along with it any adipose tissue that may be adherent to it. When this is done, pull down the sac, and, while maintaining tension upon it, introduce the index finger into the inguinal canal, separating the sac from the cord and parites

of the canal."

The finger was passed outside the sac, and the latter was loosened for about half an inch around the abdominal aspects of the circumference of the ring.

A stitch is put through the end of the sac. The thread then woven through its contents so that when pulled up the sac would fold on itself like a curtain. The free end of the suture is put on a hernia needle and introduced through the canal to the abdominal aspect of the transversalis fascia and brought out through the wall about an inch above the internal ring. Traction was made on the thread by an assistant, while the canal was sutured, then it was secured by passing it through the external oblique fascia several times. The ring was closed as follows: A suture was passed through the conjoin tendon in two places; first inward near the lower border and then outward as high as possible on the inner aspect of the canal. Then the lower end of the suture is passed from within outward through Pouparts ligament, penetrating it on a level with the lower stitch in the conjoin tendon. The the upper suture is introduced from within outward through the transversalis and internal oblique muscles and aponeurosis of the external oblique at a level corresponding to that of the upper stitch in the conjoin tendon. The two free ends were brought together and tied in a reef knot, firmly uniting the internal ring.
The pillars of the external ring were likewise brought to-

gether. When the canal had been brought together, a decalcified chicken bone was used as a drainage tube. The skin sewed up with sublimated wool pad applied and held in position by an aseptic bandage."

Macewen tabulated 81 cases without a single fatality and quite remarkable success. This method was rapidly taken up by the profession but nearly every surgeon added his modification.

Mr. E.S.Bishop (5) questioned the fact as to whether the fixation of the pad in the Macewen method was permenant or not and thought that in all probability it would loose its protection, due to the fact that the peritoneal pad might be pushed aside. He carefully separated the sac just up to the ring. Then he passed a suture with a needle on each end thru the walls so the fold would be the largest at the center. Then the needles were passed from within outward so that the first fold on either side of the pouch would be fixed over the ring, and the ends of the suture tied across it.

Koehler introduced even a different angle. The sac was completely loosened from the cord, and the sac slit into three or four strips, which were rolled up separately, with the external surface outward, and each roll sutured so as to maintain the roll. Finally all rolls were sutured with the pillars together and the wound closed by buried sutures.

These represent some the earlier methods of scientific hernial repair, but it was not until 1888 that Bassini introduc-

ed the first of the really modern methods. This was done at the meeting of the congress of Italian Surgeons, held in March 1888 (23).

The technique was quite simple, the object of the operation being to restore the obliquity of the canal. The canal was laid open to the internal ring. The sac dissected out and removed. The spermatic cord pushed aside and the posterior margin of Pouparts ligament exposed and the deep layer dissected so that it could be brought near the posterior margin of that ligament. Then from the ileo-pubic tubercle the canal was united posteriorly to within 5-7 centimeters of the entrance of the cord into the abdominal cavity. The cord was next replaced and the aponeurosis of the external oblique sutured, an opening being left large enough for the cord. The internal opening and posterior wall are now formed and the external ring narrowed, thus restoring the normal obliquity of the canal. Out of 215 cases in 108 there was no return in from 1 to 4 1/2 years. In 131 cases no reappearance had taken place from 1 month to 2 years. In 7 there was a relapse and in 4 the result uncertain.

The next important figure to come into heriology was Dr. W. S. Halstead who first presented his operation for the radical cure of hernia in 1889. The procedure was to make an incision down to and excise the sac. The cord was then transplanted to the upper angle of the wound. Then everything

between the skin and peritoneum was sutured together to close the deeper portion of the wound. The cord was then allowed to rum subcutaneously down to the scrotum and the skin sutured over it.

Dr. Halstead then wrote another article which appeard in the "Annals of Surgery 1893." He states that "Bassini's method and mine are so nearly identical that I might quote his results in support of my operation".

Halstead attempted to make a new canal instead of a new new ring as Madewen tried to do. The aponeurosis of the external oblique and internal oblique and transversalis muscles and fascia were cut from the external abdominal ring to a point 2 ventimeters above and external to the internal abdominal ring. Then the vas deferens and blood vessels of the cord isolated and nearly all the vessels excised in order to make the cord smaller. Halstead reported excellent results, but later was forced to modify his operation.

In modifying this the chief differences were that the cord was not lifted from its bed and the internal ring was not incised above the internal ring. The aponeurosis of the external oblique muscle is divided and the flaps reflected as in the Bassini-Halstead fashion. The internal oblique muscle dissected free and sutured to Pouparts ligament. The lower flap of the cremaster muscle and its fascia are drawn up under the internal oblique and sutured there.

The aponeurosis of the external oblique muscle is overlapped as in Andrews method. This methodhas become one of the standard hernial treatments of modern surgery.

E. W. Andrews introduced his operation in 1895. (1). In his orginal article he states: "While based upon the best modern, open method, and while confessedly an outgrowth of experience with Macewen, Bassine, Halstead and similar operations, yet the carrying out of the imbrication idea so far changes the technique as to make it as different from them all as they are from each other, and perhaps entitle it to be recognized as a new operation. His technique is as follows:

A skin incision 3 cm. above and parallel to Pouparts ligament is carried from near the pubis to the internal ring. Then another incision is made thru and parallel to the fibers of the external oblique. The sac is then dissected out and removed.

The canal is cleared of its contents and the cord lifted out. The internal ring is narrowed by suturing the conjoin tindon and transversalis fascia firmly to Pouparts ligament.

Then the cord is laid over the line of suture and the aponeurosis of the external oblique closed over it forming a new canal.

Andrews claimed the following advantages:

1. Large strong flaps of any needed size to fill the internal ring..
2. Transplantation of the layers of aponeurosis.
3. Interlocking layers giving broad surfaces of union.
4. Shortening of anterior as well as posterior wass of canal making them mutually supporting and relieving tension on deep sutures.
5. Cord amply protected.

Woelfter introduced a method of closure of the hernial opening by suturing the internal oblique and transversalis and recti muscles to Pouparts ligament. This method was principally for direct hernias. At one time he also transplanted the cord by removing the testis from the scrotum by severing the gubernaculum of Hunter. He then severed the transversalis fascia at the outer border of the rectus and pushed the testis between the two recti muscles, and transferred it to the scrotum and again sutured the gubernaculum. The precedure was not satisfactory because the cord was likely to become compressed by muscular action or scar tissue and cause atrophy of the testis.

Ferguson introduced his operation in 1900. Its procedure is as follows:

A curved incision extending downward from 1 1/2 inches below the anterior superior spine of the ileum was made

terminating over the conjoin tendon. Next the external abdominal ring was cut and the aponeurosis of the external oblique seperated directly over the canal beyond the external ring, over the internal oblique muscle. The sac opened and dissected from the cord and ligated high up. The cord itself is not disturbed, being especially careful of the veins and vas deferens.

The internal ring is strengthened by taking up the slack in the transversalis facia by a few sutures. The internal oblique and transversalis facia are then sutured to Pouparts ligament; this suturing extends fully two-thirds down the ligament. If the conjoin tendon is deficient or in case of a direct hernia, the rectus muscle is sutured to Poupart ligament.

The external edges of the aponeurosis of the external oblique muscle are brought together and overlapped, thus restoring the external abdominal ring.

Bloodgood is 1898 described his operation applicable either to direct or indirect hernia. The interior sheath of the rectus is incised and the rectus muscle and sheath drawn down and sutured with the conjoin tendon and internal oblique to Pouparts ligament.

In 1919 Bloodgood made the statement that better success could be obtained by transplanting the cord.

Blake in 1900 modified this by elevating the internal oblique, and the posterior sheath of the rectus is incised along its outer edge as far down as the pubic spine. The

cord then lifted up and the rectus muscle sutured to Pouparts ligament.

Doctor George Fowler of Brooklyn introduced and operation where in he transplanted the cord into the perintoneal cavity. A skin incision was made, the sac dissected and the cord lifted out of the bed . The posterior wall of the canal was opened and the cord transplanted into the abdominal cavity and the wound closed. An attempt was made to strengthen the external ring by suturing the conjoin tendon, and the aponeurosis of the external oblique to Pouparts ligament. Two sutures should also include the pyramidalis. Ferguson states that he used this method to advantage where the hernia protruded considerably. (12)

Lamphear introduced another method where by he dissected out the sac and cut it loose, then took the original sac and made a tunic for the testis, then pushed the testis through the internal ring and sutured the cord so as to cover the opening. This operation was not successful because if infections started it was necessary to open the abdomen for drainage. Secondly the body temperature destroyed the function of the testis.

A. M. Phelps instigated a method of curing hernia by lacing the canal with silver wire. He used from 25 to 100 feet of fine wire and claimed to have introduced as high as 300 feet with no bad results. No one else seems

to have had success with the method.

Another method which was introduced in 1899 by Lane was the use of electricity in hernia. He introduced a needle into the canal and passed electricity in the strength of twenty milliamperes for twenty minutes, and then applied a truss, which the patient wore for two months and effected a cure. His work was probably the basis for a good many of the electric belts and magic cures sold to the gullible by the ever persistant quack.

L. L. M'Arthur of Chicago introduced autoplastic suture method in 1906. He claimed that it remained as a fibrous tissue, or if it died, was absorbed. But that if it lived was a permanent resistance to consequesent stretching.

The usual skin incision is made, dividing the aponeurosis into an external and an internal flap. The sac is then dealt with as the operator deems best. Then a bundle of fibers entering into the formation of the internal pillar of the ring is split off from below upward from the edge of the internal edge of the external oblique up to its termination. It is cut loose above but left attached below. The strips should be about one-eighth inch in width. An identical strip is then taken from this external pillar of the ring, and the sutures are ready for use. They are best handled by tying a needle threaded with a piece of silk to the free end. Any operation may

then be performed, using this living tissue as a suture for all but the skin.

In 1921 W. E. Gallie and A. B. LeMesurier did further work with the living suture and perfected the method so that a reasonable degree of certainty as to its remaining alive is assured. They used mostly tendons and enjoyed the most success in large ventral hernias. It has since been used with great success in inguinal hernia.

In 1928 Henry M. Lyle of New York collected a series of cases inwhich living sutures were used. Three hundred and thirty-five patients were operated upon, one hundred and fifty-nine were followed for a period of eighteen months for five and on half years, various methods were used. In one hundred and one operations there were three recurrences or a failure of only three percent. In fifty-four cases of the direct type five failed or a recurrence of nine and five-tenths percent. At the same time a series of cases using regular sutures were done. In two hundred cases of indirect inguinal hernia there were nine percent failures. In seventy one cases of the direct type there were fourteen percent failures. From these statistics he drew the following conclusions;

1. Facial sutures are still on trial.
2. Facial sutures live and unite with muscles.
3. In this series of cases facial sutures prove better

than cat gut.

4. The Gallie method is best for difficult hernia and by its use the field of operability can be widened to include cases formerly thought to inoperable.
5. The future progress in surgery will be along physiological lines and the problem will solve itself when we can establish as an efficient muscular mechanism as the one which guards the normal inguinal canal.

The progress in hernia healing has been most interesting particularly from a surgical standpoint. It may be stated that our methods are considerably more successful than those of the ancients. Yet with all our knowledge of anatomy and technique there is still something lacking in our attempt to cope with hernia. Even our best methods have some failures.

In attacking the problem of hernia cure there are three main points to be considered;

1. Removal of the sac.
2. Retaining the normal obliquity of the canal.
3. Strengthening of the posterior wall.

To meet these requirements four main operations have been presented, the Bassina, the Halsted, the Andrews and the Ferguson.

In consideration of the Bassini, while it was one of the first modern operations, yet it is the one which

most nearly restores the canal to the normal, and meets the three necessary conditions. The Bassini is extremely popular because of the simple proceedure and the gratifying results obtained from it. In a survey of a large number of clinical cases this operation had had only from three to nine percent recurrences.

The Halsted was the next operation to come out, and while the author claimed great things for it, it is not very successful. Its chief weak points and reasons for its failure are as follows:

1. Division of the internal oblique.
2. Transplantation of the cord between the cut ends of the muscle fibers.
3. Bringing the cord in a direct line through the abdominal wall. It is here quite easy for the hernia to protrude directly through.

Andrews operation after all must be considered a modification of Halsted's method. Andrews evidently saw the weak points in Halsted's operation and sought to correct them by bringing the lower flap of the external oblique over the cord. This operation is still used considerably in cases of direct hernia and in instances where the muscular wall is weak, such as in old men.

The study of the Ferguson operation is especially interesting. Ferguson in his original articles was very radical, and seemed to be willing to fight anyone who

believed in the transplantation of the cord. He was particularly hostile toward Bassini and his method stating that he could see no excuse for this proceedure when a method as certain as his could be used. Ferguson was particularly dogmatic in his unwillingness to touch the cord. He seemed to be of the impression that the cord was as delicate as a nerve tract and to disturb it was certain to cause phlebitis. His stand practically split herniology into two schools, those supporting the theory of cord transplantation and those against it. Many bitter arguments arose, and as is the usual case, settled nothing.

In the final analysis of Ferguson's operation we find that he has not met with all the requirements of a normal inguinal canal, principally in that he has not strengthened the posterior wall. From another angle if the internal and external rings were dialated to any extent the hernia could come straight through, the same as it can in Halsteds.

Then in reality all that Ferguson did was to ligate the sac. Neither restoring the normal obliquity of the canal or strengthening the posterior wall. Yet he reported excellent success. The failure of the method to carry out the last two of three fundamentals in hernia cure brings out another consideration.

There has been some work done recently where the

operators went in and merely removed the sac, and tightened the rings drawing them as far apart as possible. Excellent results have been reported, which seem logical in cases where the posterior wall is strong enough to support itself. Therefore it seems logical that in selected cases with a strong conjoin tendon, this proceedure is sufficient and probably explains Fergusons success.

In summing up the surgical treatment of hernia it may be said; No one operation can be used entirely. In cases where Pouparts ligament is strong, the internal oblique should be attached to it. In direct and large hernias the cord should be transplanted and in most instances it is desirable to pull the rectus muscle down. In general, it may be stated that a good many more years of study and collection of statistics are needed, and that by no means is the study of hernial surgery complete.

Strange as it may seem the once discarded injection method of treatment has again come into the spotlight. In 1927 Pina Mestre, a Spaniard, introduced a new solution, supposed to be free from the handicaps and dangers of those used toward the middle of the 19th century. He and his associates report eight thousand cases, which were almost without exception, relieved in ten to fifteen days. They report its use surprisingly safe in reducible hernias. The solution is composed of the tinctures of several drugs, which on a chemical analysis show the active principals

to be alcohol and tanic acid.

Doctor Hall in his article reports the case of two physicians, one of whom had had three post-operative recurrences of double inguinal hernias. After five injections his hernias were erradicated. Eight months later his hernial discomforts were still at an end.

The proceedure is relatively simple. All that is needed in the way of equipment is a ten c.c. syringe, and stainless steel needles, one seven-eighths inches long, one one and a fourth inches long and one one and a half inches long. The field is prepared the same as any surgical field, and procaine solution used as the anesthetic. The patient lies in the recumbent position and the hernia reduced. Then he is changed to the Trendelenburg position. Then the inguinal canal is examined with the finger for its complete reduction. After anesthetizing the canal the solution is injected very slowly. The injection of two c.c. should require from three to five minutes, as rapid injection induces a painful reaction.

The needle is then rapidly withdrawn and pressure applied to the sight of the injection. Seepage into the cutaneous tissue will cause a burning sensation. The patient is brought to a level position and a properly fitting truss, applied to the area of the internal ring. The proper application of the truss at the internal ring

is very important. This prevents return of the intestine into the sac, keeping the walls of the sac closed. This minimizes the possibility of intestinal adhesions.

R. Wolfe in presenting his paper gave some reports on animal experimentation, which are very interesting.

1. Five mms. of the solution were injected into the rectus muscle of rats. In a few cases the abdominal cavity was entered. The result was rapidly fatal, due to intestinal adhesions.
2. The solution was next injected into the muscles of the hind leg. In about ten days a tumor arose, and in some cases ulcerated, healing rapidly, however. Biopsy showed; proliferation of connective tissue cells, large mononuclear phagocyteas, giant cells, and in short a type of granuloma.
3. Experiments were carried on in the spermatic cord of a dog. Five mms. were injected for six days, thirty days later the cord and testicle were removed, and biopsy showed absolutely no major abnormality in the testicle or vas deferens.

These experiments pointed out that;

1. The admission of the fluid into the body cavity would no doubt cause intestinal adhesions.
2. There was a vigorous proliferation of con-

nective cells.

3. Injection into the spermatic cord need not cause an obliteration of the vas.

Wolfe sums up the reasons for the failure of the injection method under the earlier operators.

1. The solutions employed were irritating and frequently caused severe pain and necrosis of the part injected.

2. As a result of the reaction, the solution could be given but once in ten days, and the patient had to be confined to bed. This was the experience of Heaton.

3. The development of antiseptic surgery and its wide spread use by the medical profession.

4. The failure of the earlier exponents of the injection method of treatment to understand properly the origin and the adoption on their part of an erroneous working hypothesis in attempting a repair.

Hall, Mestre, and Wolfe report some very miraculous cures. Hall gives his summary as follows;

1. Injection of hernia by the Pina Mestre method is safe and effective in almost every case.

2. Histopathological examination in experimental animals indicates this fluid stimulates

seroplastic exuation, and formation of adhesions, and a connective tissue barrier, thus effectively blocking and obliterating the canal.

3. The treatment may be employed in all types of hernia, it is contra-indicated when the protrusion can't be reduced, and also in bleeders. Wolfe recommends it especially in a case of poor surgical risk, old age, or a non-election of surgery, the injection method should be considered.

In this country the injection treatment of hernia is looked upon with disfavor at the present time. It is used more among the irregular practictioners and charlatans. Its present status is analagous to the position of the injection treatment of hemorrhoids , and varicose veins a decade ago. The claims for this treatment have not as yet been substantiated to the professions satisfaction. However, some experimentation is being carried on at the University of Minnesota, and when their report comes out it will no doubt either be put on a standard basis, or discarded.

It is interesting to glance back at the progress in hernia treatment. Time has caused the casting about from one method to another. The most ancient method was palliative and the ancients depended mostly on trusses with a few exceptions. In the course of time surgery was introduced, but with the coming of the barber surgeon, trusses

again became the method of choice. One 18th century surgeon was supposed to have said that the reason he did not operate was because he had to spend all his time applying trusses to those cases which other surgeons had cured. The injection method was then introduced and flourished for about 50 years. With the coming of Lister surgery became the popular method of radical treatment, and remains so today. Now, what will the work of Pina Mestre mean? Certainly no one method has proven infallible.

Hippocrates might well have been forecasting the history of the treatment of hernia when he said: " Life is short, and the art long; the occasion fleeting: experience fallacious, and judgment difficult."

Bibliography

1. Andrews, E. ". : Imbrication or Lap Joint Method; A Plastic Operation for Hernia. Chicago Med. Rec., IX, p.67-77, 1895.
2. Baas: History of Medicine; J. H. Vail Co. New York, 1889.
3. Ball, C. ". : The Radical Cure of Hernia by Torsion of the Sac; Brit. Med. J., London, p. 461-462, 1884.
4. Banks, ". M. : On Radical Cure of Hernia by Removal of the Sac and Stitching together the Pillars of the Ring; Brit. Med. J., London p. 985-988, 1882.
5. Bishop, E. ". : The Radical Cure of Hernia; Lancet, London, p. 1169-1236, 1890.
6. Bloodgood, J. ". : The Transplantation of the Rectus Muscle in Certain Cases of Inguinal Hernia inwhich the Conjoin Tendon is Obliterated; John Hopkins Hospital Bull., IX, p. 96-100.
7. Brown, Alfred,M.D.: Olde Masterpieces in Surgery; Privately Printed, Omaha, Neb., 1928
8. Coley: Radical Cure of Inguinal and Femoral Hernia with Reports of 845 Cases: Ann. Surg. July 1901.
9. Cooper, Astley: The Anatomy and Surgical Treatment of Abdominal Hernia, Edit. 2, Philidelphia, 1844.
10. Ferguson, ". H.: Oblique Inguinal Hernia; Typic Operation for its Radical Cure. J. Am. Med. Ass., Chicago, XXXIII, p. 6-14, 1899.
11. Ferguson, Alesander, Hugh.: The Technique of Modern Operations for Hernia; Chicago, Cleveland Press, 1907.

12. Fowler, G. A.: A New Method for the Radical Cure of Hernia; Ann. Surg. Philidelphia, XXVI, p. 603-623, 1897.

13. Garrison, F. H.: History of Medicine: W. B. Saunders Co., Phil. and Lord, 1929.

14. Gullie, W. E. and Le Mesurier, A.B.: The Use of Living Sutures in Operative Surgery.; Canad. Med Ass. J., Toronto, XI, p. 504-513, 1921.

15. Hall, J. S. K.: Injection Method of Treating Hernias; Med. J. and Rec. July 17, 1929. Vol. 130, p.61.

16. Halsted, W. S.: The Radical Cure of Inguinal Hernia in the Male.: John Hopkins Bull., IV. p 17-24, 1893.

17. Hippocrates.: The Genuine Works of,; Translated by Francis Adams., Lord Sydenham Soc., II, p.697-774, 1849.

18. Lusk, W. C.: Discussion on Inguinal Hernia; Ann. Surg. Phil., LXVI., p. 735-736, 1917.

19. Macewen, W.; On the Radical Cure of Oblique Inguinal Hernia by Internal Abdominal Peritoneal Pad and Restoration of the Valved Form of the Inquinal Canal.; Ann. Surg., IV, p. 89-119, 1886.

20. Macready, J.F.C.H.: A Treatise on Ruptures; C. Griffin and Co., London, 1893.

21. Manley, Thomas Henry 1851-1905, Hernia; Its Palliative and Radical Treatment in Adults, Children and infants.

22. Marcy, Henry Orlando, 1837.: The Anatomy and Surgi-

cal Treatment of Hernia: D. Appleton and Co., New York, 1892.

23. Mastin: Hernia, A Comparison of the various Methods Adopted for its Cure, Inviting a Discussion of their Respective Merits., Tr. Am. Surg. Ass., Philidelphia, VII., p. 25-56, 1889.

24. Meyer, W.: The Implantation of the Silver Filigree for the Closure of Large Hernial Apertures.; Tr. Am. Surg. Ass., Philidelphia, XX, p. 262-373, 1902.

25. Nelson :Loose-Leaf Living Surgery; Thomas Nelson and Sons, New York, IV. p. 590.

26. Pancoast, J.: See Macready, p. 225.

27. Paulus Aegina: Vol. II, Trans. by Francis Adams; London, MDcccxlvi.

28. Raaf, John A.: Hernia Healers; Annals of Medical History; IV-p.377, 1932.

29. Scarpa, Antonius: Treatis on Hernia; Edinburg, 1814.

30. Steel, Chas.: On Operations for the Radical Cure of Hernia; Brit. Med. J. p.584, Nov. 7, 1874.

31. Warren, J. H.: Hernia, Strangulated and Reducible, Boston, 1881.

32. Watson, Leigh Festus, - Hernia; C. V. Mosby Co., St. Louis, 1924.

33. Wood, J.: On Rupture; J. W. Davies, London, 1863.

34. Wood, Thomas : Radical Cure of Hernia by Closure of the External Ring by Subcutaneous Suture; Transac. Am. Med. Ass'n. , p. 251-257, 1861.

35. Wolfe, Ralph: Injection of Inguinal Hernia; Med. J. and Rec., Mar. 4. Vol. 133, p. 243-246.

36. Wood: On Rupture; Med. Times and Gazette; Vol. I, p. 29-119-169, London, 1864.