Clin Ob Gyn 1966 V-9

PELVIC ORGAN PROLAPSE: FOUR THOUSAND YEARS OF TREATMENT

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THE HISTORY OF GENITAL PROLAPSE and proposals for its treatment can be traced past the days of Hippocratic medicine to a record in the Kahun papyrus of Egypt. This papyrus, discovered by Flinders Petrie in 1889 and translated by F. L. Griffith in 1893, clearly represents the status of medical knowledge in Egypt approximately 2000 years before the birth of Christ. In it there are three references to falling of the womb. The Ebers papyrus, found in 1862, is a work dating from at least 1550 B.C., and in this case uterine prolapse is the first gynecologic condition referred to. According to Bernutz and Goupil in *Diseases of Women* (1866), uterine prolapse was one of the female ailments described by Cleopatra, who prescribed for therapy an astringent solution to be applied vaginally.

In the work of Chakraberty, *Interpretation of Ancient Hindu Medicine*, there is a clear delineation of medical terms. One of these is the word "mahati," which specified a very large vagina—cystocele, rectocele, and lacerated perineum.

While Euryphon, a contemporary of Hippocrates, was the leader of the Cnidian School of Medicine, he suggested the use of succussion for therapy of uterine prolapse. His was the first recorded reference to this procedure (Fig. 1).

Hippocrates also employed succussion for irreducible prolapse. However, he discussed the condition in more detail, and was the first to attribute problems of infertility to genital organ prolapse. He also suggested that wet feet, excessive exertion, fatigue, and sexual excesses, especially in a recent parturient, were all etiologic factors in the production of procidentia. Hippocrates described succussion as follows: After the patient had been tied to a ladder-like frame she was tipped upward so that her head was toward the bottom of the frame. The frame was then moved upward and downward more

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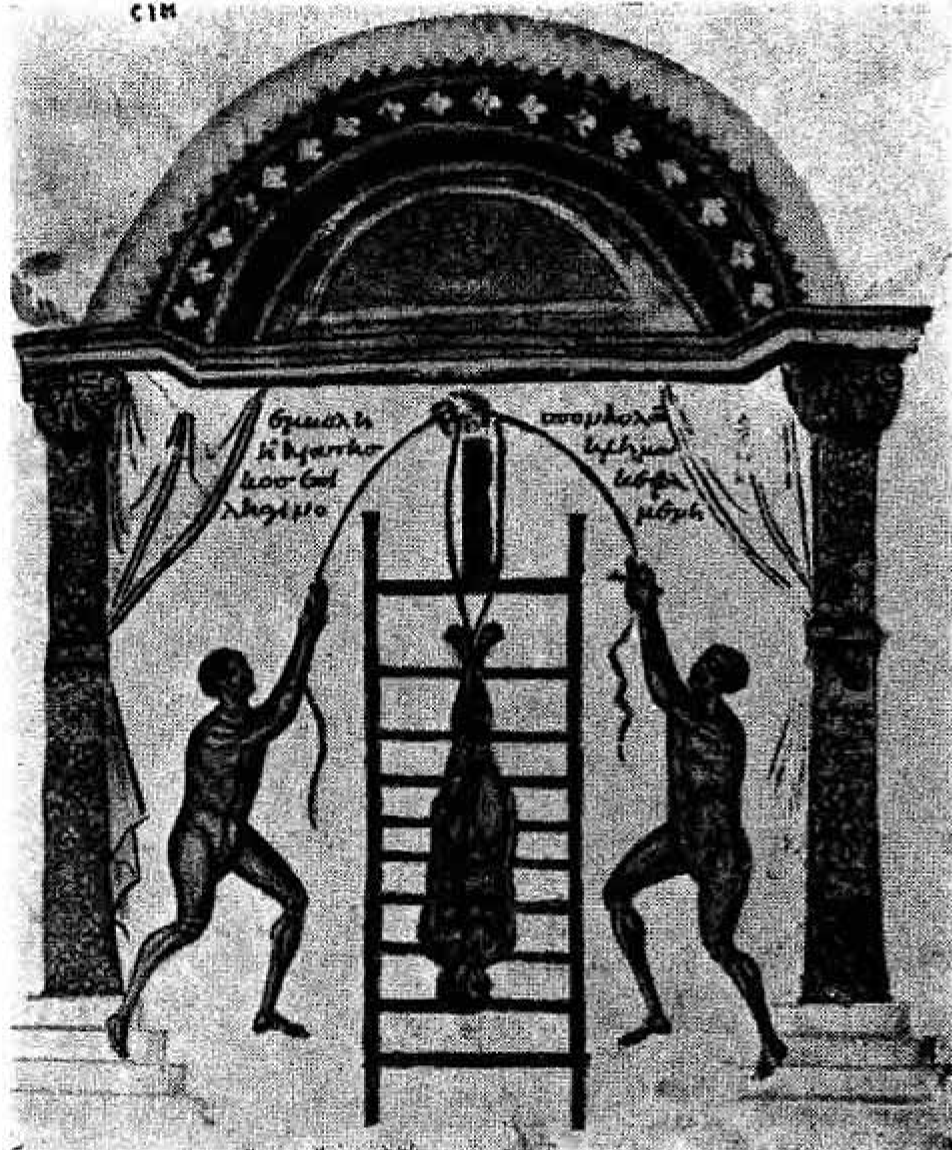

Fig. 1. **Example of hippocratic succussion. (From Appolonius of Kitium.[7])**

or less rapidly for approximately 3–5 minutes. Since the patient was in an inverted position, it was thought that the prolapsing organs of the genital tract would, by the force of gravity as well as the shaking motion, be returned to their normal position.

A most vivid description from the Hippocratic era concerns the appearance of a prolapsed uterus as compared to that of a scrotum. Such a comparison indicates the wrinkled and changed appearance of the genital organs which has occurred by virtue of the drying

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and shrinking of the vaginal mucous membrane in genital prolapse of long standing.

The great number of articles that were written over a period of forty centuries concerning the correction of genital prolapse are ample proof that no single method of control has been a universally effective panacea. From the days of Hippocratic medicine to the mid-fourteenth century blocking of the vaginal canal by mechanical means was the most widely accepted method of treatment.

Polybus wrote in his *On Diseases of Women*, probably the first text of gynecology, that a prolapsed uterus was treated by the use of: (1) local astringent lotions, (2) a sponge packed into the vagina, or (3) the placement of half a pomegranate in the vaginal area. The latter acted to create vaginal constriction as well as to provide a mechanical barrier against further descent of the uterus and the bladder.

0–300 A.D.

Soranus credited Diocles of Carystos (350 B.C.) with the idea of dipping half a pomegranate into vinegar before inserting it into the vagina. Soranus also suggested herbs and fumigations of various kinds for the management of uterine prolapse. Pleasant fumigation was advocated for the patient's head and neck to entice the uterus upward, while fetid odors were applied to the vagina to force the recalcitrant organ to ascend. Soranus mentioned that Evenor had placed a piece of beef into the vagina to serve as a pessary, which was unsuccessful, while Straton had used moist ashes for the same purpose with an equal lack of success. A more successful method of therapy was advised by Soranus as follows: The patient should be placed on bedrest with reduced fluid and food intake. If the uterus had not been replaced by the succussion method, the legs of the patient were tied together and the body elevated, head downward. If this did not succeed the parts were washed with pine water, the uterus was massaged, succussion again was carried out and the thighs were tied together for three days. Fumigations were advised and a T-binder was placed on the patient. Soranus proposed further that the patient should be put to bed, given enemas and cathartics, and then the foot of the bed should be raised and the prolapsed part oiled. Following this, a linen tampon soaked in an astringent solution was used to keep the prolapsed uterus in place. Other therapeutic measures were offered, such as sitz baths in warm wine, numerous drugs, and phlebotomy. Soranus suggested a surgical procedure only when the uterus itself was gangrenous, and stated unequivocally that it could be done without endangering the patient's life.

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Aeitas had similar suggestions for the therapy of uterine prolapse; however, he listed the following agents in its etiology: a fall, violent extraction of the placenta, a poorly executed delivery, prolonged labor in delivery, excessive heavy lifting, direct injury to the uterus itself.

Areteus the Cappadocian described the uterine ligaments with the colorful analogy "like the sails of a boat," and stated that uterine prolapse was due to relaxation of these structures.

MIDDLE AGES

Oribasius, Paulus Aegina, the Arabian physicians of the eighth and ninth centuries; and the medical figures of the medieval epoch, including Trotula and others, contributed nothing innovatory to the diagnosis and management of uterine prolapse. Occasionally reference was made to a successful extirpation of a prolapsed uterus, and then primarily to comment on the amazing absence of mortality. According to Ricci a prolapsed uterus was extirpated in the 1300's by Marco Gattinara of Pavia.

A. Benedetti (1497) was the first person to use the word "procidentia" in describing genital organ prolapse.

SIXTEENTH CENTURY

The first true vaginal hysterectomy was done by J. Berengario da Carpi in 1521, but Berengario stated that his father had removed a uterus using a scalpel. Da Carpi's technique was to place stout twine around the prolapsed uterus, which was gradually tightened over a period of days until the organ was severed. The stump was treated with a mixture of wine, honey, and aloes.

The German "Schnitt and Augenartz," Caspar Stromayr of Lindau, recommended in 1559 that the use of a sponge "tightly rolled and bound with string, dipped in wax and covered with oil or butter" be substituted for a pomegranate as a pessary (Figs. 2 and 3).

Christobal de Vega in 1575 described having seen a prolapsed gangrenous uterus in a woman 34 years old. He referred her to a surgeon who excised this gangrenous mass and the patient survived for ten years, de Vega believed, after this procedure.

Ambrose Paré, late in the sixteenth century, devised ingenious oval-shaped pessaries of hammered brass and of waxed cork for uterine prolapse. He also made an apparatus of gold, silver, or brass which was kept in place by a belt around the waist. He suggested that a prolapsed uterus be restored to its correct position by the application of cupping glasses. This was done by positioning the woman so that her buttocks were high and her legs crossed, following which the

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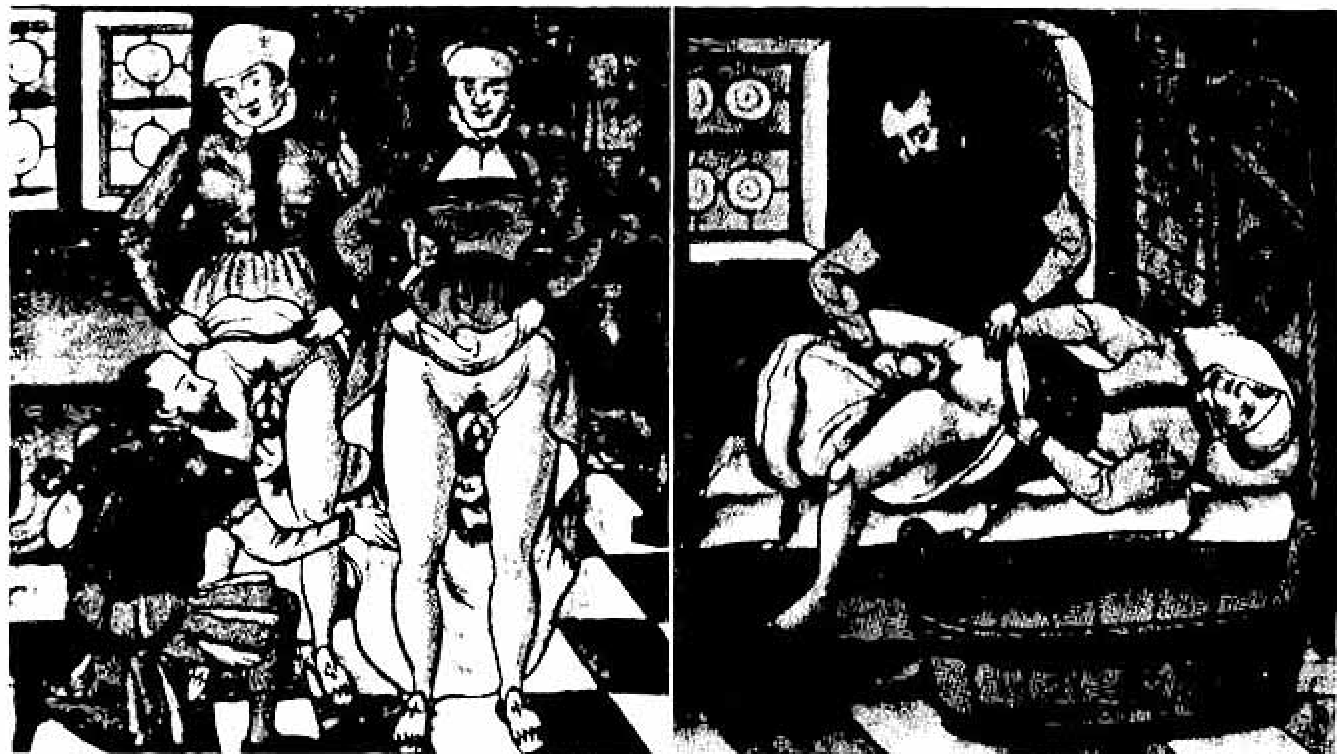

Fig. 2. Left, demonstration of genital organ prolapse; *Right*, demonstration of pessary insertion. (From Stromayr.[2])

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cupping glasses were applied to the navel and the hypogastrium. Paré repaired the perineum following severe traumatic childbirth, stating: "We should by means of some stitches unite the parts unnaturally separated and treat the wound according to (the) art."

William Fabry of Hilden described in 1592 a pregnancy in a prolapsed uterus, and also a case of uterine prolapse in a virgin. He

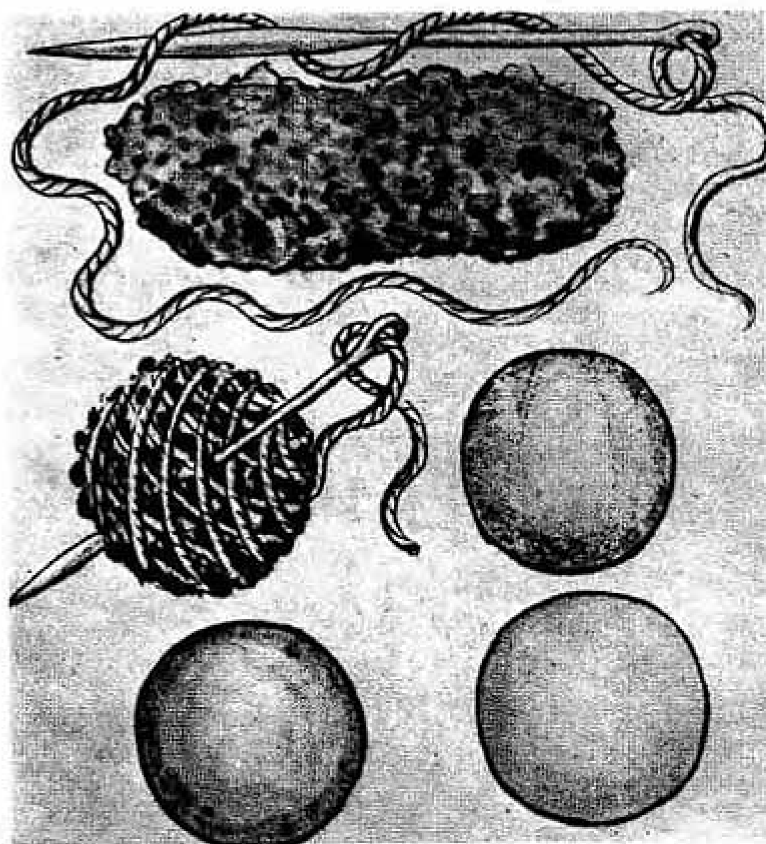

Fig. 3. Shows type of pessary used. (From Stromayr.[11])

designed pear-shaped and round pessaries, which were the first improvements after the pessaries of various shapes which had been designed by C. Bauhin in 1588. This improved use of materials to sustain the uterus in the genital canal led to the ultimate evolution of more than 400 types of pessaries, as were listed by L. A. Neugebauer, who reviewed the subject of pessaries in 1917.

SEVENTEENTH CENTURY

The clinical aspects of genital tract prolapse became more clearly defined in the 1600's although total prolapse of the uterus was an

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entity whose existence was denied by most of the famous physicians until the later years of the century. In 1603 R. de Castro suggested a most unique method for treatment of uterine prolapse: "by attacking it with a piece of iron—red hot—as if to burn it, whereupon fright will force the prolapsed part to recede into the vagina."

Toward mid-century Van Heer enumerated numerous old and unusual reports of uterine excision, most of which were done by medical quacks. He wrote a clear and detailed report of one of these instances, which was published posthumously.

There is a reference in William Harvey's anatomic exercitations in 1653 to a pregnancy in a totally prolapsed uterus with an account of the fact that the pregnancy was lost and the fetus did not survive.

In the work of J. Scultetus (1653) is found the first known illustration of procidentia.

Both van Horne and van Roonhuyse of Holland denied vigorously that the uterus could or did prolapse totally, which was unfortunate since van Roonhuyse recorded clearly many early gynecologic and obstetric procedures in his text on the specialty. Although he described genital organ prolapse, he disclaimed that the uterus was ever found in the protrusions, and his reference to the use of pessaries was for the correction of vaginal prolapse. His is the first specific reference to prolapse of the vagina in gynecologic literature.

In 1664 T. Bartholinus published a book reporting an operation for a prolapsed uterus which had been performed by two Italian surgeons. Several years later Johan Peyer, a Swiss gynecologist, made the first reference to the bladder as a prolapsed viscus and recorded unquestionably the first true description of a cystocele. Peyer was one of the first physicians who believed that *both* the uterus and the bladder could prolapse under certain circumstances.

In C. G. Le Clerc's surgical treatise of the same year there is a reference to one gynecologic therapeutic procedure and this is for procidentia. However, he suggested massage and replacement rather than surgery.

The first illustration of uterine prolapse which truly represented the organs involved in such relaxations was published in 1691 by van Ruysch.

In the late 1600's there was a considerable amount of material written regarding the etiology of uterine and vaginal prolapse with references to numerous medical treatments, pharmaceutical concoctions, and conservative methods for attempting to keep the prolapsed organs within the genital canal.

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EIGHTEENTH CENTURY

It was not until the 1700's that a clear differential diagnosis was made of the actual problems related to prolapse and the organs concerned. Even more significant was that in this century more definitive treatments to bring about more acceptable cures were introduced. In 1702 B. Saviard attempted to differentiate between a prolapse and an inversion of the uterus, and his scholarly study led to not only discussion of etiology but also to anatomic investigation which resulted in differentiation of these two entities.

The first accurate description of a cystocele in the eighteenth century was in a case report by J. Méry in 1713.

A. V. Halder in the 1730's stated that in his judgment uterine prolapse resulted from difficult and protracted labor and that when the fetal head was retained in the pelvis for a long period of time the vaginal parts below it eventually protruded through the vaginal orifice. Later in the century, A. Levret offered an opinion similar to that of Halder regarding the etiology of prolapse; he believed the condition was caused by relaxation of both of the ligaments in the peritoneum.

The Frenchman R. J. C. de Garengeot used the term "enterocele vaginale" in 1736, which was the first use of the term enterocele in relation to vaginal relaxation. De Garengeot's description definitely was of the entity which we know as "true pelvic hernia." His recognition of the perivaginal muscle and fibrous connective tissue sheath also was recorded at an early date. He described fleshy fibers surrounding the vagina which extended from the labia to the uterus and stated that "the second tunic of the vagina consists of a layer of spongy tissue containing a network of blood vessels with many interwoven fleshy fibers of which the largest are strewn longitudinally.

Three years later D. Santorini described the venous plexus in the vaginal supportive tissue inferior to and lateral to the neck of the bladder. The veins of Santorini often account for some of the problems now encountered with the more modern extensive suprapubic operative procedures.

F. D. Wachter differentiated between a prolapsed uterus and relaxation of the vaginal walls in 1745, describing in detail a cystocele and rectocele. In 1761 Morgagni made a distinction between fundal prolapse and hypertrophied elongation of the cervix, a distinction described also by Levret in 1775.

L. M. Dietericks reported in 1745 what was to be the only reported successful surgical procedure for prolapse in the 1700's.

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Jean Astruc in 1763 advised amputation of a gangrenous prolapsed uterus by using a constricting suture ligature placed around the upper portion of the prolapsed organ, which was tightened daily until the organ became totally necrotic and fell off. The same suture was then pulled very tight to prevent postoperative hemorrhage.

H. Manning stated that a rigid vagina was the support for the normal position of the uterus and that when it relaxed, the uterus prolapsed. A. Hamilton stated that a rigid perineum was the main support of the pelvic organs, and this idea was widely accepted into the nineteenth century in spite of the fact that prolapse was rarely seen with a third or fourth degree unrepaired perineal laceration.

E. Sandifort, the famous anatomist of Leyden, described a combined intestinal vaginal hernia, which was obviously an enterocele and rectocele together. He also wrote of a cystocele in a young nulliparous woman, which he called a vaginal hernia of the bladder. This is one of the earliest authenticated instances of the observation of a cystocele in a nulliparous woman.

A. Marshall is credited with having performed a vaginal hysterectomy in 1785, but this was actually a partial excision of a prolapsed cervix.

NINETEENTH CENTURY

The termination of the eighteenth century and the beginning of the nineteenth century signaled the establishment of a terminology and an anatomic classification of various pelvix relaxation defects which is in use today. These are: uterine prolapse of various degrees, relaxation of the anterior vaginal wall or cystocele, relaxation of the posterior vaginal wall or rectocele, true pelvic hernia or enterocele, procidentia or total prolapse of all the pelvic organs outside the vulva, and vaginal prolapse secondary to previous surgical procedures. The term "urethrocele" is being and has been almost eliminated from modern gynecologic terminology. The last addition in this classification occurred in the early twentieth century, and it indicates the entity of postoperative pelvic organ prolapse, vagina only or vagina and cervical stump together, usually referred to as secondary total vaginal prolapse.

In the nineteenth century the development in general of surgical techniques and procedures and of anesthesia, the influence of Lister, the adaptation and improvement of suture materials, and the creation of surgical instruments led to the development of numerous operations for the correction of genital organ prolapse. There were already a multitude of conservative methods for the cure of prolapse, including

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hundreds of different intravaginal pessaries. There were also proposals which encompassed such unique therapeutic recommendations as the use of cold water douches or cold water hip baths, and even the use of a continuous stream of cold water directed into the vagina, or surf bathing, a regimen proposed by T. G. Thomas in 1872. A system of uterine "gymnastics" was introduced by T. Brandt in 1859. F. W. Scanzoni in 1856 recommended massage but when this was not possible due to local congestion and swelling of the prolapsed organ he suggested the application of leeches.

Uterine Prolapse

VAGINAL HYSTERECTOMY

The history of the development of vaginal hysterectomy done primarily for the correction of uterine prolapse is highlighted by an operation performed in 1861 by Choppin of New Orleans who did the first vaginal hysterectomy specifically for prolapse in the United States, and probably the world. Choppin later presented the patient to a medical class with the uterus in her hand to prove that she had survived. However, the first authenticated vaginal hysterectomy was done by the Italian G. Paletta, who inadvertently performed this operation for the removal of a cervical cancer when he thought he was performing a cervical amputation.

C. J. M. Langenbeck in Germany performed the first planned vaginal hysterectomy for cervical cancer in a prolapsed uterus in 1813, but from the account of his operation he probably did not remove all of the uterine corpus. F. B. Osiander earlier had carried out an extensive cervical amputation and his anatomic and surgical description led the way to the vaginal operation by Langenbeck.

J. N. Sauter in 1822 performed a vaginal hysterectomy on an unprolapsed uterus using a circumferential incision around the cervix, and one year later E. A. von Siebold did the third vaginal hysterectomy for cancer in a prolapsed uterus. J. Blundell in 1829 performed the first vaginal hysterectomy in Great Britain for cervical cancer in a prolapsed uterus, and in the same year J. C. Warren carried out the first such operation for cervical cancer in a prolapsed uterus in the United States.

G. B. Bellini in 1835 used the ligature method for removal of a gangrenous prolapsed uterus and H. F. Killion several years later claimed that the gangrenous condition was the only indication for the operation. J. F. Dieffenbach of Berlin in his 1848 text on gynecol-

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ogy conceded that vaginal hysterectomy was indicated in cases of uterine cancer and prolapse together.

P. C. Huguier, who had opened the way for advanced surgery for uterine prolapse, nevertheless in 1860 decried the possible use of vaginal hysterectomy while advocating high amputation of the cervix. But the next year Choppin, as mentioned previously, did the first vaginal hysterectomy *specifically for uterine prolapse* in the United States.

In the 1870's A. Patterson successfully removed an uncomplicated prolapsed uterus vaginally, and H. Fritsch introduced a simple hemostatic technique for vaginal hysterectomy for prolapse, which was reported by R. Asch in 1889.

In 1896 P. Delbet further refined the use of vaginal hysterectomy in the treatment of uterine prolapse by suturing the round ligaments to the vaginal wall in an operation which he called "colpocystopexie." Fritsch's presentation of vaginal hysterectomy technique was based upon the systematized schedule of the operation which was done by V. Czerny.

Vaginal hysterectomy as a primary operative procedure for the treatment of uterine prolapse was not accomplished until 1861; other procedures which preceded it were: denudation of vaginal mucosa, infibulation of the vulva, closure of the vaginal orifice, and incorporation of high perineal repairs.

Denudation of vaginal mucosa

The Frenchman R. Geradin in 1823 suggested a denudation of the vaginal mucous membrane, which he carried out on a cadaver. This operation was then performed in 1830 by Dieffenbach on a living person. G. O. Heming of Kentish Town at the suggestion of Hale of London denuded the anterior vaginal wall for prolapse in 1831, but it was L. J. C. Mendé in 1834 who introduced the concept of denuding and suturing the vagina in the region of the vaginal orifice in order to narrow the vagina by constriction. In 1840 J. de Lamballe performed a denudation of the anterior vaginal wall and closed the area with sutures twisted over inserted needles. In so doing he stated that while denudation procedures were primarily for the correction of uterine prolapse, in this situation it was used *primarily and essentially for the correction of a cystocele.*

True closure of infibulation of the vulvar and vulvovaginal tissues was introduced by J. C. G. Fricke in 1832. Various additions and modifications of his approach were conducted over the next 10–15 years, including the creation of a high perineum combined with

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closure of the tissues of the vulvar and vaginal orifice by I. B. Brown in 1854.

Huguier in 1859 introduced the concept of cervical hypertrophy and elongation in relation to uterine prolapse and used high amputation of the cervix to treat the problem. He was the first to demonstrate an understanding and definitive knowledge of the avascular space between the bladder, the vaginal wall, and the cervix. His work provided the background for D. Bissel's most important contribution on this subject many years later.

J. M. Sim in 1866 began a series of denudation operative procedures in which he very nearly approached the discovery of the modern method of anterior vaginal repair for cystocele, but he did not persist in his dissections.

In 1871 T. A. Emmet did many variations and modifications of procedures for the repair of vaginal prolapse and emphasized the use of the term "pelvic fascia," a term which has produced confusion in regard to the understanding of pelvic anatomy to the present. Emmet's "posterior repair," however, has served for many years as the basis for rectocele obliteration operations in the United States (Fig. 4).

The use of denudation procedures to obliterate the vagina and thus prevent uterine prolapse reached its zenith in L. LeFort's devel-

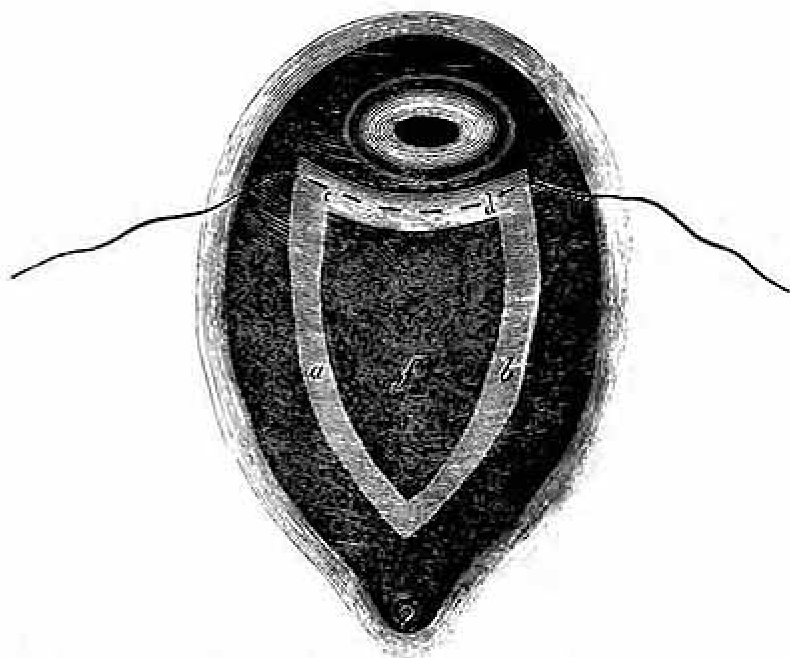

Fig. 4. Emmet's technique of posterior colporrhaphy. (From Thomas.[15])

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opment in 1877 of a total vaginal occlusion operation, which was based in reality on G. Simon's "colpokleisis." The LeFort operation, with minor modifications by Neugebauer in 1881, and Goodall and Power in 1937, is still in surgical use (Fig. 5).

In 1888 A. Donald of Manchester, England combined anterior and posterior vaginal wall repairs, perineorrhaphy, and amputation of the cervix in a procedure which proved to be the basis for W. Fothergill's operation reported in 1908. Donald's combined operation thus led to the development of one of the most widely used procedures for both uterine and generalized pelvic organ prolapse.

Relaxation of the Vaginal Walls (Cystocele, Rectocele, Enterocele)

Mucosal denudation

Obviously, as the operations for correction of uterine prolapse were developed they came to be used more accurately for correction of relaxed vaginal walls as well. We have noted previously that de Lamballe stated that his procedure of vaginal denudation was used primarily for the correction of cystocele. The operations of Sims, Emmet (especially for rectocele repair), and T. G. Thomas were used exclusively for vaginal relaxation repairs. Thomas in 1872 devised special clamps for cutting and clamping the vaginal mucosa (Fig. 6).

Simon, A. Hegar, and R. L. Tait in 1874 independently devised operative methods to produce a band of cicatrix in the posterior vaginal mucosa to support the anterior vaginal wall. LeFort's operation in 1877 reduced vaginal wall relaxation in addition to supporting a prolapsed uterus, and H. W. Freund constricted the vagina by creating an ascending series of fibrous rings produced by placing wire sutures in the wall of the vagina.

Tissue dissection and "infolding" techniques

Tait in 1887 devised a mucosal "flap-splitting" operation for correction of rectocele, which was later used by M. Sanger for the anterior vaginal wall. But B. E. Hadra advocated lifting a vaginal flap from the cervix and used a crescent-shaped incision above the cervical os for this purpose. This incision lead D. Bissell 35 years later to revolutionize vaginal plastic surgery, for it enabled him to utilize the "avascular space" which had been illustrated by Huguier in 1859.

In the 1890's Mundé suggested the use of a purse-string suture of black silk to close "muscle tissue" underlying the bladder rather than the vaginal mucosa alone. S. Pozzi differentiated between uterine prolapse with and without cystocele and *used separate operations*

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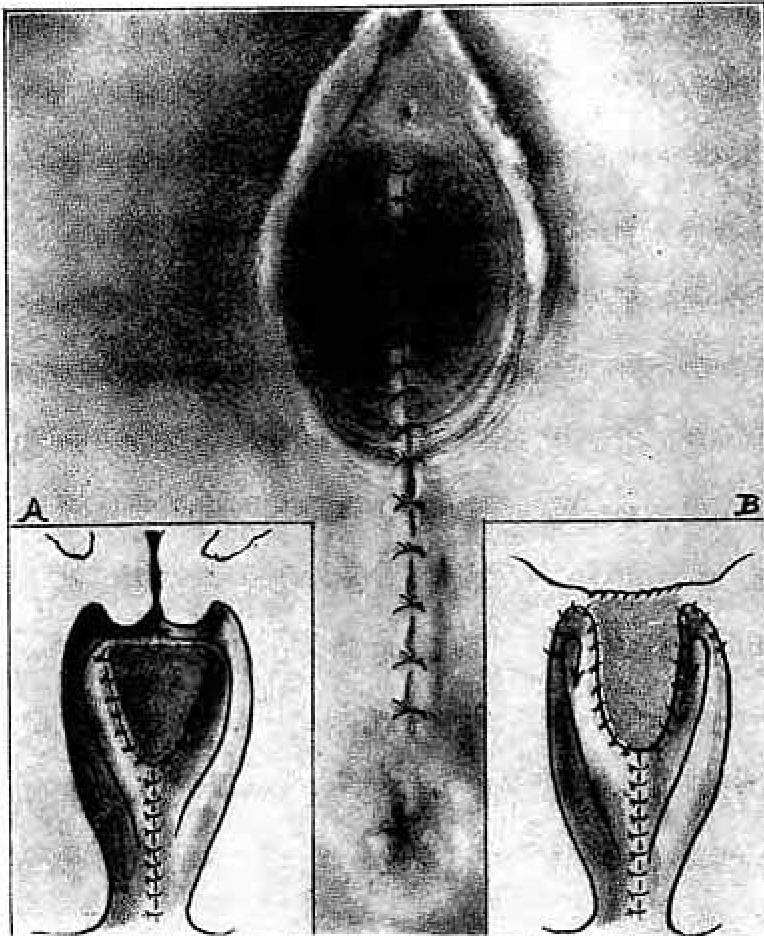

Fig. 5. The LeFort operation after Goodall and Power. (From Goodall and Power.[6])

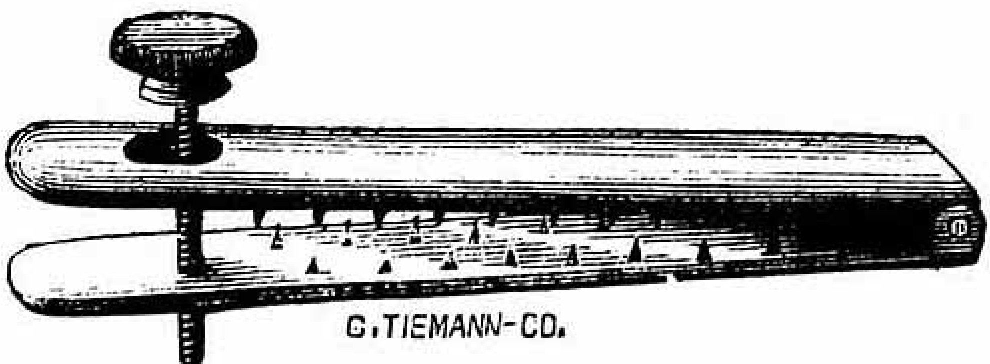

Fig. 6. Clamp for vaginal mucosa for anterior repair. (From Thomas.[18])

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for each condition. T. J. Watkins one year later dissected specific vaginal mucosal flaps and "turned in the fascia" for anterior vaginal wall support, thus perpetuating the concept of a pelvic fascia which had been proposed by Emmet.

Separation of the bladder from the cervix by dissection was advocated in 1892 by Sanger in a "flap-splitting" technique while M. von Arx was the first surgeon to *amputate the cervix for cystocele repair,* an operation accomplished in 1896. Von Arx also described "elevation of the bladder" which was accompanied by "turning in the mucosa" upon itself. (This method has since been attributed to Emmet). Variations of technique have been legion but it was H. F. Kreutzmann of California in 1896 who first accurately described *wide* removal of the bladder from the cervix, the uterus, and the vaginal wall. He closed the dissection with silkworm gut and on occasion removed the uterus vaginally in cases in which uterine prolapse was associated with cystocele.

Vaginofixation operations

In 1888 A. Mackenrodt passed a suture through the cervical canal and uterine fundus to the uterovesical attachment and vagina without dissecting the bladder. A. Shucking in this year used a special trocar and needle in his operation, while Sanger suggested an incision in the anterior vaginal wall, upward dissection of the bladder, with anteflexion of the uterus which was then sutured to the vagina.

A. Duhrssen in 1894 reported on 250 cases of vaginofixation operations and suggested incision of the anterior peritoneum to avoid injury to the bladder. This was done also by Mackenrodt in 1895, but O. Küstner was the first to enter the peritoneal cavity from below routinely.

Interposition operation

Freund in 1895 brought the uterus into the vagina and sutured it in situ. H. Vineburg and E. Wertheim in 1896 shortened the round ligaments vaginally in a modified type of vaginofixation which led to the "interposition operation," a term attributed to the Austrian F. Schauta. Schauta had used an extraperitoneal vaginofixation method since 1889 which actually was an interposition of an anteflexed uterus sutured in place under the bladder (Fig. 7). Both Wertheim and Watkins described a similar procedure in the same year. All of these procedures were, except for insignificant details, similar to the original operation proposed by Sanger seven years before. This operation has been used universally in the twentieth century for the

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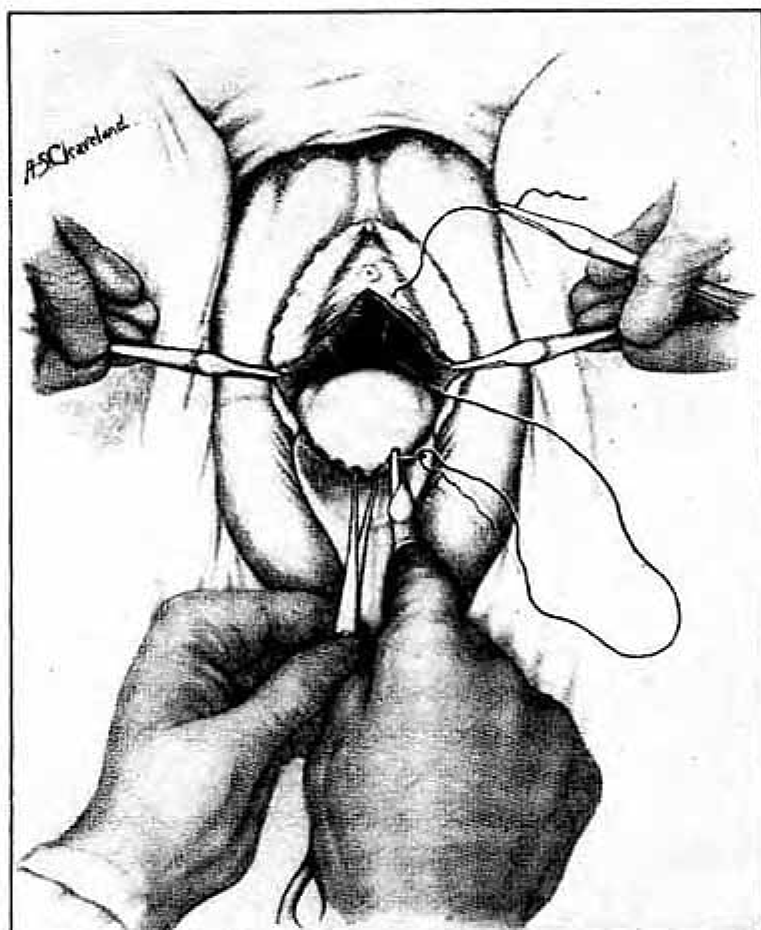

Fig. 7. **Watkins-Wertheim interposition operation for cystocele based on an original concept of Schauta. (From Watkins.[19])**

correction of cystocele, especially in elderly women and occasionally for the correction of uterine prolapse as well.

Correction of cystocele and anterior vaginal wall relaxation through a suprapubic approach

T. L. Tuffier was the first surgeon to correct a cystocele through an abdominal approach. He suggested fixing the bladder high upon the abdominal wall extraperitoneally through a transverse suprapubic incision. In 1890 H. T. Byford created an operation called "colpo-cystorrhaphy" in which the anterior vaginal wall was elevated using silkworm gut carried through the inguinal canal in the region of the posterior pubic cellular tissue. P. L. Laroyenne in this year transfixed

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the bladder musculature transperitoneally and in another procedure the same year sutured the bladder to the posterior superior surface of the uterus.

D. Lawson in 1898, after research on the cadaver concerning tensile strength of the urachus and obliterated hypogastric vessels, exposed the extraperitoneal area through abdominal incision and pulled these structures upward and secured them to the rectus muscle sheath in the living. Later he sutured the bladder flap to the umbilical peritoneum as well.

Rectocele and enterocele repair

Posterior Vaginal Wall—Rectocele

Based upon the idea of Hegar to extend a perineal incision and repair to the posterior vaginal wall, I. B. Brown in 1854 attempted repair of a rectocele by a horseshoe-shaped incision in the posterior wall of the vagina. However, as previously noted, Emmet working from 1864 to 1883 developed the best operative technique for rectocele repair.

Enterocele

After Garengeot's initial description of enterocele in 1769 there were numerous case reports of the entity. In the 1800's, however, T. G. Thomas in 1885 was the only physician to suggest a repair by means of abdominal laparotomy with suturing of the hernial sac to the abdominal wall. Correction of enterocele was not heavily emphasized until the twentieth century, and surgery for correction of rectocele in the nineteenth century often was confused with perineal repair.

TWENTIETH CENTURY

In the early twentieth century the advent of increased anatomic knowledge led to the development of sophisticated surgical procedures to correct the specific problems of pelvic organ prolapse. Most of these were developed by a modification of existing operative techniques which were incomplete or had serious faults. For this reason there is a resemblance in the technique of one operation to another in most of the modern procedures. The summarization of a 1000–1500 articles and monographs on the subject of pelvic organ prolapse is exceedingly difficult. Accordingly, this is a brief historic account of the development of the more commonly used procedures in the twentieth century through 1965.

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1900–1930

1900. D. T. Gilliam reported an account of a uterine suspension operation utilizing the round ligaments, which were reduplicated upon themselves, carried extraperitoneally and sutured to the undersurface of the abdominal rectus fascia. Gilliam attributed the procedure to Fergison who originally devised it. However, it has usually been used primarily for the correction of third degree retroversion-retroflexion of the uterus (Fig. 8).

1902. Reynolds in the United States suggested a crescent-shaped incision above the cervix which was carried out by Alexandroff in 1903.

1904. An example of the increasing usage of anterior and split-flap dissection techniques for the correction of cystocele is the procedure described by J. R. Goffe. In the same year F. H. William introduced an operation for the reduction of complete uterine prolapse by using kangaroo tendon as a purse-string through both broad ligament areas at the level of the round ligaments. This suspension was followed by posterior wall repair; no anterior vaginal wall repair was deemed necessary because in this method the prolapse of the tissues underlying the bladder was corrected by the suspension of the uterus.

1905. Tweedy (England) suggested entering the peritoneal cavity and suturing the cardinal ligaments to the anterior wall of the cervix. Here G. W. Crile performed an abdominal hysterectomy and a suspension of the vagina and pelvic ligaments to the anterior undersurface of the abdominal wall with catgut. C. G. Cumston did a colpectomy for uterine prolapse in which he denuded the vagina and closed the walls in the midline, disregarding the fact that the uterus was still in place.

1907. Halban and Tandler in Germany presented their technique of an extensive muscular repair of the so-called pelvic diaphragm for the correction of both uterine and vaginal prolapse.

1908. Donald (Manchester) proposed the principle of cervical amputation with anterior and posterior vaginal repair; in the same year but prior to his publication, Fothergill introduced the operation in which the conception of suturing the cardinal ligaments to the anterior cervical wall (after amputation of the cervix) was combined with an anterior and posterior repair. This is known today as the Manchester-Fothergill operation (Fig. 9).

1909. Schauta reiterated his technique of the interposition operation while G. R. White in this country submitted an operative procedure for the reduction of cystocele by suturing the vagina to the linea

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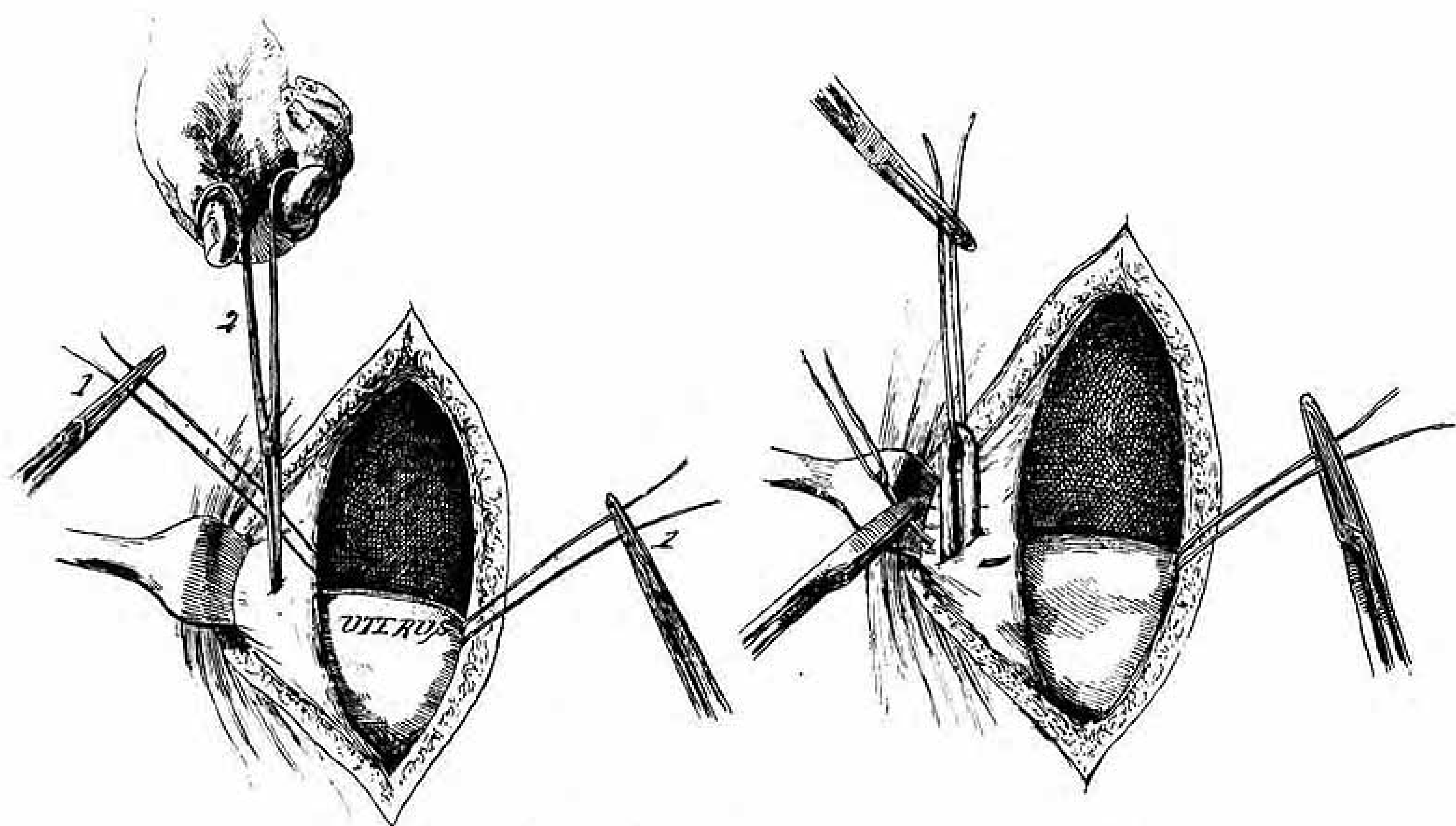

Fig. 8. Left and *Right*, uterine suspension after Gilliam. (From Gilliam.[4])

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alba of the pelvis. E. C. Dudley discussed many of the operative procedures reported in United States literature from 1900–1910 and introduced modifications of his own.

1912. H. L. Kelly in the United States introduced a technique for the correction of urinary incontinence in which permanent suture was used in reducing the area of the urethra and the posterior vaginal

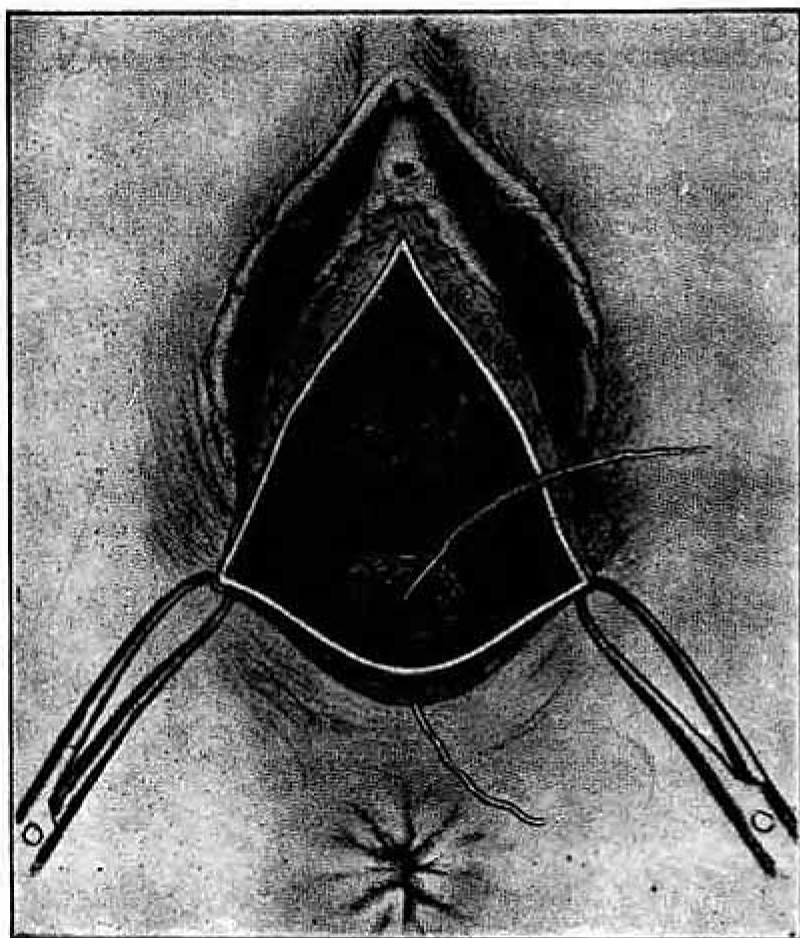

Fig. 9. **Cervical amputation and anterior repair. (From Fothergill.[7])**

wall in the region of the vesical neck (Fig. 10). His contribution remained and is today the most universally used technique for the repair of cystocele and stress incontinence problems in women.

1913. D. J. Schirchow reported his creation of an operative procedure for prolapse of the vagina through an abdominal incision. The anterior leaf of the broad ligament was opened with the dissection carried out against an assistant's finger in the vagina. The vagina

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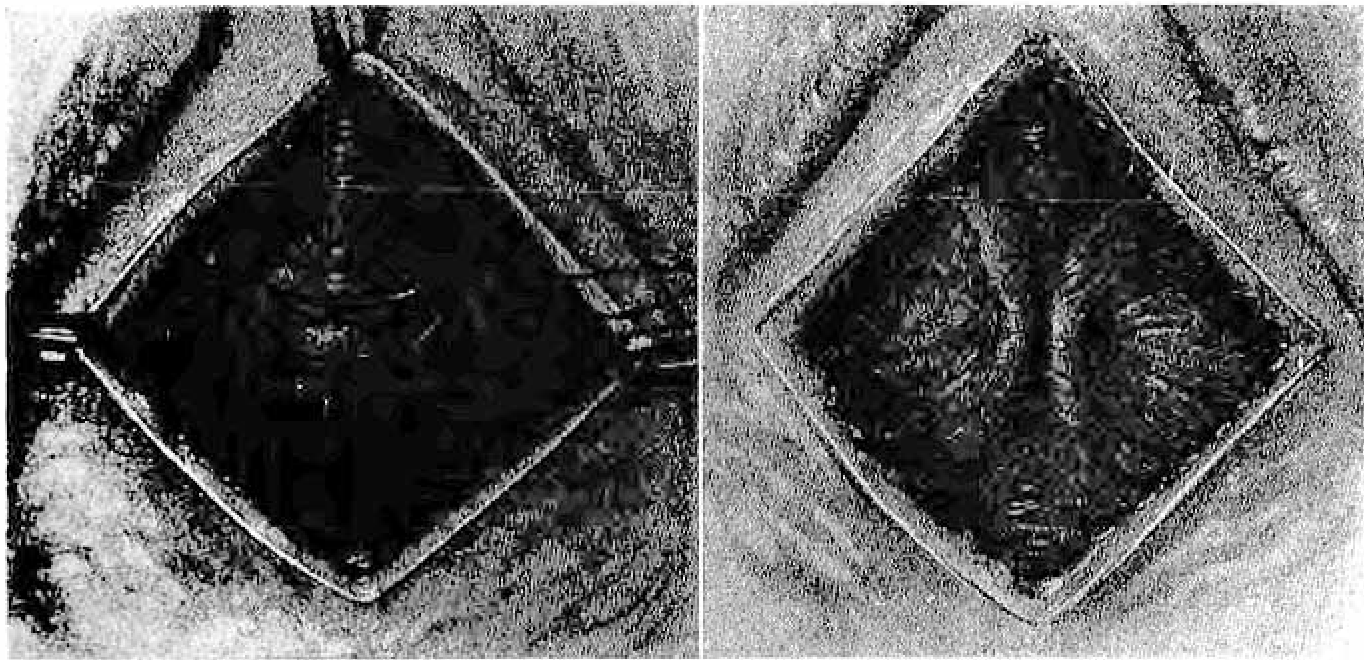

Fig. 10. Left, placement of Kelly sutures in vesical neck; *Right,* Kelly sutures tied indicating tissue apposition. (From Kelly and Dumm.)

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was then fixed by catgut sutures to Poupart's ligament. The peritoneal surface of the broad ligament was closed and the uterus was suspended to the undersurface of the abdominal wall by ventral fixation.

1915. C. H. Mayo introduced in a classically distinct description his technique of vaginal hysterectomy for the correction of uterine prolapse and associated pelvic relaxation (Fig. 11).

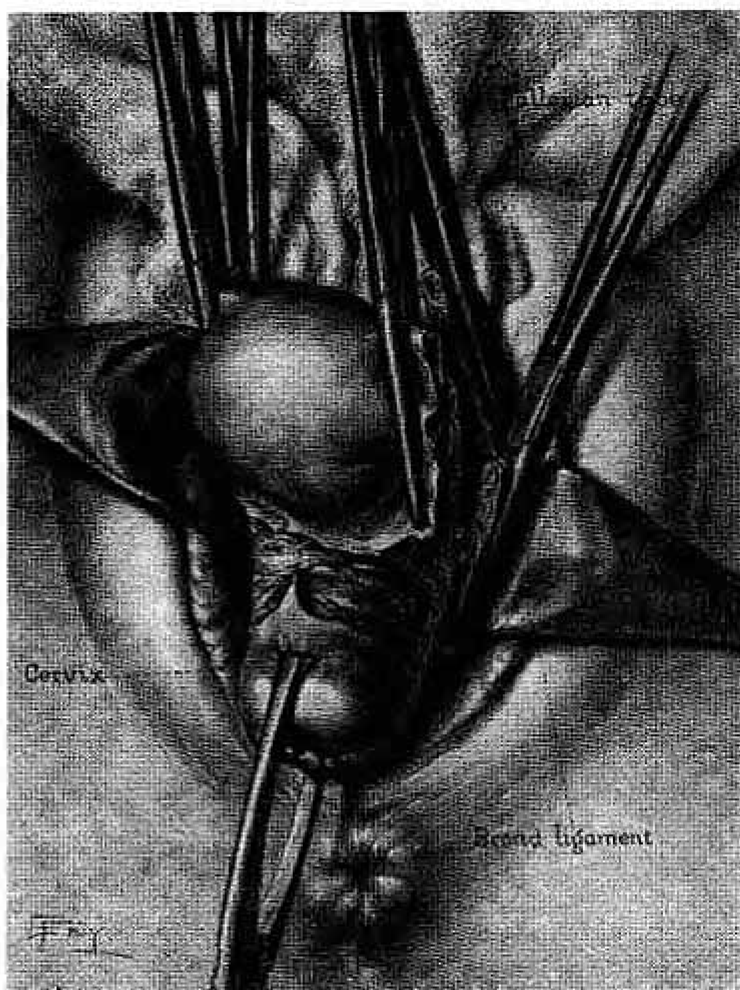

Fig. 11. **Technique of uterine extirpation by Mayo. (From Mayo.")**

1914. B. Nadory suggested a technique for the implantation of fascia lata for the therapy of genital prolapse and Vineberg introduced an extensive operation for general visceral enteroptosis.

1918. E. Ries reported a technique involving the medial suturing of the bladder "pillars." The bladder peritoneum was sutured as high

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as possible on the anterior uterine wall. The anterior wall of the bladder was sutured to the undersurface of the abdominal wall and the parietal peritoneum was sutured to the posterior surface of the uterus, tilting the uterus posteriorly and thus extruding it from the peritoneal cavity. This procedure was accompanied by tubal ligation. In the same year R. L. Rawls used kangaroo tendon as a prosthesis under the bladder and indicated that it should be utilized only for the correction of cystocele.

1919. In this year Bissell's classic article on the anatomy and physiology of the pelvic supportive tissues and spaces was published, several surgical innovations were introduced, and J. B. Young suspended the uterus to the sacrum using linen sutures to correct both uterine and vaginal wall prolapse. Alfred B. Spalding described an operation for pelvic prolapse which was to be outlined by E. H. Richardson in 1937. This is a "composite operation" in which the cervix is amputated followed by a supravaginal hysterectomy thus preserving the cervical isthmus as a point of support in the pelvis.

1921. S. J. Cameron (Scotland) suggested an operation in which the cervix is amputated, the anterior vaginal wall repaired, and the cervical stump buried into the vaginal and perineal tissues. B. P. Watson in England suggested that the cause of incontinence in parous women might be prevented by well-timed episiotomy. This point recently has been reemphasized in a discussion of the timing of episiotomy in the second stage of labor by R. Durfee and J. Schneider.

1923. M. Savariad of France suggested the use of a purse-string closure of the cul-de-sac by the abdominal route combined with an Alquié-Alexander uterine suspension. If the uterus is amputated, the cervical stump should be sutured into the abdominal wall. As an alternative the vagina can be fixed either to the abdominal wall or to the pelvic ligaments. Occasionally the bladder can be suspended by the urachus. Hysteropexy can be accomplished by suturing the uterus to the abdominal wall but one should suture the uterine isthmus only when performing the operation in the young woman.

1924. Gersuny suggested that the urethra be twisted 180 degrees and stretched under the symphysis pubis and supported by the dissected pyramidalis muscle or by the method suggested by Stoeckel of Denmark. The Australian F. A. Gill in this year performed a type of uterine ventral suspension wherein he converted the uterus into two flaps which were then sutured to the abdominal wall. N. D. Morgan reported a procedure in which he repaired the cervix and the perineum, opened the abdomen, removed all of the ligaments of the uterus, sutured the round ligaments behind it, and then retro-

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verted the uterus into a denuded cul-de-sac and peritonized it, thus excluding it from the peritoneal cavity. He suggested that one could also do this with a cervical stump.

1925. H. D. Furniss introduced a technique for suprapubic tightening of the urethra sphincter to be used in cases in which the Kelly vaginal plication operation is too difficult, in which the patient has senile atrophy of the vagina, or in cases of previous operative failure (Fig. 12). Also in this year L. E. Phaneuf described procedures for

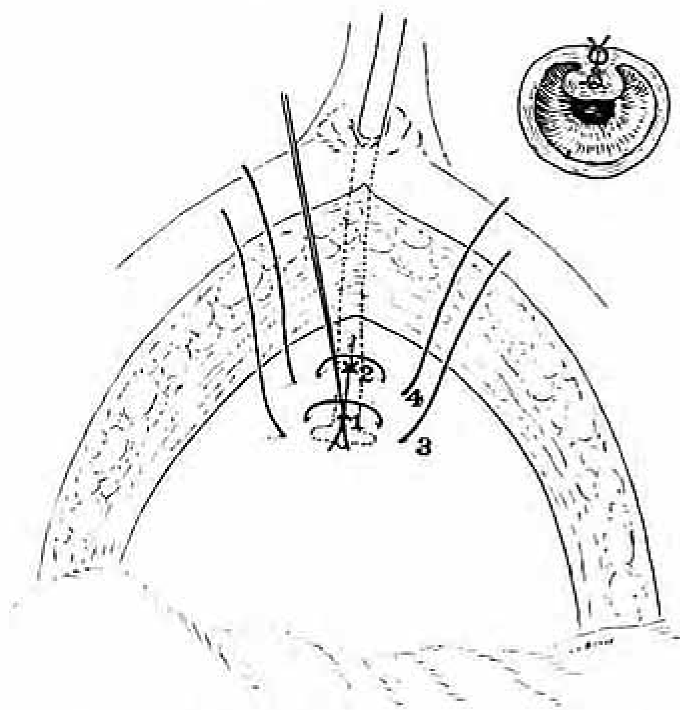

Fig. 12. **Suprapubic correction of stress incontinence after Furniss. (From Furniss.[4])**

the repair of a prolapsed cul-de-sac and posterior vaginal enterocele, incorporating both abdominal and vaginal repair operations.

1926. D. H. Doherty introduced the use of kangaroo tendon for suspension of the uterus, quoting an article by DuBose in 1919.

1927. M. Douglass introduced the use of a modified Gilliam suspension operation with a Moschcowitz occlusion of the cul-de-sac in the management of uterine and anterior vaginal wall prolapse.

1928. N. F. Miller reported the results of an operation for the correction of cystocle by a simple "fascial pleat" method. In doing so Miller thus preserved the use of the term "fascia."

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1929. H. S. Crossen advocated shortening the broad ligaments and elevated and repaired the uteropubic fascia for the correction of uncomplicated prolapse of the uterus and bladder. A. M. Richardson in this year described a classic technique for abdominal hysterectomy for the correction of uterine prolapse. And G. G. Ward submitted his operative technique for the repair of rectocele and injuries of the pelvic floor.

1930–Present

1933. B. H. Goff evaluated the Bissell operation for uterine prolapse and furthered the controversy over the functional anatomy of the pelvis in relation to pelvic organ prolapse and its repair.

1934. V. Bonney in England elucidated the principles that should underlie all operations for the correction of pelvic organ prolapse.

1934. N. S. Heaney reported on 565 vaginal hysterectomies for benign pelvic prolapse introducing his superb technique for the operation which has persisted to the present (Fig. 13).

1935. Gellhorn invented a pessary for inoperable prolapse.

1936. W. F. Mengert conducted an experimental study indicating for the first time the importance of some of the factors which influence uterine support. Also in this year J. W. Kennedy introduced his technique of vaginal hysterectomy by the clamp method for uterine prolapse, and also incorporated the principles of his modification of the Kelly repair of the bladder neck.

1937. G. D. Royston and D. K. Rose presented a new concept of an operation for cystocele in which the urethra is shortened, not lengthened, by a "superior-inferior" suturing method. J. L. Bubis in the same year introduced his technique for surgical correction of a retrograde cystocele, which is done through an abdominal incision following total abdominal hysterectomy. S. H. Geist introduced a combined operation using complete abdominal hysterectomy and a vaginoabdominal technique for the obliteration of anterior vaginal wall relaxation.

W. T. Kennedy in 1937 and again in 1938 advocated the usage of his modification of the Kelly plication technique for the management of urinary incontinence in women (Fig. 14). H. D. Cogswell in 1937 stated that the *only* indication for vaginal hysterectomy was uterine prolapse.

1938. G. E. Ward proposed that ox fascia lata be substituted for the round ligaments for the reconstruction of the round ligaments in the correction of vaginal prolapse.

1939. J. R. Miller introduced an abdominal technique of cystocele repair following total abdominal hysterectomy.

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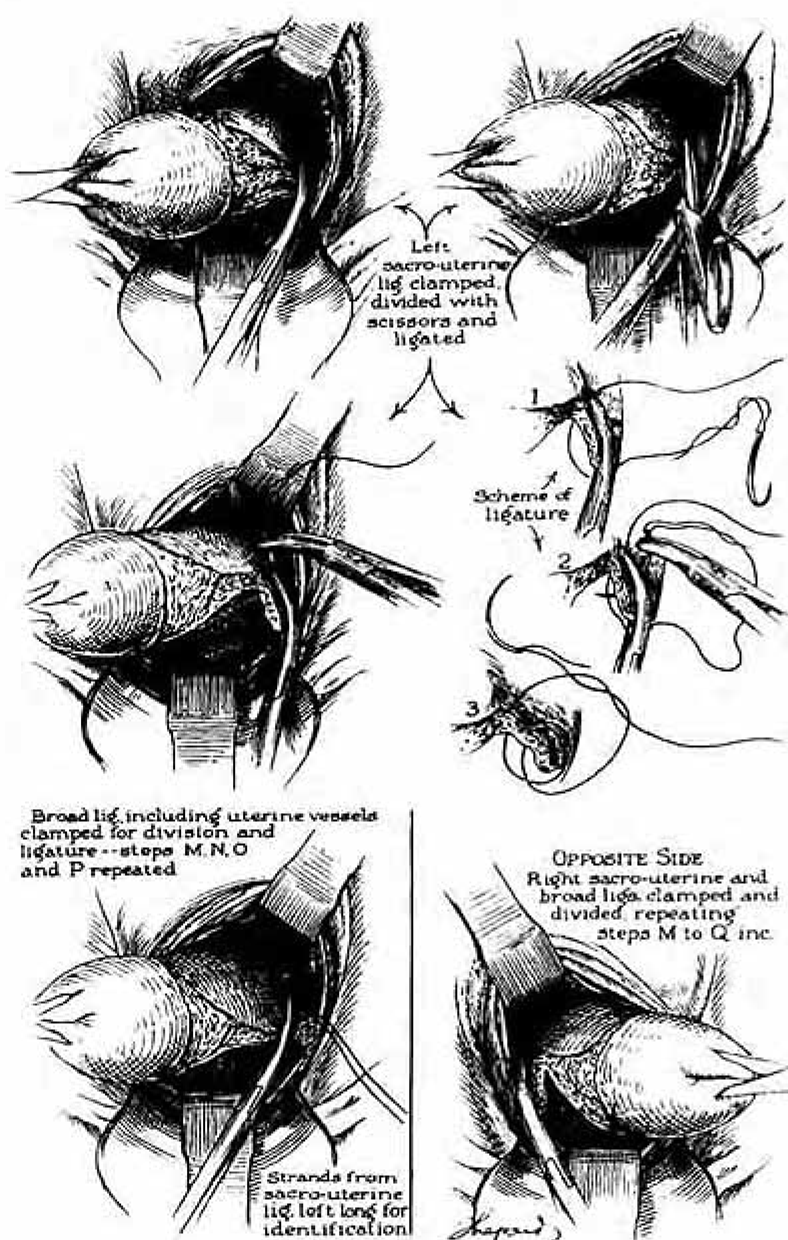

Fig. 13. **Fundamentals of vaginal hysterectomy after Heaney. (From Heaney.[1])**

1940. Stallworthy in England reported that he found a minimum recurrence rate of 13 per cent following all operations for prolapse.

1941. D. Chais, Jr. introduced the use of ribbon gut as a prosthesis for the suspension of a prolapsed uterus.

1942. H. Kirschbaum introduced the use of homologous fascia lata prostheses for vaginal surgery. W. T. Dannreuther suggested a transverse plication of the perirectal tissues for the reduction of large

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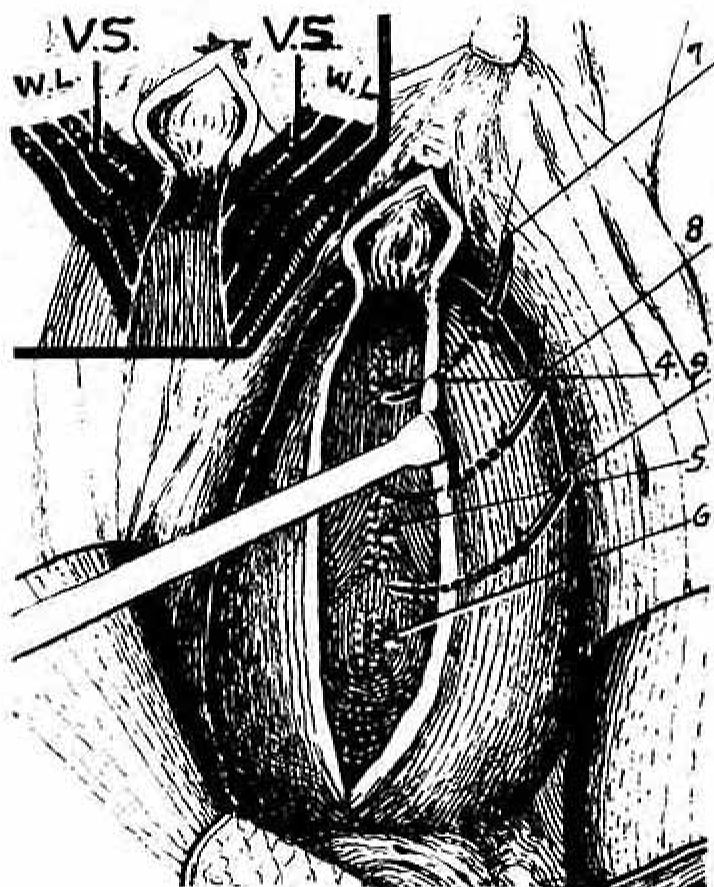

Fig. 14. **Reinforcing sutures of Kennedy used in anterior vaginal repair. (From Kennedy.[9])**

rectoceles. A. H. Aldridge in this year introduced his fascial sling technique for suburethral support (Fig. 15).

1943. R. W. TeLinde and E. H. Richardson, Jr. emphasized the good results achieved by the Richardson composite operation for uterine prolapse (Fig. 16).

1945. W. E. Studdiford published results of further experience with the use of abdominal fascial transplants in the correction of stress incontinence.

1946. C. T. Beecham avowed that the late complications of the Watkins-Wertheim interposition operations were so serious that the procedure should be abandoned in the management of pelvic organ prolapse.

1947. C. E. Judd stressed the preservation of the upper pelvic floor and of bladder support at time of total abdominal hysterectomy. E. G. Waters in this year introduced the techniques for the detection

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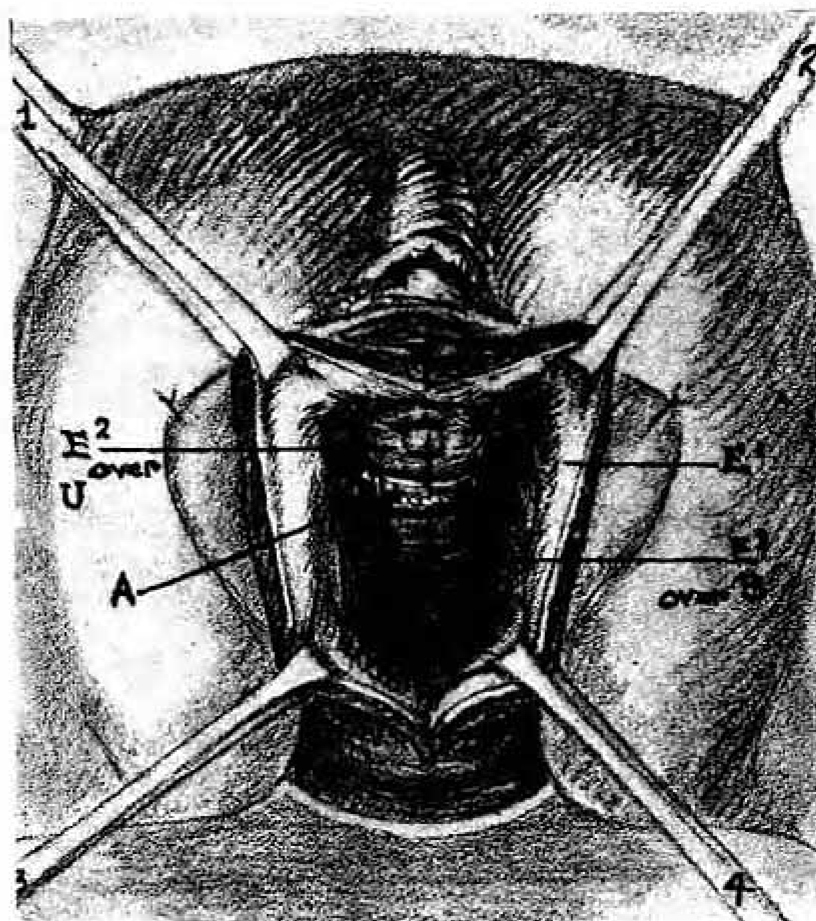

Fig. 15. **Principle of a "sling operation" for stress incontinence after Aldridge. (From Aldridge.[1])**

of enterocele. H. Stearns and V. Counselor, in separate publications, reported experience with vaginal hysterectomy, discussing the indications and technique of the operation in the management of uterine prolapse. R. Tauber introduced a ligament carrier for use in vaginal hysterectomy and R. A. Reis and E. J. DeCosta introduced the bar technique of periurethral fixation for the management of stress incontinence. A. Ingelman-Sundberg proposed his idea of the extravaginal repair of the pelvic floor for the prolapse of the bladder neck. In an elucidation of his procedure later in the same year he refers to the transplantation of the levator muscles in the repair of complete tears and rectovaginal fistulas. M. A. Goldberger in this year introduced the idea of a tantalum plate prosthesis to correct urinary stress incontinence in women who have insufficient tissues for the repair to be accomplished with their own materials.

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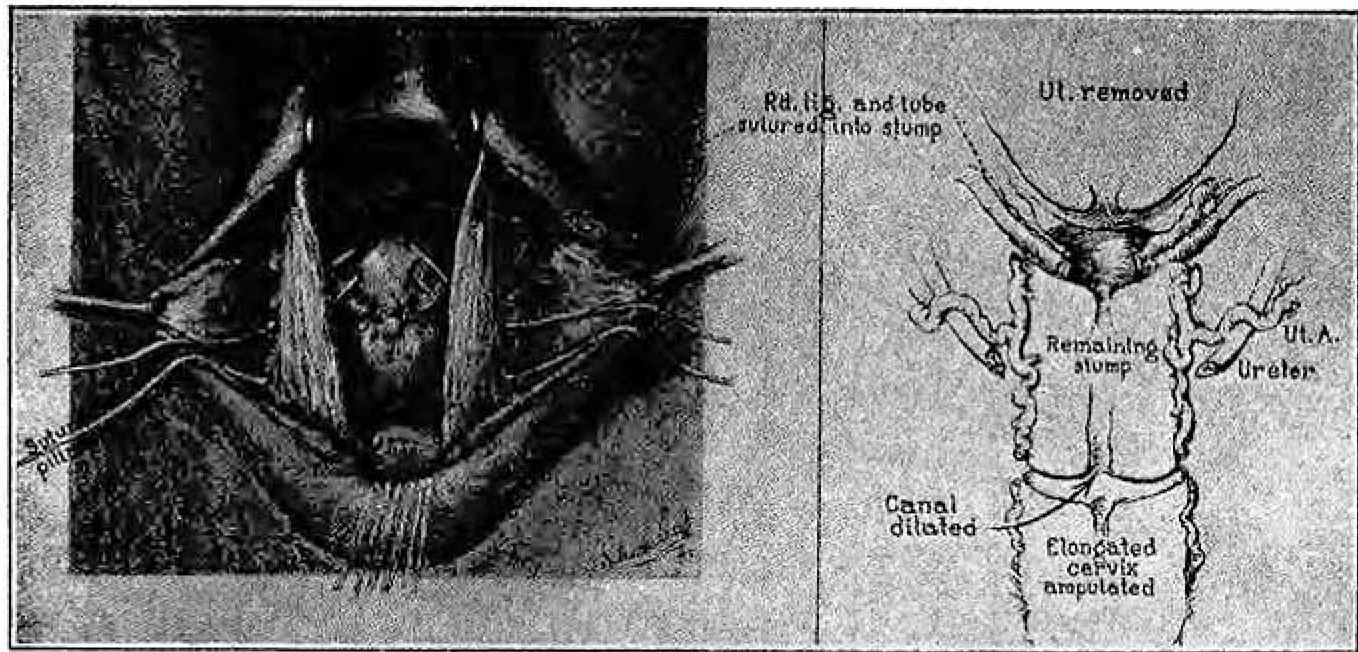

Fig. 16. Principle of composite operation after Spaulding by Richardson and TeLinde. (From Richardson.[3])

1948. D. M. Marshall discussed the repair of severe stress incontinence utilizing the technique and anatomic principles of two suprapubic fascial operations. H. N. Shaw introduced the technique of fascial support of vaginal vault prolapse following hysterectomy (Fig. 17). B. H. Goff reiterated the surgical anatomy of cystocele and urethrocele with reference to pubocervical vescal fascia, thus preserving the controversy over the term "pelvic fascia."

1949. V. F. Marshall, A. A. Marchetti, and K. E. Krantz introduced a procedure described in their article "The Correction of Stress Incontinence by Simple Vesicourethral Suspension Operation" (Fig. 18). A. H. Kegel in the same year introduced an instrument called a perineometer and also the principle of pelvic exercise to enhance the muscles and muscular fascial support of the pelvic structures. K. Pacey suggested his conception of the proper technical approach in the repair of genital prolapse.

1950. T. L. Ball, R. Douglas, and L. Fulkerson emphasized the role of urethrography in correction of stress incontinence problems.

1951. Krantz described the anatomy and the functional anatomy of the urethra and the anterior vaginal wall.

1952. T. L. Ball presented his procedure of a combined vaginal and abdominal plication for cystopexy for stress incontinence of urine. J. B. Richey introduced a uterovaginal extirpation for procidentia.

1953. Stacey credited Sir Eardley Holland with the origination of the term "stress incontinence of urine." C. P. Hodgkinson in this year began a 10-year series of studies on the normal and pathologic physiology of the urethra and its relationship to the bladder. R. Tauber introduced a specific type of suture for correction of stress incontinence.

1954. Both E. Allen and L. Gray accentuated the value and described the technique of vaginal hysterectomy in pelvic organ prolapse correction. W. H. Masters introduced an abdominal operation for cystocele repair, and N. F. Miller proposed a vulvar urethra to solve problematic cases of urinary incontinence.

1955. J. Botella-Llusia of Spain revived a modified Goebel suprapubic repair for stress incontinence using a Cherney incision. E. Waters and J. W. H. Glaeser used rectus fascia strips which were carried through the inguinal canals to the vagina for suspension.

1956. J. C. Ullery published an excellent monograph on stress incontinence. Sava reported that the more than three hundred operations in the literature up to that time were unsatisfactory in one way or another.

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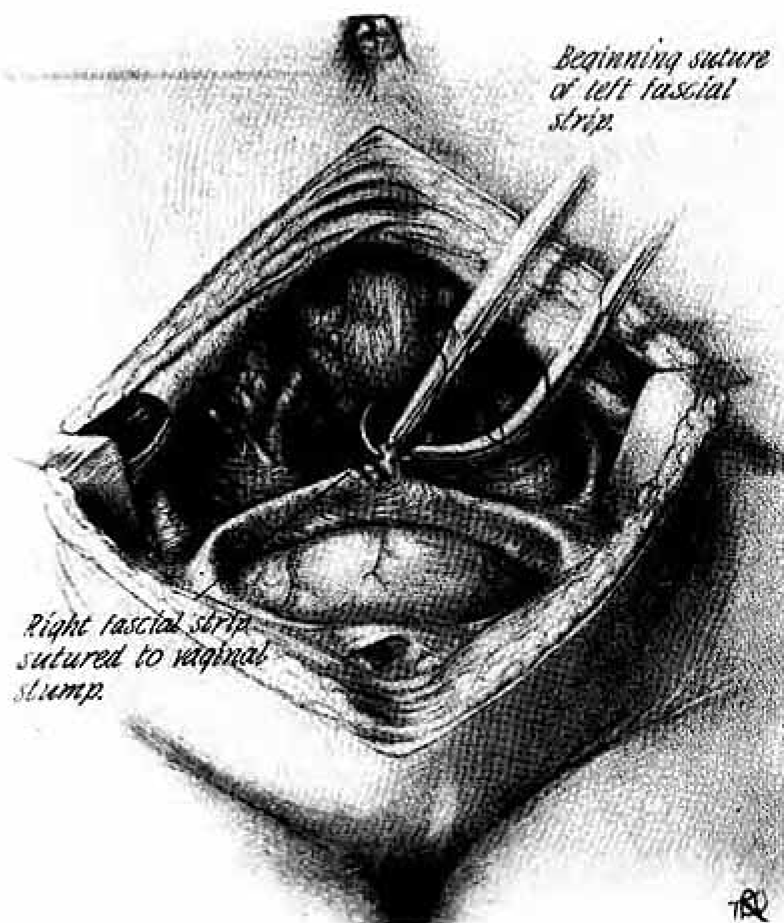

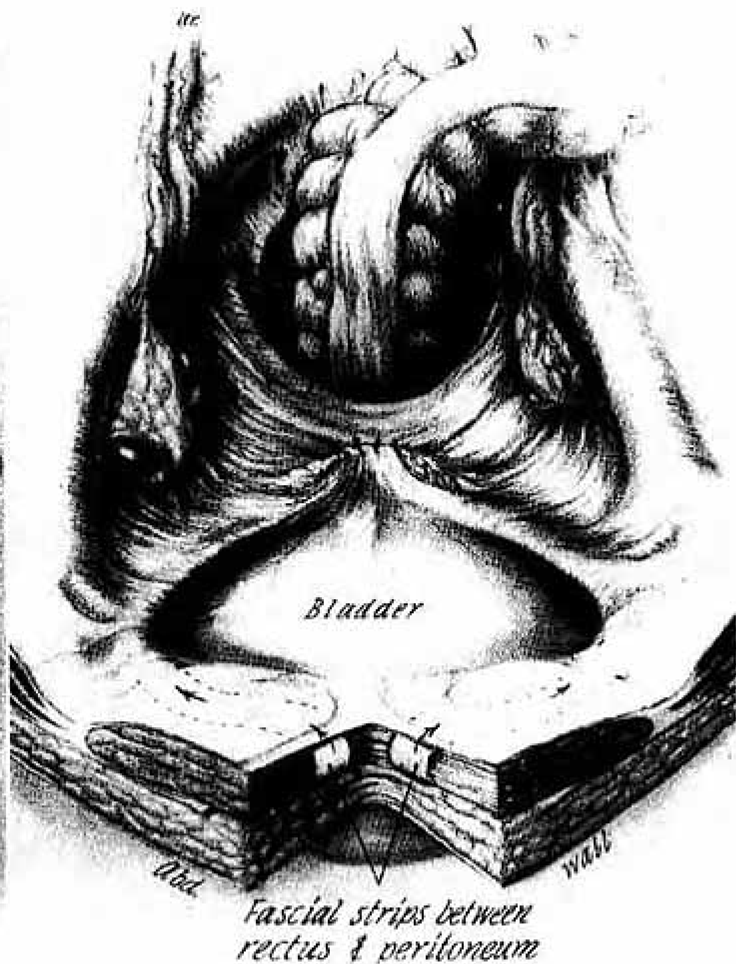

Fig. 17. Left and *Right*, illustration of the use of fascial strips, to suspend a post-hysterectomy vaginal prolapse. (Shaw.[illegible])

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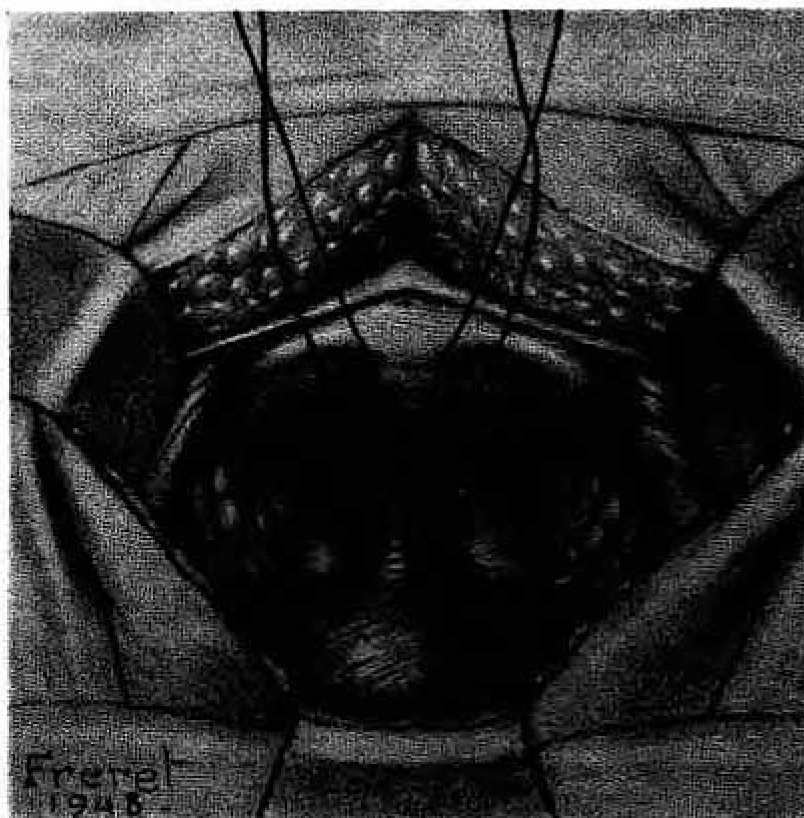

Fig. 18. **The "key" suture placement of the suprapubic "pin-up" operation of Marshall, Marchetti, Krantz. (From Marshall, Marchetti, and Krantz.[11])**

1957. The question of the validity of the presence of vaginal fascia was raised again by E. Uhlenhuth and G. W. Nalley. M. L. McCall published an excellent operative procedure for correction of enterocele (Fig. 19).

1958. J. H. Mulvaney proposed his procedure of vesicourethrolysis for stress incontinence.

1959. T. N. A. Jeffcoate suggested that posterior vaginal repair should not be routine in all vaginal prolapse reparative operations. Jacobs stated that previous pelvic surgery is not necessarily a contra-indication for vaginal hysterectomy. R. Durfee introduced a modified Marchetti procedure for suprapubic repair of anterior vaginal wall relaxation using a low lithotomy position of the patient and permanent suture material. Janssens introduced the use of nylon sutures in the cartilage of the pubic symphysis.

1960. C. J. Lund, R. E. Fullerton, and T. A. Tristan reported cine-fluorographic studies of voiding patterns, normal and abnormal. M. Parrott introduced a procedure for vaginal support of the bladder

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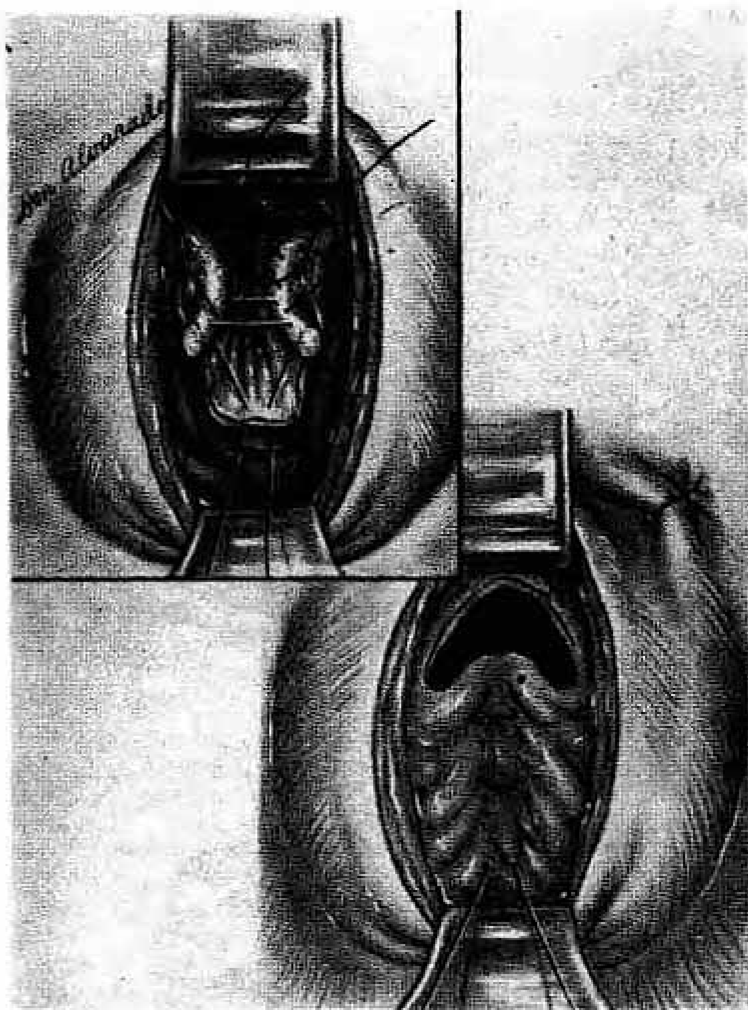

Fig. 19. **McCall's occlusion of the incipient or actual enterocele. (From McCall.[30])**

by suturing the pubococcygeous muscle to the contralateral side in the region of the inferior border of the pubic arch (Fig. 20). Ingelman-Sundberg suggested resection of the inferior hypogastric plexus of nerves by the vaginal route for treatment of urge incontinence. J. Lapides *et al.* emphasized the importance of lengthening the urethra by suturing the anterior bladder wall and vesical neck tissues to the undersurface of the symphysis pubis.

1961. J. C. Burch suggested fixation of the vaginal supportive tissue to Cooper's ligament and E. Lenzi wrote a monograph on enterocele. R. E. Symonds and L. T. Gordon discussed the management of iatrogenic cases of stress incontinence. Percy and Perl reviewed the results of total colpectomy.

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Fig. 20. A pubococcygeal sling for anterior vaginal repair after Parrott. (From Parrott.[11])

1962. Lash and Levin suggested a radiologic technique for diagnosis of vaginal vault hernia.

1963. M. S. Weinberg and M. Stone introduced a simple method of cystocele repair by an abdominal approach.

1964. The use of Marlex mesh as a secondary repair in vaginal vault prolapse was introduced by W. H. Ferguson. E. Véress and B. Volet from Geneva reemphasized the value of radiologic diagnosis of uterovaginal and vesical prolapse.

1965. J. A. O'Leary summarized the procedures used for management of vaginal vault prolapse. C. P. Hodgkinson summarized the past ten years of progress in the control of stress incontinence.

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W. B. Harer and R. E. Gunther introduced a simplified technique for urethrovesical suspension.

1966. E. H. Brewer has treated vaginal prolapse after hysterectomy with dacron tape supports as has R. Durfee.

Currently Used Operations

Therefore, as of 1966 the operations in use for the correction of pelvic organ prolapse are: (1) vaginal hysterectomy and anterior and posterior repair as indicated, (2) LeFort operation and total colpectomy, (3) Manchester-Fothergill operation, and Shirodkar modifications, (4) sling operations, (5) Ball's combined abdominal-vaginal plication, (6) Marshall-Marchetti operation and anterior vaginal suspension operation, (7) sling and suspension operations for vault prolapse (secondary), and (8) dacron prostheses of suture and ribbon to correct prolapsed uterus in young women and stress incontinence problems.

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