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## Chronic endocervicitis

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Senior Thesis

CHRONIC

ENDOCERVICITIS

April 21, 1933

John H. Clements

## INTRODUCTION

Infections of the cervix are so common that it is said that practically one out of every two married women who have borne children has consulted and received neighborly advice relative to a leucorrhœal discharge.

While endocervicitis is more general than the ordinary cold, it is potentially more dangerous than tuberculosis. Invalidism is often the result, and indirectly, the cost to the country is as great as any disease of today. Yet there is less publicity and effort to educate the people of this danger than of the common cold.

Unfortunately, few physicians have the patience to treat locally, in the office, a case of acute or subacute infection of the cervix. The nose and throat specialist will spend weeks or even months in treating an infection that can do far less damage to the health of the patient than an infection of the cervix or one of Skene's glands, and yet, because of the unpleasantness and inconvenience of treating the latter, the physician contents himself with prescribing a simple douche.

A few years ago dilatation and curettement was the most frequent gynecological operation performed; the scraping of the uterus to cure a case of leucorrhœa had assumed the proportion of a fad, the fallacy of which has been proven by the present day knowledge that there is probably no such infection as chronic endometritis; that the uterine canal is practically infection proof under the conditions of everyday life, and that leucorrhœa is of cervical and Skene's gland

origin instead of uterine.

Chronic infections of the cervix act as foci of infection in exactly the same manner as do chronically inflamed tonsils, abscessed teeth or chronic appendices. The ophthalmologist and the orthopedist must keep the cervix in mind as a focus of infection in inflammatory diseases of the eyes and joints. Sterility in the female is undoubtedly often caused by chronic inflammation of the cervix. Puerperal infections are often caused by bacteria which have been in the cervix for months before delivery.

The recognition that chronic endocervicitis is a menace to the future health of the patient has led to renewed efforts to find an effective cure. Carcinoma of the cervix is undoubtedly often related to long continued irritation of its epithelial tissues by an inflammatory process deep in the cervix, and it is imperative to treat thoroughly and conscientiously every badly infected cervix.

This paper is an attempt to review the recent literature concerning endocervicitis, with most emphasis placed upon the treatment of the condition. No effort is made to correlate the cervical inflammation and the numerous coincidental conditions, complications and sequelae. The question of cervical carcinoma in relation to chronic endocervicitis and the possible results of adequate treatment and obliteration of infection immediately comes to mind, but because of the great mass of recent literature on the subject, no attempt will be made to consider this extremely important problem.

The scope of this paper will be confined to a brief review of etiology, pathology, symptomatology and diagnosis with review and comment upon the more recent and successful methods of treatment.

## ETIOLOGY

The normal vaginal secretion is distinctly acid. It contains almost no bacteria except large, gram-positive bacilli, closely related to lactic acid bacilli. Pathologic secretions are weakly acid, neutral or alkaline. They contain numerous varieties of bacteria, chiefly anaerobic bacilli and staphylococci.

The gonococcus is the most common cause of chronic purulent discharges in women who have not been pregnant. In women who have borne children, the local resistance is decreased through lacerations and passive congestion. Chronic discharge may occur in these cases without infection; more often, however, bacteria of low virulence secure a foothold and produce chronic discharges which are cured with the utmost difficulty.

Polak (1921) states that endocervicitis is the most common of all gynecological disorders, and believes that fully 85% of all women, single or married, have infected cervixes. Hoenig (1927) believes that endocervicitis can be found in more than 50% of all women who have borne children. Dallas (1931) in a series of 3,391 patients at Stanford University, found 33.1% with an endocervicitis of sufficient severity to record that diagnosis.

Sovak (1928) states that 85% of all cases occur between twenty and forty years of age. Matthews (1926) gives the age incidence at 35.1 years. McCrossin (1930) gives the average age at 33.5 years.

Lancaster (1930) divides chronic endocervicitis into two classes: gonorrhoeal and septic. The first type is seen more often in women who have not borne children, although it may also be found in multipara. The second type is more often seen in nulliparous women and results from the trauma produced during labor. Trauma is more rarely produced by (1) excessive coitus, (2) foreign bodies, as tumors, polypi and pessaries, (3) unclean fingers or instruments, or (4) strong chemicals.

Sturmdorf (1916) states: "The dominating fundamental factor that establishes the morbidity of a cervical lesion is the incidence of infection." Shaw (1929) agrees that chronic endocervicitis is always due to the presence of bacteria, even though trauma, mechanical or chemical, has acted as a predisposing factor.

Miller (1926) states that the gonococcus is the most frequent provocative organism in chronic endocervicitis, and streptococci, staphylococci and colon bacillus infections are not at all infrequent findings in the order named. Brown (1931) agrees with him as to relative frequency. Curtis (1920) states that at least four gram negative diplococci resembling the gonococcus are encountered, and that streptococci are present in about 30% of the discharges from all cases. He adds that interference with drainage and passive congestion are added factors in persistent infections. In a later work (1931) he states that cervicitis in virgins may result from purely emotional disturbances. In these cases hypersecretion

from the cervical glands is comparable to hypersecretion from the nasal mucosa.

Wynn and Visher (1932) believe that endocervicitis is more frequently non-specific than gonorrhoeal in origin. Emrich (1931) suggests that eversion of the cervical mucosa, as in laceration, normally accustomed to alkaline media, but now exposed to the acid media of the vagina, will sometimes develop inflammatory reaction without infection.



## PATHOLOGY

In order that the pathological conditions found in chronic endocervicitis may be fully appreciated, it is necessary to consider the anatomy of the cervix in some detail.

The cervix is covered on its vaginal aspect by stratified squamous epithelium, which contains no glands and is continuous with the squamous lining of the vagina.

At the external os the squamous epithelium suddenly changes to a high columnar epithelium with deeply placed nuclei. At numerous sites this epithelium is invaginated deeply into the mucosa, and into the muscular layers of the cervix to form compound racemose glands. The secretion from these glands is thick, mucoid and viscous, and forms the characteristic cervical secretion.

The high columnar epithelium lining of the cervical canal can be followed up to the internal os, when the appearance again changes suddenly as the uterine cavity is reached. Here the epithelium is similar but not so high; the glandular depressions are simple tubules, and the stroma is thick and cellular.

Between these two epithelium-covered surfaces is the main muscular and fibrous structures of the organ. Fibrous tissue strands lie between the muscular bundles, and thick-walled blood vessels and smaller endothelium-lined lymph spaces are also present.

The lymph flow may be traced from its origin in the cervical and corporeal mucosa through minute, funnel-shaped ostia, directly to the myometrium, where it branches

into an extensive capillary net which penetrates every bundle of the entire uterine musculature, later draining into the main collecting channels which course parallel to the uterine and ovarian blood vessels at the base and top of the broad ligament.

The essential lesion of cervicitis is inflammation produced by infection, and this may be brought about in several ways, but the most usual mechanism is chronic pyogenic infection after laceration of the cervix during labor. The conditions after labor predispose to infection. The cervix is patulous, lacerated and bruised, with the vagina bathed in alkaline lochia rather than the normal acid secretion, and in this manner the normal resistance to infection is definitely impaired.

As a result of infection the changes of inflammation soon appear. There is edema of the subepithelial stroma with outpouring of lymphocytes and plasma cells, especially around the blood vessels and glands, and beneath the epithelium. The blood vessels dilate, the surface columnar and glandular epithelium becomes irritated, so that glandular hypertrophy and distention occur, and the cervical secretion becomes increased in amount and is of a muco-purulent appearance from mixture with products of inflammation. This increased cervical inflammatory secretion is known as leucorrhoea. Partly as a result of maceration by continual leucorrhoeal discharge, partly by being raised and devitalized by subepithelial edema, and partly on account of trauma, a plaque of squamous

epithelium surrounding the external os becomes separated and cast off in the discharge, and a denuded surface of variable extent is now left wholly or partly surrounding the external os. The columnar epithelium, from the cervical canal, being more resistant is not destroyed, but is stimulated to grow out and cover this denuded area, so that after a time the area around the external os becomes covered by columnar epithelium, which carries with it in its outgrowth cervical racemose glands. This lesion has a red, raspberry appearance and the name, "cervical erosion", is given to it.

This erosion is not an ulcer and it is not a granulating patch; it is an epithelium-covered surface, although there is often a breach of continuity between the two types at the periphery of the lesion. If the surface is smooth and the glands few, the erosion is called "simple"; if the glands are numerous and dilated, and the surface is rough, the condition is called a "follicular erosion"; while if the glands are numerous but run mostly at right angles to the surface; numerous papillae project upward between the glands and it is known as a "papillary erosion". Occasionally these papillae grow to a large size, and constitute the mucous polypi found in this condition.

If the cervix should be definitely lacerated, especially if bilaterally lacerated, it tends to become everted, partly by muscular action and partly by inflammatory infiltration, so that the congested and thick endocervical mucosa is exposed to view. The name "ectropion" is given to this

eversion of endocervical mucosa.

The occurrence of erosion marks the first effort at healing on the part of the infected cervix by covering over the denuded area by epithelium. After a time the displaced squamous epithelium makes an effort to replace itself. The germinal layer grows inward and below the covering columnar epithelium, and by continued growth, the columnar epithelium may be finally cast off from the eroded surface and confined to normal bounds.

Prior to this the infection seldom remains localized in the mucosa; usually the fibro-muscular substance of the cervix has also become infected, so that chronic inflammatory hypertrophy is seen, and this, after the inflammation subsides, may be succeeded by fibrosis and atrophy, so that the cervix may be eventually reduced to a shrunken and nodular mass.

When the squamous epithelium displaces the columnar cells, the racemose glands of the latter are left in situ, and these usually become occluded by blockage of epithelium or inspissated secretion or by periglandular fibrosis. Usually the glands continue to secrete; they become increasingly distended with retained secretion, while the lining epithelium, columnar at first, becomes cuboidal, and later flat from pressure. In this way a number of cystic spaces - Nabothian follicles - are formed in the substance of the cervix, and often form projections, especially in the vaginal aspect. Usually these cysts are few in number, but in severe cases the cervix is largely occupied by them. It is evident then,

that the presence of Nabothian follicles indicates an advanced stage in the healing process in this condition, and that when these follicles have developed the erosion will in most cases have disappeared, although fibrosis of the cervix still persists. The final structural result, then, to the cervix, consists of fibrosis and eversion, with some persistent Nabothian cysts.

Bailey (1930) suggests a new nomenclature for types of cervicitis: (1) That a proliferative erosion is periorificial cervicitis; (2) That the ulcerative erosion should be called ulcerative cervicitis, and (3) that infection limited to the glands alone should be known as glandular cervicitis.

Miller (1926) states that the cervical mucosa appears red, swollen and more or less everted, and that there may be circumscribed areas of glandular proliferation about the external os. The columnar epithelium may have pushed itself out upon the vaginal portion, producing an erosion, which is in no sense an ulceration but merely new cell formation. Connective tissue formation and cyst formation add to the general hypertrophy of the cervix. The microscopic picture varies from mild inflammation to cystic degeneration and abscess formation. Maryan (1932) states that the microscopic studies reveal mild, moderate, recurrent and intense cellular infiltration and glandular hypertrophy of the endocervix and the deeper structures.

McCrossin (1930) states that during proliferation

and hypersecretion of the glands, the erosion is akin to abnormal cell formation and there is only a small line of demarcation between the extreme cell proliferation in orderly arrangement of hyperplastic endocervicitis and the disorderly arrangement of embryonal cells found in true malignancy of the cervix.

Powell (1931) states that, "Careful laboratory studies, culminating in the work of Curtis, have proven quite definitely that the internal os acts as a barrier against practically all invading organisms except the gonococcus, so that while infection of the endocervix is frequent, infection of the corporeal endometrium is rare, and is practically never of intrinsic origin.....The normal external os has to some extent the faculty of the internal os of prohibiting the entrance; but when injuries occur, as lacerations in childbirth, or less frequently from careless instrumentation, this is no longer the case, and the gaping, patulous os and the exposed mucosa, due to the resulting eversion, offer an easy avenue of access to whatever bacteria may be present." K ndig (1927) and Rowlett (1931) agree that the old theory that infection travels up the uterine canal to the tubes, has been dispelled, except in the case of the gonococcus, but K ndig goes on to say that extension does take place when the cervix becomes pathologic and ceases to function normally.

Matters (1932) found that the lacerated type of cervix is invariably infected, and the amount of discharge varies from that producing an almost unnoticeable stain to a

rather copious discharge which distresses the patient. Curtis (1926) states that chronic discharges arise chiefly from the cervix and from glandular pockets in the vicinity of the urethra, rather than from the endometrium as was formerly believed.

## SYMPTOMS

The symptoms of endocervicitis are numerous and variable, and mild cases may be almost symptomless.

The most frequent symptom is vaginal discharge. This may be scanty or copious, intermittent or continuous, odorless or foul smelling.

Backache is the next most frequent symptom. This is usually low, across the sacro-iliac region, and frequently radiated down the thighs, closely resembling sciatica. The lumbar region may also be affected, and the pain may radiate upwards and simulate abdominal disease.

Pelvic soreness is often found, and there may or may not be menstrual disturbances. Dysmenorrhea, dyspareunia, and bladder irritability may be present. Associated there may be general malaise, loss of energy, lassitude, headache, fatigueability and nervousness.

Fulkerson (1926) states that, "The most usual symptoms complained of were leucorrhoea, backache, abdominal pain, menstrual disturbances, urinary symptoms, bearing down or dragging sensations, dyspareunia and a heterogeneous collection of other symptoms; which, except in a few cases of itching vulva or bleeding on intercourse, did not have even a remote relationship to cervical inflammation." He further states that uncomplicated endocervicitis has no cardinal symptom except leucorrhoea, of which 74.1% of the women examined by him complained. Miller (1926), Matthews (1926), and Hoenig (1927) agree that leucorrhoea is the only constant symptom,



although backache and menstrual disorders are often associated. Masson and Parsons (1928) in a survey of 226,900 cases found that the chief complaints were: leucorrhoea in 23%, menstrual irregularities in 23.4%, pelvic pain in 23.6% and unrelated symptoms in 30% of cases.

I quote from Sturmdorf (1916): "It is a..... perversion of muscular function, impairing the intensity and rhythm of the uterine contracting cycle, which we must learn to recognize as the morbid link between cervical lesions and their clinical manifestations."

## DIAGNOSIS

Since the leucorrhoeal discharge and the gross cervical picture are in most instances pathognomonic, diagnosis does not ordinarily present many difficulties. Tuberculosis and syphilis of the cervix, both comparatively rare conditions, may be differentiated by the history and the general physical and laboratory examinations, as well as by the fact that normally in both the tendency is toward destruction of tissue rather than proliferation. Smears should always be made and cultures if necessary, in an effort to identify the invading bacteria, and in suspected malignant cases laboratory studies are essential for a differential diagnosis, which is imperative in view of the radically different treatment in each instance. It goes without saying that infection of the lower genital tract and of the upper pelvis should also be carefully ruled out.

The normal cervix is smooth, velvety and dry. The eroded cervix shows a mucus or purulent plug in the cervical canal, and if the process has extended beyond the cervix, the cervical mucosa is red and granular in appearance and bleeds on the slightest trauma. The cervical canal stands open if a laceration is present and the mouth of the cervix may be everted. Bursey (1932) says that retention cysts cause the cervix to be larger than normal and hard and irregular to the examining finger, while to inspection the cystic areas may appear whitish or grayish.

Fulkerson (1926) states that the clinical diagnosis

of endocervicitis can be made by direct inspection through a vaginal speculum. A swollen, eroded area adjacent to the external os or the presence of Nabothian cysts, either with or without muco-purulent discharge and hypertrophy is considered as sufficient evidence to establish the diagnosis. Miller (1926) believes that leucorrhoea and gross appearance are sufficient to establish a diagnosis, but advises laboratory aid to differentiate tuberculosis, syphilis and carcinoma.

## TREATMENT

In the treatment of infected cervixes, gynecologists have come to feel that, unless begun very early, or in superficial cases, local applications have little value. Furthermore, when the infection continues unchecked for years and finally operative measures are undertaken, we realize that operation does not offer all that could be desired. This state of affairs seems to call for means of treatment that, (1) is suitable for management during the child-bearing age, and (2) may in milder cases be substituted for the more radical operative procedures.

Prophylactic measures are of extreme importance and should consist of careful instrumentation where the cervix is involved. Early and complete repair of all lacerations soon after child-birth is now a routine procedure with gynecologists, and the incidence of cervical infection may be greatly reduced by closing the open avenue of infection which the lacerated cervix presents.

The removal of irritation by scrupulous cleanliness on the part of the patient, the removal of foreign bodies from the vagina or the cervical canal, care that pessaries are clean, well-fitted and non-irritating, and the careful repair of vesicovaginal or rectovaginal fistulae, are important prophylactic measures.

The prevention of re-infections is of cardinal importance, and can be aided by both the patient and the physician by care and cleanliness of towels, douche nozzles

and instruments. Infection in the neighborhood of the cervix must be eradicated before a lasting cure of the cervix can be anticipated. Should the glands about the urethra and vulva be involved, the same degree of attention should be paid them as to the cervix itself. Last, but not least, the husband or consort should be inspected, and steps taken to eradicate any infection found. Curtis (1931) reminds us that man is an important factor in gynecology.

The chemical medicinal agents and their methods of application are so many as to defy enumeration, and their very multiplicity attests to the unsatisfactory results attained by their use. In many cases, it is advisable to use local therapy before resorting to more radical methods, regardless of the fact that a large percentage of apparent relief will not be permanent.

Before applying any medication to the cervical canal it is advisable to remove the purulent or muco-purulent secretion by the use of 10% silver nitrate or sodium hydroxide, or sodium bicarbonate in a saturated solution. Campbell (1926) suggests the use of a paste of sodium bicarbonate and peroxide, and Dunlop (1929) uses liquor potassae or caroid in powdered form to clear the cervix. A small Hegar dilator may be passed into the cervix as an initial maneuver if the cotton-tipped applicator does not enter readily. This insures access to the entire canal as well as free drainage.

Silver nitrate in 1% to 10% strength may be used as an initial application to the canal. Where no gonococcal

infection has existed, this treatment sometimes produces an abrupt cessation of excess cervical discharge. In general, silver nitrate is applied with the expectation of producing a localized acute inflammation in an effort to bring about resolution of a chronic inflammatory process. Mickels (1926), Campbell (1926), Phaneuf (1928) and Rowlett (1931) agree that silver nitrate in solutions of 5% to 15% is of definite value in mild cases.

Argyrol in 20% solution, protargol in 2 to 10% solution and neosilvol in 10% aqueous solution have been recommended for use in the cervix, but there is considerable disagreement as to their germicidal properties.

Liquid phenol, zinc chloride solutions, nitric acid and other caustics are advised by some authors, but the use of such preparations must always be regarded as dangerous.

Iodine has been used in solutions of varying strength (3.5 to 7%) and good results reported in mild cases (Gardner, 1926).

The use of mercurochrome in solutions varying from 2 to 20% is advised by Martzloff (1932) who is impressed by the germicidal qualities of the stronger solutions. Mercoxyl, metaphen and merthiolate are said to be equal in germicidal power and possess the added advantage of not staining brilliantly all the material with which they come in contact.

Powdered potassium permanganate applied directly to the cervical canal and erosions is recommended by Wynn and Visher (1932). The treatment is repeated at weekly

intervals and is said to be very effective but painful. "A useful test not usually known is to paint the cervix with tincture of iodine. If it takes the iodine stain, it will usually respond to medical treatment. If it does not take the stain, cautery, radium or operation is indicated."

Salicylic acid has recently been recommended by Thaler (Martzloff, 1932), used in the form of topical applications in the proportion of 5 cc. of a 5% alcoholic stock solution in 20 cc. of water.

The acidity of the vagina is increased and the growth of normal organisms is prohibited while coincidentally there is a marked reduction in the cervical discharge. This use of acid or acid-producing substances in the vagina is not new, and lactic acid, acetic acid, yeast, lactic acid bacilli, grape sugar and numerous proprietary compounds have been used with indifferent success. Moench (1928) and Martzloff (1932) have had poor results with this type of therapy, due, Moench believes, to inability to maintain the changed flora alive in the vagina.

Medicated douches, in the treatment of endocervicitis, in so far as the cervical infection is concerned, are of questionable value and tend to introduce bacteria into the cervical canal. Douches for cleansing purposes should be confined to external cleansing of the vulva. Boric acid solutions and physiologic salt solutions (2 teaspoonfuls of salt to one quart of water) are satisfactory for this purpose.

Hot douches relieve pain and promote comfort, but apparently have no curative power and tend to spread infection (Curtis, 1931). The use of a medicated douche following cautery or operation with the object of removing offensive odors and insuring general cleanliness is open to question. Potassium permanganate in 1:1500 solution is effective in destroying foul odors, while physiological salt solution or sodium bicarbonate, one teaspoonful to the quart of water, is satisfactory for cleansing. All caustic or irritating chemicals should be avoided. Campbell (1926) advocates the use of hot astringent douches such as zinc sulphate in 1:1500 solution for the relief of pain and congestion in recently infected lacerations, and Martzloff (1930) recommends a powder of the following composition:

Boric Acid	oz. iv
Phenol	dr. iii
Powdered Alum	oz. i
Oil of Peppermint	dr. i ss.
M. et Sig. Dr. i to 1 qt. of warm water.	

He states, however, that any favorable influence of such a douche might be due to a vascular dilatation resulting from the heat carried by the warm irrigating solution.

Tampons have long been a favorite method of applying medication to the cervix, on the theory that the therapeutic agent is held in close contact with the cervix. The same objection applies here as in local applications and douches; that is, the medication does not reach the deep glands of the cervical mucosa and affects only the surface infection. Glycerin tampons promote drainage (Gardner, 1931) but have



little direct influence upon the infection. Tampons may be useful to catch excessive drainage and destroy offensive odors, but there is the objection that if the tampon is too tightly fitted against the external os proper drainage may be obstructed.

Fulkerson (1926) gives a series of 423 cases treated with caustics and antiseptics, in which the treatment consisted in either an application of 7% iodine to the cervical canal and external os or an application of 2 to 10% silver nitrate or merely the use of 10 to 30% argyrol. In some instances the silver nitrate was applied immediately after the iodine application. For the most part only very mild cases received this treatment. Of the 423 so treated, 52 or 12.2% were cured; 294 or 69.5% were improved and 77, or 18.37% were unimproved. The apparent cause of unimprovement appeared to be insufficient treatment.

Blair (1927) states that persistent applications to the cervical canal, the daily use of vaginal douches and tampons do more harm than good. The antiseptic does not reach the seat of the trouble but rather acts as an irritant. The douches maintain a damp, warm environment ideal for bacterial growth and the tampon accomplishes nothing in the way of medication and interferes with drainage. He advises the use of 2% mercurochrome followed by a powder composed of two parts of kaolin and one part of sodium bicarbonate. This powder is applied by means of a Nassauer's Siccator, with which it is possible to deposit powder directly in the cervical

canal and also to inflate the vagina and coat its surface with the powder. Treatments are given twice weekly, and in most cases no douche is required. He finds that this procedure is very effective in relieving leucorrhoea and that the powder tends to "mummify" the bacteria. If the discharge is recurrent, he follows this treatment by cauterization of the canal. Gellhorn (1928) advises 20% aluminum acetate with kaolin or 2% silver nitrate with kaolin.

Delaney (1926), Shaw (1929) and Woodward (1930) agree that unless treatment of infected cervixes is begun early within a few weeks after infection is planted, local applications are of little or no value. Woodward goes on to say, "Of the local treatment so called, tons of tampons, pails of silver nitrate and barrels of iodine, let us only reverently refer to them as historically interesting and allow them to sink into innocuous desuetude."

Injection and infiltration of the cervix by anti-septics in an effort to reach infection deep in the cervical glands has recently been used. Helvestine and Farmer (1928) have used 2% mercurochrome in a series of cases. The cervical canal is swabbed clear of discharge and mucus, and the needle of the syringe is inserted at the junction of the mucosa and stroma, the point being kept toward the mucosa, as no pain is felt if the needle does not enter the stroma. Injections into the cervix are made at the four points of the compass, the needle being passed into the mucosa its full length and a few drops injection, then the needle is slowly withdrawn

with the injection continued over the entire course, until a total of one-half to three-fourths of a cc. of mercurochrome has been injected. In conjunction with this all cysts are punctured and allowed to drain, and the cervical canal is kept widely open to promote free drainage. A daily douche of some mild antiseptic (potassium permanganate, 1:6000) is prescribed. Treatments are given two to three times a week and an average of six or eight treatments are required. Lancaster (1930) follows Helvestines and Farmer's method, but uses 4% mercurochrome in 2 cc. total doses, and claims rapid improvement even in complicated cases.

Methylene blue infiltration has been tried and advocated by Gellhorn (1928) for chronic gonococcal endocervicitis. He uses a 1% methylene blue solution in normal saline, each treatment requiring one to two cc. of solution. Treatments are twice weekly and the average number of treatments is six. Matters (1932) has used 0.5% acriflavine in this type of treatment.

Vaccines and sera of various types have been in use for several years, but with the exception of cases of temporary improvement in the treatment of infections gonococcal in origin, little satisfaction has resulted. Corbus and O'Connor (1926) state: "Unfortunately, most vaccines are nothing more than autolyzed solutions of the gonococcus, and do not cause antibody formation. In those cases in which improvement, or even cure, has been noted following the injection of mixed vaccines, or sera, it seems likely that the accompanying fever,

rather than the production of specific antibodies, was responsible for the beneficial result." Gellhorn (1928) believes that while in general, pelvic infections are benefited by protein therapy, the cervix remains unaffected and must be treated separately to prevent re-infection.

The actual cautery was first introduced by Hunner in 1906 and his original statement covers so many important points that I feel justified in quoting the following portion: "During my early association with Dr. Kelly we often treated cases of cervical gland hypertrophy by making multiple radial incisions within the external os by means of a scalpel. This opened many of the dilated cervical glands or Nabothian follicles, and allowed their mucous contents to gush out. I often noticed, however, that after recovery of such patients from the principle operation the cervical condition did not seem to be altered. Later it was our custom to take the hot blade of a Paquelin cautery and run it about over the hypertrophied mucosa of the cervix. This destroyed the superficial layers of tissue, causing a temporary necrosis. But as soon as the epithelium was replaced, the leucorrhoea seemed as profuse as ever. My method grew out of these two, and consists in radial incisions deep into the cervical tissues by means of the cautery blade. I believe that the other two methods failed because the incisions with the knife blade simply emptied and failed to destroy the dilated cervical glands, while the surface application failed to either empty or destroy the deeper glands. The deep radial cuts with the cautery

emptied the deep cervical glands and cause such a wide necrosis of tissue that many of these deep glands are obliterated in the healing process.

"One great advantage of this method is that it may be applied in office practice without giving anesthesia of any kind.....The strokes should be made one at a time, the cautery being removed from the vagina after each stroke as the patient feels the radiated heat on the vaginal walls..... In general I make four or five strokes at each treatment and burn to a depth of 2 to 5 mm.....The usual number of treatments ranges from three to six, and the greatest number of treatments I have given to any patient is ten....."

Dickinson in 1921 adopted the fine platinum wire loop electrode to cauterization of the cervix, believing that it offered more accurate control and less destruction of tissue for the same therapeutic result, with the added advantage of decreased danger of stenosis.

The more or less superficially infected, eroded cervix, or the recently lacerated cervix seen ten to twenty weeks post-partum can usually be healed by the use of a small nasal type cautery in from four to eight weeks. Four or five linear stripes are made over the eroded area, spaced from one-half to one cm. apart and from three to five mm. in depth and extending well into the canal. If a second cauterization is necessary it should be done in two weeks. For the more severely infected cases of longer standing several treatments at intervals of about two weeks may be necessary for the

entire destruction of the infected area and complete disappearance of the erosion.

Better results are often obtained by cauterizing only one cervical lip, with the corresponding portion of the canal, at a time, particularly if there are severe lacerations with eversion. The infected mucous membrane of the canal must be included in this procedure; otherwise the leucorrhoea will not be relieved. Care must be taken, however, that all the mucous membrane about the external os is not destroyed, and any Nabothian follicles which are not entered during the cauterization should be punctured and the contents drained away. This type of cautery is usually painless, and epithelization should be complete in about eight weeks.

When the infection is deeper and there is definite hyperplasia with cyst formation, the linear incisions are deeper, a little further apart and extend two to three cm. up the cervical canal. A heavier cautery tip is used, and the reaction may be so severe as to require hospitalization.

The mucous membrane must be entirely cut through if the infection is to be destroyed, but care must be taken not to cauterize so freely as to cause stenosis, as the caliber of the canal must be restored by complete epithelization. Following the treatment a more profuse leucorrhoea, perhaps slightly blood-tinged is present for a few weeks and then gradually lessens as healing takes place, until at the end of eight to twelve weeks there should be no discharge. If all the foci of infection have not been removed there will still be more

or less leucorrhoeal discharge.

Another type of cauterization may be used when there is frank infection with hyperplasia, but with which there is no laceration or eversion. A crucial incision is made with the nasal type cautery, extending well up the cervical canal and outward over the cervical rim. The incisions are from three to five mm. in depth and from two to three mm. wide. If cysts are present and it is thought unwise to use crucial incisions, simple puncture of the cysts with evacuation and sterilization may be carried out.

The fourth type of cauterization is the extensive and deep operation with the object of destroying completely all infected cervical mucosa with its underlying muscle and fibrous tissue, as well as the everted or eroded area about the external os, leaving a cavity extending to the internal os. The danger of hemorrhage following such extensive use of the cautery must be kept in mind, and unless the patient is well past the menopause, destruction of the uterine endometrium must be carried out to avoid hematometra following stenosis. A very heavy cautery is required for this type of operation and, of course, anesthesia and hospitalization are necessitated.

A method of using the cautery (Kendig, 1927) consists of puncturing the cysts and incising to the depth of the infection, the diseased mucosa with a small knife cautery leaving a portion of uncauterized mucosa between the treated areas. It would seem that these areas of infected mucosa

left between these cauterized strips would continue to give trouble, but it has been found that following this use of the cautery, these left-in strips of mucosa grow over the cauterized areas, thereby reforming the mucous lining of the cervix, and except in severe cases, the infection in these residual areas disappears by the time healing is complete. The residual areas are probably sterilized by the direct effect of the heat of the cautery on the organisms present.

Ludden (1931) describes a screw type of cautery having a thick, spiral thread on the head. This is heated to 400° C., in boiling vaseline and screwed into the anesthetized cervical canal and allowed to cauterize until cool. As it is withdrawn the coagulated tissue is caught in the threads and removed, lessening the danger of secondary hemorrhage and toxic absorption from necrotic tissues.

Following ordinary cautery he uses a powder of kaolin, 15 parts and sodium bicarbonate 1 part, applied with a powder blower, with a cleansing douche of boric acid and soda the next day. Matthews (1926) followed cauterization by painting with 4% mercurochrome and a tampon, the tampon to be removed the following day. A cleansing douche is used if the patient desires it. Davis (1926) believes that douches are of doubtful value in after treatment, but cleans the cervix every week and paints the cauterized area with mercurochrome or tincture of benzoin.

In most cases anesthesia is not necessary, but in case of nervous patients bromides or morphine may be advisable.



Dickinson (1928) advises the use of novocaine and adrenalin if the patient complains of pain, and Matthews (1926) uses a cotton pledget soaked with 10% cocaine inserted in the canal for the relief of discomfort. Wynn and Visher (1932) advise the use of 2% nupercaine topically applied.

Hirsch (1927) believes that cautery should be used in those cases in which only part of the cervix is involved. According to Kuhn (1927) cautery amputation is indicated when the woman is past the climacteric, when malignancy is suspected, when the cervix is badly eroded, and when epithelioma of the cervix, both in the early and late stages, is present. The procedure should not be carried out before the menopause unless a supra-vaginal hysterectomy is done, because cicatrization invariable closes the canal.

Adams (1928) and Halden (1928) believe that cautery offers the most satisfactory means of treating the milder types of cervical infection, especially adapted to uncomplicated cases, virginal, senile, polypoid and cystic forms, to erosions between labors and to lessen the amount of cervix surgery in multiple operations.

It has been generally agreed (Richardson, 1927) that chronic endocervicitis is only curable by eradication or destruction of deep cervical glands and that any form of treatment to be successful must have these requisites.

Any surgery is best preceded by a preliminary course of treatment, the object being to reduce the hypertrophy and inflammation in the structures and to restore the normal rela-

tion of the parts (Miller, 1927). This preparatory regime consists of rest in bed, postural exercises, general hygienic measures, local applications, douches and light cauterization. Rest, physical and sexual, is essential.

In dealing with the more extensive lesions of the cervix we have the choice of amputation and of the tracheloplastic operations. Curettage of the cervix for endocervicitis is mentioned to be dismissed as useless and dangerous. It is now well established that leucorrhoeal discharge from the cervix takes its origin from the cervical glands and not from the endometrium.

Three operations may be considered as procedures for the eradication of pathological tissue in severe cervical disease: (1) High amputation of the cervix; (2) Schroder's tracheloplasty; and (3) Sturmdorf's conical enucleation of the endocervix.

Amputation of the cervix (Collins, 1929) is essentially an operation to be employed after the menopause and should not be done during the child-bearing period without some means being taken to prevent conception, or at least informing the patient that pregnancy is unlikely to go to completion. Masson and Parsons (1928) believe that amputation is preferable to cauterization when other surgical work is to be done; the extent of the operation to depend upon the local condition of the cervix and not upon the symptoms.

The Schroder operation is of use in cases in which the infection is not of the most severe and extensive type, and consists essentially of excising a wedge of infected

tissue on either side of the cervix and doubling the raw edges of the cervix upon themselves. The most proximal portion of cervical mucosa is not excised, and the cut mucosa is placed in end-to-end apposition. The procedure is difficult and is apt to result in excessive scar tissue formation.

The Sturmdorf (1916) operation consists of an incision in the mucous membrane of the portio encircling the diseased tissue. The mucous membrane is dissected back sufficiently to provide an ample cuff for later inversion. Then with a sharp knife, while traction is being made on the diseased area, the entire glandular area surrounding the cervical canal is "coned out" up to the internal os, taking care to conserve as much muscle tissue as possible. The flap of vaginal mucosa originally liberated at the beginning of the operation is now inverted into the hollowed-out shell of the cervix by the double inverting stitch of Sturmdorf. As compared with the Schroder operation the conical excision of the cervix has the advantage of easier technical performance, while primary healing without undue scar tissue is usually obtained (Martzloff, 1932, Hoenig, 1927, Statham, 1929, Kendig, 1927 and Mazer and Sabel, 1928) ~~AND~~ McCrossin (1930) recommends the Sturmdorf operation in severely infected cervixes.

Curtis (1926) states that operations by the vaginal route upon patients with chronic purulent leucorrhoea introduce an increased risk of post-operative streptococcal peritonitis.

Passmore (1932) advocates the use of the cautery

in severe endocervicitis during pregnancy, but warns against possible abortion from cervical irritation. Care must be taken not to introduce the cautery tip too far, for fear of coagulating the membranes with subsequent rupture.

Matthews (1926) gives a series of cases treated by cautery, the results of which are shown in these tables:

Table I: Results in 226 cauterizations.  
Office Cases; no anesthesia.

	<u>Number</u>	<u>Percentage</u>
Cured	180	80
Improved	46	20
Unimproved	0	0

Table II: Results in 55 cauterizations.  
Hospitalization and anesthesia.

Cured	28	51
Improved	18	32.7
Unimproved	9	16.3

Table III: Results in 70 Sturmdorf Excisions.

Cured	49	70
Improved	16	22.8
Unimproved	5	7.2

From this he concludes that cauterization is essentially an office procedure, and does not replace the Sturmdorf operation, but rather that the operative procedure is indicated in cases of long standing with cystic degeneration during menstrual life.

Fulkerson (1926) gives a series of 591 cases of endocervicitis at the Cornell University Clinic. The cautery technique consisted of lightly burning the eroded areas and the mucous membrane lining the cervical canal. Nabothian cysts

were burned out. The patients were requested to douche with an alkaline douche (sodium bicarbonate 1 oz. to 4 quarts of water) and to return every 4 weeks for inspection. Operation was recommended in only the most severe cases. Of the cautery cases, 386, or 65.3% were cured; 125, or 21.1% were improved; 13 or 2.2% were unimproved; and 67 or 11.3% failed to return after the cautery was used. The failure to return was found in most cases to be due to the fact that the treatment increased the leucorrhoea, which created the idea that the disease had been greatly aggravated. Of 25 patients operated by the Sturmdorf excision, 24 or 96% were cured, and 1, or 4% was improved but required cautery to the cervical stump to eradicate the persistent inflammation.

Gardner (1930) states that among 1700 cervixes cauterized by Graves and his associates not a single one has developed cancer. Davis (1932) agrees that, "in cases of laceration, erosion, ectropion, infection and ulceration, early and adequate attention yields almost a perfect score of cures and at the same time prevents cancer formation in 90 to 100% of cases."

38 unselected patients with gonorrhoeal infections of the cervix and urethra were treated by Williams (1932) using a Wappler diathermy machine, the average treatment in the patients with cervical infection being 52 minutes at a temperature of 113.5° F. The average hospitalization was 8 weeks with the shortest stay 28 days and the longest 31 weeks. Satisfactory laboratory and clinical results were

produced in 20% of the cervical infections and in 26% of the urethral infections. Williams concludes that diathermy to the cervix and urethra may be regarded as an adjuvant to the treatment of gonorrhoeal infection but can not be regarded as a positive cure. He believes that better results can be obtained by cautery, and that when diathermy produces improvement it is due to increased vascularity rather than actual thermal destruction of the organisms.

White (1929) recommends diathermy in non-gonococcal endocervicitis and Ende (1929) believes that it is painless, scar tissue formation is slight and the dosage can be accurately measured.

The advantages of hyperemia are obtained by Moench (1928) through suction. He places a suction tube and leaves it in place for 5 minutes after developing a partial vacuum in the tube by means of a hand pump. At the end of that time a stop-cock in the tube is opened and 25% argyrol is introduced which is allowed to cover the cervix for 5 minutes. By this method he believes that he obtains a drainage action by suction, passive hyperemia and medicinal action from the argyrol, which penetrates the deeper structures after the discharge has been drained by suction. He has treated 200 cases by this method with marked improvement in all but six cases. Two to three treatments are given each week and the usual length of time required is six to eight weeks. If adnexal complications develop, all treatment save external douches is stopped at once.

Tovey (1930) advocates a treatment by the introduction of ions into the tissues by a galvanic current. The positive copper electrode is placed in the cervical canal, packed with cotton to prevent contact with the speculum, and the current turned on. The positive current is germicidal, dehydrating, sedative and tends to harden and constrict the cervix. At the end of the treatment the electrode and os will be seen to be surrounded by copper crystals which have been deposited upon and driven into the cervical tissues. The electrode will likely be found adherent from dehydration and coagulation, but by reversal of polarity, relaxation and softening of the cervical tissues occurs and the electrode can be withdrawn without trauma. The time of the treatment is 20 minutes. "The results of copper ionization are a lessening of the discharge. In a week or ten days it has disappeared, the cervix shrinks, and after three or four treatments it appears normal." Giesy (1927) states that the treatment by galvanism depends upon three things: (1) The vasodilating, tissue softening, drainage inducing effect of the negative pole; (2) the sterilizing, vasoconstricting and tissue hardening and tonic effect of the positive pole; (3) the ionizing effect of the galvanic current. This is equivalent to actual drainage by exciting outward exudation of fluids from the field.

Hyams (1930) describes a method of conization of the cervix first used by him in 1927, in which the entire cervical mucosa is coned out by a high frequency, cutting

current. Local anesthesia is used, either by painting the canal with 35% cocaine or by inserting a crystal of cocaine into the canal. A slough separates in about 4 days, and complete epithelization is usually secured by 4 weeks. No douches are used and usually no after treatment is required. He has never seen any contracture or scarring after this procedure. He says, "In conization of the cervix the natural process of healing is not interfered with; on the contrary it is aided and furthered. While nature attempts to cure by healing up or obliterating the diseased glands, they still remain in situ, whereas conization removes not only the diseased glands in the mucosa but also the tissue in which they are embedded, thereby promoting lymphatic drainage so important for complete cure. The relining of the cervical canal proceeds rapidly, and eventuates in a cervix with an intact anatomical structure and a canal lined by squamous instead of the original columnar epithelium."

Of a total of 111 patients treated by him at the New York Post-Graduate Hospital, 48 returned for re-examination. Of these, 46 were sufficiently improved so as to require no further treatment, while 2 required conization. No scar tissue, contractures, or strictures were seen in the patients returning for re-examination. Boland (1931) and Wallace (1932) advocate conization after Hyam's method, but add to insure success, all pathology extraneous to the cervix must be corrected. Boland believes that "Chronic endocervicitis can be fully eradicated when this method is more fully



adopted." He advises the use of hydroglyceride suppositories with 4% mercurochrome. Wilson (1932) advocates conization but warns against its use when any pelvic inflammation is present.

Matters (1932) performs electrocoagulation after the method usually employed when using the actual cautery. Three or four radial striations are made, and subsequently the intervals between may be coagulated. Hemorrhage is controlled by dessication with a monopolar current. Results have been excellent in the limited number of cases in which it has been used.

Henson (1932) obtains electrocoagulation of the cervix by a needle introduced at several points around the cervix in such a direction as to approach the canal near the internal os. Cure usually results in one treatment but sometimes two are required.

Baker and Miles (1930) warn against carbonization of tissue because of hemorrhage and because of the insulating effect of the carbonized tissue. They report a series of 90 cases, 42 with anesthesia and 48 without. Of the 42 cases with anesthesia, 36 or 76% were cured; 6 or 14% were relieved, and none were unimproved. Of the 48 cases in which no anesthesia was used, 42 or 87.6% were cured; 5 or 10.4% were relieved and 1 or 2% showed no improvement. No stenosis of the canal followed any of these cauterizations. Mickels (1926) had previously advanced the opinion that no non-elastic scar tissue formed as a result of coagulation.

Curtis (1920) stated that leucorrhoea of cervical origin could in most cases be cured through dilatation of strictures and treatment with small doses of radium at infrequent intervals. He emphasizes the necessity of incision and fulguration of Skene's ducts in conjunction with this treatment. Gellhorn (1928) sometimes uses a special applicator carrying one 25 milligram capsule and six 10 milligram needles of radium, to be left in place for 4 hours. Care must be taken that the applicator is shielded from the vaginal walls. Matters (1932) gives 400 to 600 milligram hours of radium in cases of possible malignancy with gratifying results. Henson (1932) discredits the use of radium because of possible injury to the ovaries and Curtis (1931) after more than ten years experimentation with radium in endocervicitis concludes that the treatment yields results slowly, and has the disadvantages of predisposing to stricture of the cervix and sometimes produces demonstrable disturbances of ovarian function.

## CONCLUSIONS

- I. Endocervicitis is one of the most common gynecological diseases. It occurs most frequently in multiparous women, and during the child-bearing age.
- II. Leucorrhoea is the most constant symptom.
- III. It has been established that the chronically infected cervix acts as a focus of infection and is a predisposing factor to cervical carcinoma, hence early and thorough treatment is essential.
- IV. Education and prophylactic measures are assuming an increasingly important place in the treatment of endocervicitis.
- V. Local applications reach only the surface and are useful in recent and superficial infections and as a preparatory measure to more radical treatment.
- VI. In order to cure well-established endocervicitis it is necessary to adopt some measure which will provide for either removal or sterilization of all infected tissue.
- VII. Actual cautery is desirable because of simplicity and efficiency, and when properly done there are few bad after effects.
- VIII. Electrocoagulation gives excellent results in many cases, but cost of the equipment and the somewhat complex technique make it impractical for the general practitioner.
- IX. Cautery amputation is valuable after the menopause in badly infected cervixes, or when malignancy is suspected.
- X. Surgical removal of infected tissue is sometimes necessary

in the more severe cases. The Sturmdorf operation is the best suited for this purpose if the function of the cervix is to be conserved.

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