PERIODIC INTERMENSTRUAL PAIN[1] "Mittelschmerz"

By N. SPROAT HEANEY, M. D., Chicago, Illinois
Associate in Gynecology and Obstetrics Rush Medical College; Assistant Gynecologist and Obstetrician, Presbyterian Hospital, Chicago

WILLIAM O. PRIESTLY was the first to draw the attention of the profession to the periodic appearance of abdominal pain midway between the menstrual epochs. Since his article various contributions, chiefly by Englishmen, have been made, but in general they have been incomplete and unconvincing. From the prevalence of the use of the term "Mittelschmerz," one might expect to learn much concerning this subject from a perusal of the German literature, but aside from having given us an expressive name the Germans have not advanced our knowledge materially in this line.

It is the purpose of this paper, after relating the histories of three cases of intermenstrual pain, to set forth certain facts regarding the occurrence, symptomatology, and pathology, and to discuss the various theories as to the nature of this affection. The basis for this communication is a study of 66 cases, the three detailed below, 37 as cited by Rosner in his excellent paper, while 26 are collected from the literature.

Case 1. Miss L. W., age 26, school teacher. Admitted to Presbyterian Hospital on Dr. James B. Herrick's service, November 4, 1909, for observation.

History. Menstruated first at 13, 26 day type. Moderate flow four to five days. Has a dragging pain during first days of flow, when rest is beneficial. After an exploratory operation a year ago the patient menstruated every 22 to 23 days. The last three periods have been at 24 day intervals. She never experienced amenorrhœa or hæmorrhages.

Three years ago the patient began to suffer periodical attacks of pain every 26 days, appearing 13 days after onset of the previous menstruation. The pain appears first in the right groin or to the right of the umbilicus. It is paroxysmal in character, of varying severity, often radiating to the right leg or knee, later, becomes general over the abdomen. Pain lasts usually eight to ten days, exceptionally until onset of next period. Formerly the pain was alleviated by heat and enemata so that the patient regarded her difficulty as intestinal. Recently, all measures short of opiates have failed to relieve her, since the paroxysms are severe and more persistent. During the last five months or so, the patient has noticed a mucous discharge from the vagina for four or five days preceding onset of pain, disappearing at beginning of pain. In New Mexico one year ago, she menstruated every 22 to 23 days, while of late has menstruated every 24 days; pain in both instances has followed the periodicity of menstruation. Patient feels well and free of discomfort the week following menstruation.

Associated. Always constipated, especially at the time of periodic pain. She has had mucus from the bowel but only after frequent enemata. Sleep has been poor. No symptoms of general disease. Past and family history negative. Since childhood no particular illness. Operative. Because of above related symptoms, the nature of which was not appreciated, an exploratory operation was performed one year ago, with the removal of the appendix. The patient gained 25 pounds in weight but the next regular menstruation was not improved.

Examination by Dr. Herrick revealed nothing of significance in head, neck, chest, or extremities. Reflexes normal. Hyperemic spots appear and disappear in various portions of the skin. Light stroking produces a marked "tache cerebrale." Patient quite nervous. Has now the period of pain. The abdomen presents the 10-inch scar of a mesial incision, midpoint at umbilicus. Tenderness general over the abdomen, especially marked in right iliac and hypochondriac regions.

November 15, 1909, Bimanual examination by the writer just after menstruation. External genitalia and vagina, normal virginal findings, cervix conical, uterus in normal position, no abnormalities found. Right ovary very tender. Left side definitely larger than right, no especial tenderness. Blood 85 per cent

[1] For Discussion see Chicago Gynecological Society Transactions.

Hb. Whites, 8,250. Reds 3,860,000. Temperature normal. Urine normal. Feces, except for small amount of mucus in two specimens, negative.

Patient during her stay required repeated hypodermics of heroin for relief of pain. Sterile water hypodermics occasionally tried without result.

November 15, 1909. After menstruation ceased, patient discharged. Thyroid extract given. November 28, readmitted in pain.

Pelvic examination. Right ovary exquisitely tender, size not ascertainable. Left ovary larger than normal. Cul-de-sac and ligaments free. Discharged after three days observation.

December 23, 1909. Patient readmitted to Presbyterian Hospital, on the fourth day of her periodic pain, and begged that something be tried to relieve her of her suffering.

Third pelvic examination Right ovary exquisitely tender. Left ovary larger than right, though not so sensitive on pressure.

December 24, 1909. Operation by the writer. Thorough dilatation of cervix and removal of endometrium for examination. Median laparotomy through old scar. Right ovary large, white, very wrinkled, sclerotic; of leathery consistence. Left ovary prolapsed, twice the usual size, normal color, several small cysts, large recent corpus luteum. Both tubes normal with patent fimbriated ends. Uterus in good position. On posterior aspect, near right cornu an intramural fibroid of approximately two cm. in diameter found. Appendix absent. Omentum adherent to old scar above umbilicus. Kidneys and gall-bladder negative. Right ovary removed. Corpus luteum resected from left ovary and ovary elevated. Fibroid nodule removed from uterine wall. Repair of herniation at umbilicus. The following day, Christmas, patient declared postoperative pains were mild compared to her periodic paroxysms. Recovery uneventful. In chair on the 10th day. Discharged from hospital on the 17th day after operation.

Pathological report.

1. Tumor nodule from the uterus shows muscle and fibrous tissue typical of fibromyoma uteri.

2. Ovaries. Left resected portion contains a normal recent corpus luteum, and a number of small follicular cysts. Both ovaries, especially the right, show a hyperplasia of the connective tissue marked towards the periphery while the walls of the blood-vessels are thickened.

3. Uterine scrapings. The glands of the endometrium are quite tortuous and are increased in number. The gland cells are normal. Many gland lumina show a granular unstained substance; a few contain blood. The interglandular substance holds a few engorged capillaries. Extravasated blood is seen at varying depths in the troma, but is especially noticed approaching the surface. Under the surface epithelium is a thin layer of free blood. In one or two places only is there blood external to the surface epithelium and here only in minute quantities. The surface epithelium is wanting only in one or two small areas.

Subsequent history. Since operation patient has been entirely free of any pain or discomfort between or during menstruation. Her only annoyance is that the periods, though regular, have been prolonged and profuse.

CASE 2. Mrs. M. B., age 31. Housewife.

Enters Presbyterian Hospital on Dr. J. Clarence Webster's service October 17, 1909.

Patient complains of menorrhagia, periodic intermenstrual pains, frequency of urination, paleness, headaches, weakness, backaches and constipation. Menstruation began at 14. Usually, periods every 28 days, exceptionally delayed one week. Flows for five days, the first day profuse enough to weaken her. Last period five weeks ago. Since onset of menstruation the patient has suffered pain periodically from about two weeks before onset of the next menstruation. This pain is generally severe, lasting one to two days and is getting worse. She has severe headache and backache at the menstrual time.

Married seven years. One child six years ago. Not pregnant since. Husband alive and well. Past medical history: Typhoid 13 years ago, otherwise negative. Past surgical history. Perineorrhaphy three years ago. Patient has been under Dr. Webster's observation for some time. Of late he noticed a rapid increase in size of the uterus, with an aggravation of her pelvic symptoms.

October 18, 1909. Operation by Dr. J. Clarence Webster. Laparotomy. Fibroid uterus of about 5 inches in diameter. Marked cystic degeneration of both ovaries. Appendix and gall-bladder normal. Extensive adhesions in upper right and left quandrants of abdomen. Complete extirpation of uterus and appendages.

Pathological report. Ovoid tumor of uterus, an interstitial fibroid, 16 x 10 x 9 cm. Congested endometrium of normal thickness. Tubes 12 cm. long, not thickened or inflamed. Fimbriated ends patent. Ovaries, normal size, filled with small cysts; no recent corpus luteum.

Microscopic. Ovaries. Multiple small follicular cysts. Tumor. Section from the center shows it to consist of loosely associated strands of smooth muscle fibres with a minimum of fibrous tissue. Mucosa shows the usual picture found in a hypertrophy and hyperplasia of the glandular tissue.

Subsequent history. Since operation the patient has been free from the intermenstrual pain.

CASE 3. Miss ——, age 22, gave to Dr. Carey Culbertson the following history:

Menstruated first at 12. Periods every 26 to 30 days. Duration eight to nine days, rather profuse. Severe cramps come with flow and last till flow is well established. Beginning at the mid-period, the patient suffers from neuralgic-like pains in lower abdomen, mostly on left side, though when severe also on right side. This pain with exacerbations lasts till flow begins when it is followed by a pain of an entirely different sort. The week following menstruation is the most comfortable time. Never pregnant. Leucorrhœa marked at times. Considerable pain on micturition, especially at menstrual time.

Past medical and surgical history: Negative, except for a sickness of three weeks one year ago due to ptomaine poisoning.

Operation by Dr. Carey Culbertson in the University Hospital, Chicago, December 23, 1909, during the period of ease.

Uterus small in antiflexion. Both ovaries enlarged, wrinkled and of leathery consistence. Tubes normal. Left ovary presents a recent corpus luteum. Internal or dilated with difficulty. Curettage. Left salpingo-oöphorectomy. Right ovary resected. No pathological examination could be made, for specimens were lost in operating room.

Post-operative history. Uneventful recovery. Absence of pain between periods. Comfortable at menstrual time. Only annoyance now is the micturition, which is unimproved.

From a review of the 66 histories many interesting and instructive points may be mentioned. Rosner gives the frequency as being 12 times among 2,350 gynecological patients.

Classifying the cases according to age, marital state, obstetrical and menstrual history, we find that 42 cases are between the ages of 25 and 35, ten are over 35 years, and nine under 25 years of age, while in five the age is unknown. Thus the largest number of cases is found during the age of greatest sexual activity. As to marital state, 15 are single, 47 married, while in four the marital state is unknown. The greater frequency of occurrence is among married women.

Discarding the 15 unmarried women, as well as 16 whose obstetrical history is unknown, we have 35 patients, eleven of whom have never aborted nor delivered, while eleven have had one pregnancy, seven have had two, four have had three, one had four, and one nine pregnancies. The high percentage of sterility deserves emphasis. Only three of these patients became pregnant after the onset of the intermenstrual pain, two aborting at the third month, while one continued to term. It is also worthy of note that all three were free of pain during pregnancy, and that menstruation ushered in a recurrence of the periodic attacks. In the other women who had been pregnant, the histories state, that the intermenstrual pain appeared first soon after the last labor. The lapse of time since the last pregnancy, in the 17 cases where this information is indicated, is in two cases, 18 months; in one, two years, in three, three years; in one, four years; in one, five years; in five, six years; in two, seven years; in one, eight years; and in one, ten years. A consideration of this last statement increases materially the importance of sterility in this affection. It is worth mentioning that only one patient gave a history of puerperal sepsis. In those who were single or sterile, two attribute the onset to cold taking, one to influenza and one to scarlet fever.

Only two patients had a synchronous onset of mittelschmerz and menstruation, one at fourteen, and one at twenty years of age. The patient mentioned above, who had scarlet fever, noticed after her convalescence, the appearance of periodic abdominal pains, which were considered at first menstrual molimina, but at sixteen years of age she began menstruating at a period not corresponding to that of the pain. In all the other patients periodic intermenstrual pains first occurred at various periods up to 18 years after the onset of the first menstruation.

The menstrual type varies. Most of the patients are regular, and except, perhaps, for a higher percentage of scantiness of flow, no particular peculiarites in habit are characteristic. Dysmenorrhœa occurs frequently, but is not a constant finding. When present, it is generally milder than the intermenstrual pain. Very few give history of clots or shreds.

Croom, for the purpose of study, has divided the cases into those presenting no other disturbances except pain, those with pain and a colorless discharge, and those with pain and a discharge of blood. The pain is the fixed symptom and is very characteristic. It appears at a time midway between the menstrual periods, in those of 28-day type on about the 14th day after the onset of the last menstruation. In case 1 the patient's type changed twice from the 26th to the 24th, and 22d-day type. The intermenstrual pain changed accordingly. In women of marked irregularity the relation of the pain to menstruation, perhaps, goes unobserved, so that the selection of women with regular type may be, therefore, only apparent, at any rate, no cases of great irregularity are noted among the sufferers. Rosner reports a case which had two attacks a month, one 14 days before the onset of menstruation, the second seven days later. The pain is distinctly periodic and appears every month with as

much regularity as menstruation itself. When once established, it is very exceptional to have intervals when the pain fails to recur, unless there be amenorrhœa, when absence of pain is the rule.

The pain usually appears first in one side of the lower abdomen or groin, the left more often than the right, is cramplike, spasmodic, and intermittent, with periods of relative or complete recession. Radiation to the leg, opposite side or occasionally to the groin is noted. The pains become more frequent and of longer duration and generally become diffuse over all of the lower abdomen with tenderness on pressure. Rarely the pain is dull and aching, more often sharp, tearing and lancinating. The suffering in milder cases is relieved by heat, in severer ones opiates are necessary. Usually the duration is two to three days, it may however, last till just preceding the next menstrual period. The time of greatest relief usually is just following menstruation. Pure-foy mentions a case where the patient had intermenstrual pains in the breasts and none in the abdomen.

In eight of the 29 cases (exclusive of Rosner's) a colorless vaginal discharge has been mentioned, in the other 21 its presence or absence is not stated. This is variously described as thin, watery, generally as mucoid. Bouilly has stated that the secretion is always uterine in origin. The discharge in some cases appears and leaves with the pain. A few authors assert that the leucorrhœa is limited to a time just prior to the subsidence of pain and seek to bring it in causal relationship to the pain. In case 1, reported in this paper, however, the leucorrhœa was limited to a time just preceding the onset of pain.

A bloody or blood tinged discharge is only exceptionally seen, once only in the 29 cases cited above. When present it may occur as a pink tinged fluid or as a slight hæmorrhage resembling a scanty menstruation. When present in any definite quantity it might be considered as a form of menstruation, and classified under this head, which perhaps accounts for the few such cases reported as mittelschmerz, where pain is the distinctive symptom.

All cases show some pathological alteration, and it has been difficult to separate the essential from the complicating. Very few cases are reported as having been operated upon and in these few instances the case reports are often incomplete. The position of the uterus has nothing to do with this symptom complex, as all positions have been noticed with apparent equal frequency. In the 29 cases which are being reviewed, laparotomy is recorded six times and five times a fibroid uterus was found. In the case of Whitelocke, this was first manifest at the second operation and not seen at the first laparotomy, while in the case which the writer operated upon, the tumor was very small and so situated as to be found only after opening the abdomen. In these six cases the ovaries were found affected six times. Five times both ovaries were diseased while in one case, only one was altered. Twice the affection is called advanced sclerosis while in the four others, extreme cystic degeneration was found. In only one case was a hydrosalpinx found. In this case the opposite tube was said to be thickened while in one other case one tube was thickened. In the remaining four cases the tubes were declared to be absolutely normal. In the writer's case 1, in addition to a freshly ruptured corpus luteum, the endometrium was found in a state characteristic of beginning menstruation. In two of the non-operated cases fibroids were diagnosed. I shall, however, not enter further into the detailed diagnosis of the other cases where confirmation by operation or autopsy was not made. Rosner's findings, however, though not confirmed by autopsy or operation are so definitely stated as to be of value. In 12 private patients, he found only one who had normal genitalia and one who had normal uterine dimensions, while all the others (10) had increased uterine dimensions which he has designated as diffuse pathologic hypertrophy. In ten he found increased sensitiveness, increased size, or prolapse of the ovaries. He found in no case a tubal swelling of any nature, and in none an exudate. To review the above pathology, the high percentage of fibroids among the operated cases is especially worthy of note while the increased volume among Rosner's cases is highly suggestive of fibroid disease. The advanced ovarian changes among both the

operated cases and those of Rosner's deserves reiteration.

Many theories have been offered as to the essential cause of the affection, some fantastic, others with more regard to the known physiology of the genitalia, but in general without support in the way of findings. Drennan ascribes the mittelschmerz to the escape of the non-fertilized ovum in the mucous discharge, the pain being due to expulsive efforts on the part of the uterus. No further comment is necessitated, nor is a detailed elaboration of this theory considered advisable. Addinsell, Giles and Bland-Sutton believed the symptom complex due to hydrops tubæ profluens. Giles explains the periodicity by assuming that the œdema consequent to menstruation closes up the uterine end of the tube. Fluid accumulates in the diseased tube and the subsequent efforts to the tube to expel its contents give rise to the pains. The pain ceases with the escape of the tubal contents and the appearance of a discharge from the vagina. In cases which present no discharge they assume that the tubes are small. Here we have a gross anatomical lesion which, if the essential cause, should be found in every operated case. Rosner found the tubes in his 12 cases free from swelling. In only one of the six operated cases was a hydrosalpinx found, while in four of them the tubes were pronounced perfectly normal. This robs the theory of its worth because a hydrosalpinx is not overlooked in an operation. The premises even were false inasmuch as the discharge may appear before the onset of pain and does not in the majority of cases usher in the subsidence of pain.

Küstner, Schroeder, and Heitzman claim its origin in endometritis. Acknowledging the possibility of microscopical departures from the normal appearance of the endometrium, this finding needs some further explanation to account for the periodicity. The strongest point against this theory is that curettement does not produce a cure though it has been performed often.

Croom, Palmer, and Marsh believe the disturbance is due to ovulation, though they have offered no anatomical findings in support of their theory. Croom explains it by assuming that the ovulation in these cases is asynchronous with menstruation and that the pain is due to the resistance met by the follicle in its effort to burst and release its ovum. The consideration of this theory necessitates a review of our knowledge concerning the relations existing between ovulation and menstruation.

Schaeffer in Veit's Handbuch der Gyn. (p. 19), quotes Girdwood's observation that in an autopsy on a girl of 18, dead of tuberculosis, who had menstruated just six times, six scars were found as evidence of six ovulations having occurred. Lindenthal in an article on the corpus luteum cites a similar finding of von Hyrtl where in a girl who had menstruated 8 times, 4 scars were found in each ovary, and he adds that Strassman, in a review of a number of cases from the literature, found, that the number of scars agreed with the number of menstruations.

That ovulation can occur independently of menstruation is not fully proved by the occurrence of pregnancies before the onset of menstruation, during lactation, or in other periods of menorrhœa, for it can be argued that had not pregnancy resulted, menstruation would have occurred.

That menstruation can result independently of ovulation is also a question for consideration. The simple statement that it has occurred after bilateral removal of the ovaries does not answer the question in the affirmative, since an accessory ovary, or a portion of an ovary remaining undisturbed, could ovulate. It is pretty generally accepted that menstruation is dependent in some way on ovulation. That each menstruation and ovulation have a fixed time relation to one another, however, is proved abundantly in the operating room not to be true. Bischoff, Kölliker, Reichert, and Williams have been able to find freshly ruptured corpora lutea in only three-fourths of the cases examined during menstruation. Leopold and Mironoff examined 42 pairs of ovaries from three to 30 days after the past period and found 30 corpora lutea agreeing in age with the last menstruation, but in 13 of these, evidences were such as to deduce that the next successive period would occur without ovulation, and in 12 cases no corpus luteum could be found for the last menstruation.

That in a given case ovulation occurs with a

periodicity is deduced by English as well as Oldham in observations made on ovarian hernias, where they found swelling of the ovaries occurring regularly some days before menstruation; that this was ovulation, however, is not proved. From these evidences, one must conclude that ovulation does not occur in every case with the same time relation to menstruation, and that the periodicity of ovulation is not proved.

What evidences have been offered by the advocates of this theory to show that periodic intermenstrual pain is due to painful ovulation, that ovulation occurs at this time? No operative findings have been offered, only that the pain is periodic, and, since the pain does not coincide with menstruation, then the only other periodic occurrence is assumed to be ovulation.

So far as ascertainable the author's case is the only one operated on during an attack, and the condition of the ovary noted, a recent corpus luteum was found. Rupture of the follicle had occurred some time before, yet the subsidence of pain had not been ushered in; so that resistance to ovulation could not have been the cause of the pain in this case. Could the pain have been due to an excessive hæmorrhage into the ruptured follicle? Such an occurrence in a hard, inelastic tissue might well produce pain. That under certain conditions a corpus luteum can produce pain is known from the occasional case of a large corpus luteum or a cyst of the corpus luteum in early uterine pregnancy operated on under the mistaken diagnosis of ectopic pregnancy. In the author's case, however, the pain began always in the right side and that side was tender to bimanual examination three times at intervals, yet the corpus luteum was on the opposite side. Where both ovaries are present, ovulation occurs most probably in them in rotation, yet in cases of periodic intermenstrual pain, the pain always begins in the same side. Rosner reports a case in which there were two intermenstrual attacks of pain a month; according to the ovulation theory, there would be in such a case two ovulations a month. Since the periodicity of the pain is the basis for this presumption, then the dysmenorrhœa of the variety described by so many as ovarian could with equal justification be ascribed to ovulation; the presence of mittelschmerz does not protect from a dysmenorrhœa of this character. With ovulation as an explanation, what is the cause for the leucorrhœal or bloody discharge? As final evidence that the pain in these cases is not dependent upon the process of ovulation, or upon any condition of the corpus luteum, is the fact that in case 3, described here, a corpus luteum was found during the period of the patient's greatest comfort, one week prior to the next expected attack of the periodic pain.

Brodier suggests that the trouble is due to an overstimulation or a periodic congestion of the uterus, while Bouilly expresses much the same thought in blaming it on a congestion of the internal genitalia and vasomotor disturbances in the ovary. Richelot has taken the anatomy into view and says the pain is due to the diffuse pathological hypertrophy of the uterus with sclerosis of the ovaries. Van der Velde has arranged curves for a large series of women according to temperature, pulse, and blood pressure, and finds that the mittelschmerz occurs where the curve is lowest, corresponding to the lowest blood pressure and temperature, paralysis of the blood pressure allowing a demonstrable congestion to occur. Rosner's opinion is a combination of the four preceding, and he thinks the essential pathology is a sclerosis of the uterus and ovaries, and the altered secretion causes a low curve in the wave with periodic intermenstrual pain as the product.

It could hardly be called accidental that in the six operated cases six pairs of markedly sclerotic and cystic ovaries and five fibromyomata of the uterus were found. It is not at all infrequent, especially among patients with such a pathology, to see the menstrual type change so, that a woman who previously was regular may begin menstruating every two weeks. Now, we have no evidence to show that ovulation is equally frequent, yet there must be some abnormal stimulus at work in these cases whether mechanical, chemical or nervous. Also not infrequently in such cases we see the periods alternate in the quantity of the discharge, so that one period will be sufficient while the next is scanty and painful. Such a case menstruating every two weeks might easily come under the classification of

mittelschmerz with a bloody discharge. One might say that here the impulse was too weak to cause a typical menstruation. If the impulse were still weaker the stimulation to the uterus might be sufficient only to produce a leucorrhœal discharge. In other words, in the writers' opinion, periodic intermenstrual pain is an insufficient or abortive attempt at menstruation, the pain being a dysmenorrhœa and the whole picture depending upon degenerative and sclerotic conditions in the ovaries and uterus. This theory would explain the finding of an endometrium typical of beginning menstruation in the case 1 operated on at the height of a attack of periodic intermenstrual pain.

In closing it would perhaps not be amiss to suggest that such cases should be studied more carefully than they have been in the past, and especially, that in all such cases as require operation that the time of an attack of pain be elected for the procedure, that a bit of endometrium be secured for microscopic examination and if a laparotomy be performed that the presence or absence of ripe or freshly bursted follicles be noted.

BIBLIOGRAPHY

ADDINSELL. Trans. of the Obst. Soc. of London. Brit. Med. Journ., 1898, i, p. 692.
BOUILLY. Des pousses congestives intermenstruelles. Abstract. Centr. f. Gyn., 1897, No. 46, p. 1372.
BRODIER. Periodic Intermenstrual Pain. Abstract. Frommel Jahres, xiii, p. 160.
BULIUS. Der Eierstock bei Fibromyoma uteri. Zeitschrift f. Geb. und Gyn., 1892, xxiii, p. 358.
CROOM, J. H. Edin. Med. Journ., 1896, i, p. 703. Lancet, London, 1895, ii, p. 1625.
DRENNAN. Medical News, 1903, p. 68.
FASBENDER, HEINRICH. Zeitschrift f. Geb. und Frauenkrankheiten, 1875, p. 126, cit. by Crooms.
LINDENTHAL, O. T. Menstr. und Corpus Luteum. Wien. klin. Woch., 1903, xvi, p. 301.
MARSH. Am. J. of Obstr., July, 1897, p. 65.
OLSHAUSEN. Amenorrhœa und Dysmenorrhœa. Zeitschrift f. Geb. und Gyn., li, i, p. 245.
PRIESTLY. Brit. Med. Journ., London, 1872, ii, p. 431.
PUREFOY, R. D. Intermenstrual Pain. Med. Press and Circular, London, 1909, i, p. 11.
POZZI. Med. and Surg. Gyn., vol. i, p. 536.
PALMER, C. D. Periodic Intermenstrual Pain. Ohio Med. Journ., 1892, iii, p. 142. Am. J. of Obstr., 1892, xxvi, p. 470.
ROSNER. Gynecologie. Paris, 1905, x, p. 230.
SCHROEDER. Handb. d. Krank. d. weibl. Geschlechts. Leipzig, 1886, vii, p. 121, 339, 345.
SCHÆFFER. Veit's Hand. d. Gyn. Menstruation
SHEILL. Med. Press and Circular, London, 1909, i, p. 34.
STEPHENSON, WM. Am. J. Obstr., vol. xv.
VAN DER VELDE. Centr. fur Gyn., 1905, p. 964.
WATSON, A. M. Edin. Med. Journ., October, 1901.
WHITELOCKE. Brit. Med. and Surg. Journ., October, 1902.

Noble Sproat Heaney (1880-1955)

Prominent Chicago ObGyn

Best known today for spurring the revival of vaginal hysterectomy for benign disease in the USA during the 1930s and 1940s.

"Heaney clamps"---non-slip modifications of the curved Kelly clamp---are still widely used today. The classic Heaney clamps are a matched R and L mirror-image pair with the tooth on the bottom designed to hook the USL.