BRITISH MEDICAL JOURNAL

LONDON SATURDAY JANUARY 15 1938

LOWER ABDOMINAL PAINS OF CERVICAL ORIGIN THEIR GENESIS AND TREATMENT*

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The Cervical Syndrome

The cervix in its short length of one inch is unique in that, while it is freely exposed below to external injury and infection, above it is in immediate relation to the abdominal cavity and its sensitive peritoneal lining. Further, it is significant that the cervix is the sole region in the body in which a relatively simple damage is prone to persist as a permanent sore. The general pathological features of this common lesion are well known and need not be discussed here.

Alike in its frequency and in the suffering with which it is associated, the cervical syndrome constitutes one of the most important entities in gynaecology. In its typical form it possesses certain characteristic features which I first described in 1930 (Young, 1930) and which may be stated shortly as follows:

Characteristic Features

1. It is predominantly a condition found in parous women, and in a large majority it can be traced historically to the last birth or abortion. In a more or less consecutive series of 349 such patients admitted to hospital under my care, 304, or 87 per cent., were parous, and the puerperal correlation was evident in nearly 90 per cent. of these.

2. The main symptom is chronic distress and pain situated in the lower abdomen and, less commonly, in the lumbosacral area of the back. Dyspareunia is almost invariably present: the condition is the most important cause of dyspareunia in parous women.

3. Leucorrhoea coinciding chronologically with the pain, or not infrequently preceding it, is a common feature.

4. There is an absence of gross pelvic pathology, and this, combined with the marked local and general symptomatology, is a common cause of confusion in diagnosis and of error in treatment. The lesion underlying the syndrome is generally caused by the trauma of labour, on which a chronic inflammation of the cervix is implanted. The existence of a similar lesion without pre-existing trauma explains the relatively rare cases found in nulliparae.

5. While chronic ill-health is a common end-result, the abdominal distress may often extend over a long period without producing any corresponding deterioration in the general state of the patient. At the same time, from an early

stage there may be profound systemic disturbance in the shape of general weakness, dyspepsia, marked nervous reactions, "rheumatism," etc., while local functional disorders may also develop early—for example, irritability of the bladder and lower bowel.

6. In a large proportion of cases treatment of a simple nature directed to the underlying lesion is strikingly successful.

The history in many instances is characteristic. Beginning with some such expression as "ever since the birth of my baby," it tells of years drawn out with an agony both of spirit and of body. As it unfolds one can recognize the young, healthy, and buoyant bride becoming gradually transformed into the ailing matron, plaintive, peevish, sleepless, and dyspeptic, who, as in Jane Austen's Mary Musgrove, has formed a theme for easy sarcasm throughout the ages. The branks and the ducking-stool were the treatment meted out to such "scolding wives" in former days. We have tempered the harshness of those more inhumane times, but it is doubtful if we have in any great measure relieved the misery of this large population in our midst. The present inquiry had its origin many years ago in the gradual recognition, among the chronic sufferers in a busy gynaecological clinic, of a large group with an essentially similar complex, for whom, in the absence of any clear underlying pathology, no adequate treatment was possible. Many, indeed, belonged to a considerable and a peculiarly distressing class in that they had suffered frequent and varied operative treatment, both minor and major, without benefit. The scarred abdomen often witnessed to multiple operations during which in succession, it might be, the appendix and the ovaries had been removed, the womb had been fixed, and, finally, in a last desperate effort, the pelvis had been swept clean. Some of us have seen many examples of such shattered lives. It is not surprising that in a large number the mental state should have given rise to anxiety for which, as revealed in the history, the psychiatric specialist had been summoned. Recently I saw one such woman who for twenty-three years had suffered from more or less constant abdominal distress and whose organs had been removed at successive operations. The diseased cervix alone had escaped! Within a few days of treatment directed to this lesion the abdominal pain had gone, and six months later her life and health had been completely revolutionized.

* Based upon the Honorary Presidential Address to the Glasgow University Medico-Chirurgical Society, October 28, 1937, and the Annual Address to the Oxford Medical Society, November 12, 1937.

The Pain Element

In this place we are specially concerned with the pain element in the cervical syndrome; later pages will be devoted to a study of its genesis and treatment. The relatively scant attention which in the past has been given to the diseased cervix as a source of chronic abdominopelvic pain is due to three considerations: (1) the common clinical observation that cervical trauma and infection may be painless; (2) the well-known fact that, like other hollow viscera, the healthy cervix is insensitive to stimuli which provoke pain on surface tissues; (3) the frequent persistence of pain in women whose uterus has been completely removed for severe cervical infection. At first sight this triple argument would seem to have much force behind it. At the same time, as we shall attempt to show further on, each item is relevant only in so far as it fails to take into account all the available data. Thus in regard to (1) and (2) it is easy to demonstrate that in certain conditions the diseased cervix, so far from being insensitive, may acquire a most acute sensitiveness to stimuli which ordinarily are completely painless. In respect of (3) the conditions after removal of the cervix often resemble those found in a painful scar left after an operation in a sensitive area.

Visceral Pains

Before we pass on to consider the nature and the genesis of the pain phenomena of our syndrome a brief reference must be made to the present position of our knowledge on the causation of visceral pain in general. It is a common observation in abdominal symptomatology that the hollow intraperitoneal viscera, which are mesially situated in regard to their embryonic development, may in disease be concerned in the production of two completely different types of pain: (a) true visceral pain, and (b) referred or reflex pain. The viscera themselves are insensitive to the stimuli that ordinarily provoke pain on the body surfaces—for example, cutting, burning, etc.—but it is now generally agreed that pain is appreciated by a viscus when it is exposed to those intrinsic influences which are prone to disturb its function. Such visceral sensations have certain characteristic and well-defined features. In the first place, *they are typically, if not always, mesial in situation*—the epigastrium in the case of the stomach, above and around the umbilicus in the case of the small bowel and appendix, and below the umbilicus in the case of the large bowel; in the second place, such true visceral pains are usually only *imperfectly localized* by the patient; and, thirdly, they are *unassociated with hyperalgesia of the corresponding area and muscular rigidity* of the corresponding part of the abdominal wall. A common example of such mesial visceral pain in a lateral organ is the initial umbilical pain occurring in obstructive appendicitis. Referred or reflex pain is felt on the body surface at a site which in general is determined by the location of the organ, though it may be projected on to a distant area of the abdominal wall or other somatic surface. Such referred pains are *typically associated with hyperalgesia and muscular rigidity*, and they are therefore *well localized*.

It is now generally agreed that while true visceral pain is felt directly in the organ through the medium of the splanchnic nerves, its site is determined by the spinal segment corresponding to the primitive development of the organ. Referred or reflex pain, on the other hand, has been the topic of much controversy. Until recently the explanation generally accepted was that of Mackenzie (1920), who postulated that the stimuli originated in the

diseased viscus and were referred via the sympathetic nerves to the cord, where they created an "irritable focus." In this view a simple surface stimulus which is innocuous under healthy conditions is, by its passage through this irritable focus in the corresponding spinal segment, now appreciated as pain by the higher centres. This was Mackenzie's viscerosensory reflex, the muscular rigidity in the same surface area arising from a visceromotor reflex based on a similar segmental arc. The work of Morley (1931) and others has cast serious doubt on the validity of these conceptions, and there is now evidence that referred pain, with its associated hyperalgesia, muscular rigidity, and tenderness, is dependent not upon visceral impulses but upon impulses derived from a secondary irritation of the adjacent peritoneum—the so-called peritoneo-cutaneous and the peritoneo-muscular reflexes of Morley. Thus the site of the referred pain depends upon the site of the peritoneal irritation. The pain in the iliac fossa in a typical case of appendicitis, for example, is referred segmentally to the abdominal wall, not from the appendix itself but from the inflamed parietal peritoneum. In support of this view Morley quotes the observation that the site of surface tenderness in gastric ulcer varies with the position of the stomach within the abdomen. A further common example pointing a similar lesson is found in ectopic pregnancy. The referred pain in this condition is localized to the iliac fossa when the extravasated blood is located in the pelvis and lower abdomen, but when, as often happens, the fluid blood flows upwards to the under surface of the diaphragm it provokes the shoulder pain of phrenic stimulation.

The intrinsic mechanism underlying the actual sensation at the referred site has given rise to much speculation. That the skin and other structures of the abdominal wall are directly concerned is proved by the observations of Lemaire (1926) and Morley (1931), who abolished the spontaneous pain by means of a local anaesthetic applied to the corresponding skin area. Morley (1929) found that this procedure did not necessarily abolish deep tenderness. That the referred sensation is dependent, not on an alteration in the "sensitiveness" of the higher nerve levels, such as Mackenzie and others have postulated, but on some local change induced at the nerve terminals in the skin, has been put forward by some writers. Verger (1927), for example, has suggested that the original stimulus in the abdomen induces reflex vasomotor changes in the corresponding segmental skin, while Spameni and Lunedei (1927) suggest that centrifugal impulses passing to the skin result in local biochemical changes. Recently Lewis (1937) has adduced striking evidence for the view that the spreading hyperalgesia round a focus of damaged skin is dependent upon stimuli which radiate along a specialized type of nerve—named by him the "nocifensor nerves"—to the distant areas and there induce biochemical changes. In this way the threshold for pain for the ordinary sensory nerves in the corresponding area is lowered. Lewis's work so far has concerned itself solely with the demonstration of the peripheral manifestations of this phenomenon.

The Lesion and its Pains

I have already indicated that the dominating symptom in the complex which is the subject of this discourse is abdominal pain. In some cases the area of pain and tenderness may be widespread over the abdomen, but in the large majority it is restricted to the lower segment. In a typical case the chief emphasis is found in the iliac fossae, and especially the left iliac fossa. Cases with a

restriction to one iliac fossa exhibit a preponderance on the left side in the proportion of about four to one.

Mesial Visceral Pain

Although this does not ordinarily constitute the main pain symptom, I will discuss it first because it would seem in its genesis to possess the features which are generally ascribed to a visceral pain. It is expressed in two clinical forms: (a) As a *spontaneous* discomfort or actual pain vaguely located to the retropubic area and lower mesial abdomen (Fig. 1). It is rarely present alone,

FIG. 1.—Mesial visceral pain. Typically this is low in situation and it is poorly localized. It is present as (a) spontaneous and (b) excitation pain.

and it is not associated with hyperalgesia, muscular rigidity, and local tenderness on pressure. Its main and almost invariable clinical manifestation is (b) as a pain felt immediately when the finger placed in the vagina exerts pressure against the cervix. Under these conditions the sensation may be acute, and in severe cases may cause the patient to cry out because of its intensity. Typically the patient has difficulty in locating it; she may state that it is felt deeply in the pelvis or she may place her hand somewhat vaguely over the pubes and lower abdomen. In the indefiniteness of its mesial localization it at once suggests the true visceral pain of other diseased states. To the pain excited by pressure on the cervix in this manner I have applied the term *visceral excitation pain*.

To appreciate the significance of this excitation pain we have to remember that in health the cervix may be moved in any direction through a considerable range without pain being elicited. The fact that in a typical case pain can be induced by even the slightest pressure endows it therefore with a considerable clinical significance. In passing it may be remarked that fixation of the cervix by contracture in traumatic or inflammatory tissue is a common finding in cases exhibiting this sign. Displacement of the organ is also not infrequent, either laterally or posteriorly, although, as I have elsewhere shown, this displacement may in some cases be due to muscle spasm, which disappears under anaesthesia and after treatment. Further, although a lesion of the kind which we have previously described constitutes the essential causal factor, in many instances, and so long as the inflammatory condition is limited to the lower vaginal cone of the cervix, both the spontaneous and the excitation pains may be absent. Moreover, it is notorious that even when the external and visible signs of infection have resolved after treatment the pains may persist, either

because of a remaining more deep-seated inflammatory change or because of the sensitiveness of the residual scars. The complex sometimes follows trauma that results in scarring without the supervention of any external evidence of infection. It is clinically important to observe that in cases exhibiting excitation pain *dyspareunia* is both a characteristic and a distressing symptom. The condition indeed is the most common cause of dyspareunia in the parous woman.

A further point of considerable importance to note is that the cervix itself in these cases often acquires a true inherent sensitiveness. In the healthy woman the cervix, like other hollow abdominal viscera, can be subjected to ordinary trauma without the creation of pain. It can, for example, be seized between the blades of a vulsellum forceps without suffering being caused. In the condition under discussion this insensitiveness is often abolished. The cervical lips are no longer immune to even such mild trauma, and in exceptional cases, indeed, I have found that the gentle pressure of a probe against the cervical surface may elicit a severe pain reaction. These pains all possess the vagueness of localization, characterizing the ordinary excitation pain.

Iliac Fossa Referred Pain

This, the dominating symptom in a typical case, may be present in both sides of the lower abdomen. Characteristically, however, it is restricted to one side, more commonly the left. The pain distributed in this way exhibits itself: (a) as spontaneous pain, (b) as local tenderness, and (c) as well-localized excitation pain. The *spontaneous* pain may consist of an aching, ever present during the waking hours, or, more commonly, of a pain which comes and goes, being prone to aggravation before

FIG. 2.—Referred pain. Typically this is situated in one or both sides of the lower abdomen. Where unilateral it is more often on the left side. It is present as (a) spontaneous pain, (b) cutaneous hyperalgesia and deep tenderness, and (c) excitation pain. Deviation of the cervix to side of pain is common.

menstruation and during exertion. It may be widely spread over the lower lateral quadrant or it may be more localized. It is associated with *local tenderness*, often over a smaller area, which is usually easy to delimit. In many instances it is restricted to a segment about two inches square lying below and external to the umbilicus. There is generally an associated hyperalgesia of the skin, but muscular rigidity is typically absent. A further observation almost invariably made is that where this referred

segment of spontaneous pain and local tenderness exists pressure on the cervix at once excites pain in an acute and well-localized form in the same area. To this phenomenon I have applied the term *referred excitation pain* (Fig. 2). Excitation pain of this kind is more frequently encountered than the visceral type already described, and it constitutes the main manifestation of the dyspareunia complained of by the majority of such women.

Data Obtained from the Effects of Treatment

Local Treatment.—Before proceeding to a further discussion of this problem it is necessary to interpolate some data derived from the results of treatment directed to the cervical lesion. In a previous communication (Young, 1930) I reported a follow-up of sixty-seven cases over a period varying from two to twelve months subsequent to the routine treatment which we adopt in such cases—namely, dilatation of the cervix, radial incision of the infected area with the electric cautery, and deep puncture of the tissues, including evacuation of the gland cysts which are found in a large proportion of the cases. In thirty-three, or 49 per cent., there was complete relief of pain, whilst in twenty-one, or 31 per cent., there was partial relief. Including a further series of 116 cases we now have records of 183 cases unassociated with any other recognizable lesion, showing after this simple procedure a cure of pain in eighty-five, or 46.4 per cent., and cure or partial relief of varying degree in a total of about 80 per cent. In a number of the partial or complete failures a repeat operation effects entire clinical recovery.

Blockage of Pelvic Nerves.—Despite the good results of these measures, a considerable proportion obtain little or no relief, and in 1932 (Young, 1933) I introduced for this class of case a method aiming at blockage of Frankenhäuser's plexus by an injection into the base of the broad ligament along the side of the cervix of 5 to 10 c.cm. of 85 per cent. alcohol, after the procedure adopted successfully for the treatment of trigeminal neuralgia. In the preliminary communication published in 1933 I recorded eight cases so treated, with relief in seven. Since then I have employed this method in forty-eight cases, with complete immediate relief in forty-one—that is, with a percentage success over both series of 85.7. In my preliminary paper I noted—and this has been borne out in the larger series—that the relief so obtained often only lasts for two or three months, and that for these cases repetition of the procedure is necessary. Recently, however, Sutherland (1937) has employed proctocaine (benzyl alcohol 5 per cent., butyl-p-aminobenzoate 6 per cent., olive oil to 100 per cent.) as a substitute for alcohol, and claims complete relief maintained over the period studied (three to twenty months) in twenty-six out of fifty cases, or 52 per cent., and partial benefit and cure in 42, or 84 per cent. For the last six months this procedure has been adopted in my clinic, and although the period is too short to allow of a conclusive statement I have gathered the impression that the method is an improvement on that in which alcohol is used. In parenthesis I would here state that in order to give the patient reporting for the first time the maximum chance of relief it is now my custom to employ a regime in which the treatment directed to cervical drainage is combined with nerve blockage.

The relief conferred by the procedures just mentioned is not restricted to the alleviation of the pains which we have described as characterizing the majority of the cases.

Apart from the improvement in the general health and well-being of the patients, which is often rapid and striking, there is in an otherwise successful case usually an immediate relief in the *bladder irritability*, often a distressing element in the syndrome. In the majority of instances this is unassociated with any abnormal constituents in the urine or any evidence of organic lesion in the urinary tract. Within a relatively few hours after the cervical drainage and the nerve blockage the urinary symptoms (diurnal and nocturnal frequency and occasionally dysuria) clear up. It would seem legitimate to assume that these functional disturbances are dependent upon nerve irritation. In some instances there is, in addition, pain related to the bowel and associated with defaecation; in such cases excitation pain may be referred to the back passage. Relief in these respects is also usual.

From what has been said it will have become apparent that there is a small group comprising those who fail to respond to any of the therapeutic measures which we have so far been able to devise, and there is a considerable group of patients in whom the response is only temporary. These groups at the moment are the subject of special study. In some instances relief may be obtained by hysterectomy, although this is by no means certain: out of five such cases the pain persisted in two. Presacral neurectomy, as practised by Cotte (1928) for intractable pelvic pain, fails to give relief in this condition (Young, 1933). Of course in the recalcitrant case a possible error in diagnosis must not be overlooked; this aspect of the subject I shall consider on a subsequent page.

Anatomical Basis of the Visceral and Referred Pains

Visceral Pain.—The mesial and low situation of this pain (corresponding to the twelfth dorsal and first lumbar nerves), its poor localization, and its freedom from any accompanying local tenderness, taken in conjunction with the method in which it is evoked by excitation, all strongly suggest that it arises in the cervix or immediately adjacent tissues. While its actual genesis cannot be established with certainty, the readiness with which it responds to procedures directed to blockage of the nerves at the side of the cervix is in keeping with the view that the nerve stimuli pass upwards along Frankenhäuser's plexus (the inferior hypogastric plexus), the rich bundle of sympathetic fibres which on each side form the downward extension of the superior hypogastric plexus or so-called presacral nerve. These plexuses reach the cervix on each side after encircling the ampulla of the rectum.

Referred Pain.—The relatively high situation of this pain (corresponding in a typical case to the tenth, eleventh, and twelfth dorsal segments), its more or less precise localization in the side of the abdomen, and its associated hyperalgesia and local tenderness, all by analogy strongly suggest that it is not directly visceral in origin and that it should be classed among the referred pains, which in other sites are peritoneal in their genesis. In the absence of reliable data it is impossible to ascribe to them an accurate pelvic source, but the circumstances underlying their easy excitation by cervical pressure are in keeping with the view that they arise from irritation extending beyond the confines of the cervix to the adjacent peritoneum of the pouch of Douglas or broad ligament. In Fig. 3 I have, in diagram, represented the speculative source of the (A) visceral and (B) referred pains. According to such a conception we must assume that the nerve blockage succeeds because it includes the fibres supplying both irritable foci—cervical and peritoneal.

That the visceral and referred pains have such a separate and distinct anatomical basis is supported by two further observations: (i) one pain may exist without the other, and (ii) the procedures directed to nerve blockage may on occasion exert a differential selection in

FIG. 3.—Speculative origin of (A) visceral and (B) referred pains.

respect of the two pain phenomena. Thus it sometimes happens that complete relief in one set of pain phenomena is obtained without the other being affected: infiltration of one side with procaine may abolish the referred pain in the corresponding iliac fossa and leave the visceral pain unaffected till similar blockage of the opposite side is carried out.

Low Back Pain

Pain in the lumbo-sacral area is commonly present in women who exhibit the abdominal pain syndrome. Where the symptoms show the puerperal correlation the backache may either date from the latter months of pregnancy or, more commonly, it may only appear after—sometimes some weeks or months after—childbirth. The factors responsible for the common backache of parous women are still obscure, and the wider issues of the subject are not germane to the present discussion. Suffice it to say that from a somewhat confusing symptomatology we can assemble with a degree of precision three more or less definite and distinct clinical conditions: (a) backache directly due to genital prolapse and major pelvic disease, which in each case responds to the appropriate treatment; (b) backache which is orthopaedic in origin and due to involvement of the sacro-iliac or lumbo-sacral joints (cases with a puerperal correlation are often immediately relieved by manipulation—forcible flexion and extension of the spine and rotation at the sacro-iliac joints); and (c) cases that are associated on the one hand with no evidence of joint pathology, and on the other with no pelvic disease except the lesion which has been discussed on the preceding pages. Here excitation pain, poorly localized and referred to the corresponding area in the back, is typically found, and dyspareunia is usually a prominent clinical feature. In such cases blockage of the pelvic nerves is generally successful.

Cases Illustrating the Effects of Nerve Blockage

In the following short clinical records the method which we have latterly introduced for the routine treat-

ment of our cases is made clearer than is possible in the text. The employment of procaine as a routine procedure enables one to determine the extent to which relief may be expected in any individual case by the placing of the proctocaine. It provides at the same time a valuable method of studying the nature and response of the various elements in the pain complex.

CASE I

A 3-para, aged 29, whose last pregnancy ended in miscarriage five years ago.

Complaint.—Leucorrhoea, five years; pain in the left iliac fossa, aggravated pre-menstrually, five years; dyspareunia, five years; frequency of micturition, diurnal and nocturnal.

Examination and Treatment.—October 26, 1937, 10 a.m.: There was no tenderness in the abdomen. The cervix was infected and was mobile; excitation pain was present in the low mesial abdomen, poorly localized. 10.17 a.m.: 10 c.cm. 1 per cent. procaine, left side. 10.20 a.m.: 10 c.cm. 1 per cent. procaine, right side. 10.27 a.m.: Excitation pain gone. 10.40 a.m.: 10 c.cm. proctocaine, both sides. 10.43 a.m.: cauterization of cervix and puncture of Nabothian follicles. November 1, 10.30 a.m.: Excitation pain gone; discharged from hospital. December 23: No spontaneous or excitation pain; dyspareunia, frequency, and leucorrhoea completely relieved.

CASE II

A 2-para, aged 55; last pregnancy eighteen years ago; menopause four years ago.

Complaint.—Leucorrhoea, thick and yellow, one year; pain in left iliac fossa, constant and marked, one year; pain in low back, three months; dysuria and urgency; severe constipation with marked dyspeptic symptoms, pain on movement of bowels; health depreciating, loss of weight, fainting attacks.

December 17, 1936: X-ray investigation to exclude bowel neoplasm—negative; no x-ray evidence of abnormality in spine or pelvic joints. December 24: Physician diagnosed "spastic constipation." January 2, 1937: Surgeon found no trouble in sacro-iliac or lumbo-sacral joints: "Redundancy in rectal mucosa three inches from anus. Area acutely tender. In view of the negative x-ray and laboratory findings I think this is part of an abdominal hypersensitiveness associated with her enteroptotic condition. Her caecum and ascending colon to-day are hyperresonant and the liver dullness is reduced."

Examination and Treatment.—January 10, 1937, 10 a.m.: Spontaneous pain, diffuse over lower abdomen, marked in left iliac fossa; tenderness and superficial hyperalgesia in iliac fossae—marked in left; excitation pain very marked in left iliac fossa. 10.15 a.m.: Endocervical polypus removed; 10 c.cm. 85 per cent. alcohol on each side. January 11: No spontaneous pain, no local tenderness, no excitation pain, no pain on movement of bowels; discharged from hospital.

January 20: As above; general condition very much improved. February 2 to 9: Readmitted because of swelling of left ankle; abdominal condition satisfactory. March 24: Pain in right and left iliac fossae; tenderness and excitation pain have recurred. June 2: Diffuse lower abdominal spontaneous pain, especially in left iliac fossa and extending downwards on inner aspect of left thigh; marked cutaneous hyperalgesia and tenderness in both iliac fossae, especially left; excitation pain in left iliac fossa. June 4: Cervix healthy; proctocaine, 10 c.cm. left side, 5 c.cm. right side. June 6: Spontaneous pain, tenderness, and excitation pain gone. September 15: Feels well; putting on weight; constipation still severe; slight pain in lower abdomen. October 6: Pains and aches have recurred as bad as ever. October 16, 9 a.m.: Spontaneous pain diffuse lower abdomen; cutaneous hyperalgesia and tenderness in both iliac fossae, especially left; excitation pain in left iliac fossa. 9.15 a.m.: 10 c.cm. 1 per cent. procaine, left side. 9.25 a.m.: Tenderness and excitation pain unrelieved; 10 c.cm. 1 per cent. procaine, right side. 9.28 a.m.: Tenderness right side gone, tenderness left side unrelieved; excitation pain unrelieved. 9.35 a.m.: 6 c.cm.

more of procaine, left side. 9.40 a.m.: All pain and tenderness gone; 8 c.cm. procaine each side. October 17, 10 a.m.: No pain, slight tenderness left iliac fossa. December 2: No spontaneous pain, tenderness, or excitation pain; dysuria and frequency completely relieved; general condition much improved.

CASE III

This patient, aged 22, had her first child one year ago; spontaneous birth.

Complaint.—Leucorrhoea, copious and offensive, one year; pain over sacral area of back, nine months; dyspareunia, nine months; tired, loss of energy—formerly well and vigorous.

Examination.—Nothing abnormal was seen in the abdomen, and there was no local tenderness in the back. The cervix was infected, fixed, and markedly retroposed; severe pain was felt "deep down towards the back" on moving the cervix; poor localization.

Treatment.—October 29, 1937, 11.15 a.m.: Severe excitation pain deep in pelvis—badly localized; caused patient to cry out. 11.18 a.m.: Pain on grasping cervix with vulsellum. 11.24 a.m.: 8 c.cm. 1 per cent. procaine, left side. 11.25 a.m.: 8 c.cm. 1 per cent. procaine, right side. 11.32 a.m.: Excitation pain gone. 11.35 a.m.: 10 c.cm. procaine, right side. 11.37 a.m., 10 c.cm. procaine, left side. 11.40 a.m.: Cauterization of the infected cervix. November 1: No spontaneous pain in back since operation; no excitation pain. December 23: No spontaneous pain, tenderness, or excitation pain; dyspareunia and leucorrhoea completely relieved.

REMARKS ON CASES I, II, AND III

Cases I and III are common examples in young women of the comparatively early and generally easily curable stage, in which drainage of the cervix is often alone sufficient to effect relief. The recognition of the condition at this early stage is important if the patient is to be protected against a long period of suffering, with the production of a far-reaching systemic upset. Case II is an example in an older woman of the more intractable condition in which treatment effects only a temporary relief. Here the problem is more difficult, for while treatment succeeds in curing the active cervical disease, it does not clear up the pain arising in the residual "scars" for more than three months. Major surgical procedures give no assurance of relief, and such cases in the past have tended to bring surgery into disrepute.

General Discussion

The above observations would seem to make it clear that within the ambit of the one syndrome there are two essentially different pain mechanisms. They differ, first, in regard to the site at which the pain is felt in relation to the body surface and, secondly, in regard to the inherent nature of the sensations experienced. The separateness of the two phenomena lends support to the argument of Morley that the visceral and referred pain mechanisms employ different kinds of nerve tracts. Morley has suggested that, while the splanchnic nerves subserve the visceral mechanism, the cerebrospinal nerves are concerned with that of referred pain and tenderness.

To the student of pain genesis these phenomena, as seen in their somewhat crude form by the clinician, open up intriguing lines of investigation. There are surely few fields in medical research in which the anatomist and physiologist can with more signal advantage be ranged alongside the clinician in pursuit of a common end. Among the many problems that await solution there are two which stand out because of their clinical bearing. The first concerns the study of the nervous arc by which the impulses originating directly or indirectly from visceral

disease are eventually registered on a somatic surface as pain. In this connexion the experimental work of Pollock and Davis (1935) has already suggested that the arc involved in the referred pain produced by irritation of the diaphragmatic terminals of the phrenic nerve is much more complex than is generally believed. According to these observers the posterior roots, four segments of the cord, the efferent sympathetic fibres, the cervical sympathetic ganglia, and the sensory nerve endings and sensory nerves of the cerebrospinal system are all implicated.

The second problem relates to the intimate meaning of the various subjective reactions. Take for example the two clinical manifestations of the visceral pain—that which is spontaneous and that which is elicited by excitation. In so far as these are both conceived as arising in and being felt in the viscus, although registered at a site depending upon the spinal segment affected, they may be regarded simply as originating from one and the same local factor, which in the case of excitation is merely increased in intensity. In respect of the referred pain complex, on the other hand, the facts do not lend themselves to such an easy theoretical interpretation. Here the pain would seem to be more definitely felt at the site of registration, whether spontaneous or excited or in the form of tenderness. The interpretation of this, the feature which specially distinguishes the referred phenomena, is not affected by the choice we make between the two competing views of the essential mechanism involved—that is, whether we regard the reference to the distant somatic site as merely due to the creation of an irritable focus in the corresponding segment of the cord or whether we postulate a stimulus sent along the segmental arc to the somatic tissues with the production of biochemical changes at the sensory terminals. The existence of superficial hyperalgesia and local tenderness as an ingredient in the referred complex necessarily implies that the tissues at the site of registration enter into the scheme, though it is true that it cannot be argued from this that the spontaneous and excitation pains of necessity also depend upon the same superficial nerves for their appreciation. I have attempted to test this question by observing the effects of local anaesthesia applied to the abdominal wall. In general it is found that while local anaesthesia of the skin alone abolishes superficial hyperalgesia it does not affect the local tenderness or the excitation pain. Anaesthetization of the entire thickness of the abdominal wall from skin to peritoneum, which is necessary for a complete test, has not so far been employed. In any case there would seem to be a distinct difference between the mechanisms of tenderness and excitation, in that while the former implies a lowering of the threshold for pain in response to impulses previously discharged from the primary lesion, it is difficult to explain excitation pain at the same distant site except on the basis of a new reflex stimulus which for its appreciation is independent of the threshold mechanism as this is ordinarily understood. In other words, while stimulation of the sensory terminals at the surface site is necessary for the eliciting of the tenderness, there is no evidence that such is necessary for the eliciting of the excitation or, for that matter, of the spontaneous pain. That tenderness and spontaneous pain are dependent upon a continuous flow of stimuli from the primary source is proved by their immediate disappearance after blockage of this source with procaine.

Some Points in Differential Diagnosis

The establishment on a sound basis of this common syndrome enables us, from the varied conditions responsible for chronic abdominal pain in women, at once to

remove a large—I believe the largest—group, which is easily recognized by its well-defined clinical features. It may be claimed with justice to have effected a veritable clearance in a lumber-room of diagnostic confusion. Most of us can recall the days when the chronic abdominal pains which are the subject of this study were ascribed to conditions as unsatisfying to the conscientious clinician as they were ill founded in pathology—for example, varicocele of the pampiniform plexus, sclerotic ovaries, ovaritis, prolapse of the ovary, constipation, adhesions, neurasthenia, etc.

The absence of gross pelvic and abdominal pathology and the puerperal correlation usually suffice at once to distinguish the syndrome from the major causes of lower abdominal pain—neoplasm, endometrioma, diverticulosis, appendicitis, etc. In subacute and chronic salpingitis there may be confusion, especially where the history dates from childbirth or abortion, but the presence of a tender, fixed, often bilateral mass in the posterior pelvis generally establishes the diagnosis. In some few cases the syndrome may be simulated by endometrioma; but here the puerperal correlation is usually absent, and whereas the former is very common in young women endometrioma is more frequent in later years. In endometrioma, moreover, the characteristic tender and fixed mass in the pouch of Douglas is often found. At the same time in women over 30 with a menstrual exacerbation of the pain endometrioma should always be considered. A chronic pelvic appendicitis may sometimes closely simulate the condition, though here again the characteristic puerperal dating is generally absent. It should be remembered that in such conditions as salpingitis, endometrioma, and pelvic appendicitis, where a tender swelling is present low in the pelvis, vaginal excitation pains are usually easily elicited, and therefore they cannot of themselves be regarded as of great value in the relatively rare cases which are in doubt. A common source of clinical confusion is in regard to recurrent appendicitis, and it is notorious that a large number of women with right iliac fossa pain have had their appendix removed before coming to our clinic. It is of the utmost importance that the surgeon should be more familiar with this common source of iliac fossa pain and its diagnosis. The easy establishment of referred excitation pain in the right side and its immediate removal by nerve blockage are the main diagnostic aids.

Finally, it is important to remember that in a large number of gynaecological conditions a serious error in diagnosis may arise from a failure to recognize that iliac fossa pain may spring not from the more apparent pathology, such as retroflexion, genital prolapse, etc., but from the frequently coincident cervical lesion. The institution of treatment appropriate to this lesion may eliminate the indication for more major treatment; where major measures are required the associated syndrome should be dealt with at the same time.

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CULTURAL METHODS IN BACTERIOLOGICAL DIAGNOSIS OF TUBERCULOSIS

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Using the Jensen (1932) modification of the medium introduced by Löwenstein (1930), Holmes (1934) drew attention to the value of cultivation in the diagnosis of tuberculosis. Of the many observations of similar nature may be mentioned those of Hohn (1926), Sweany and Evanoff (1928), Bezançon and Buc (1931), Herrold (1931), Corper (1932), Danbolt (1935), Cummins and Duggan (1934), and Mishulow and others (1934). Shrewsbury and Barson (1937) noted successful results following the introduction of cultivation as part of the routine investigation of selected specimens of sputa. In order to determine the practical value of the method the same procedure has been adopted in this laboratory with all specimens in which an examination for *B. tuberculosis* was requested, and the results obtained over a period of two years are here recorded. Sputa from recognized or clinically suspicious cases of human tuberculosis comprised the bulk of the material examined, which also included specimens of urine, pleural fluid, milk, and cerebrospinal fluid. The previous routine examination was adhered to and the results compared with those secured by the additional aid of cultivation.

Methods

Routine Examination.—The examination of sputa consisted in the usual microscopical examination of films stained by the Ziehl-Neelsen method. The finding of acid-fast and alcohol-fast bacilli morphologically identical with *B. tuberculosis* was reported as a "positive" result, the absence of such forms being reported as "tubercle bacilli not found." The same procedure, preceded if necessary by centrifugation, was adopted with all other specimens save in the case of milk. Guinea-pig inoculation was carried out in specimens other than milk only if special request was made, but in examining milks the animal test was invariably utilized.

Cultural Methods.—If the specimen received was likely to be free of organisms other than tubercle bacilli—for example, cerebrospinal fluid withdrawn at lumbar puncture—the centrifuged deposit of such specimens was directly inoculated on culture media without further treatment. In the presence of contaminating organisms the material was first centrifuged if necessary. The deposit was then suspended in 2 c.cm. of the supernatant fluid, acidified for thirty minutes by the addition of an equal volume of 6 per cent. hydrochloric acid, and neutralized by the addition of 4 per cent. sodium hydroxide. The centrifuged deposit was then inoculated by means of a sterile Pasteur pipette on culture media. In a previous examination of a large number of cerebrospinal fluids and specimens of pus for tubercle bacilli the preliminary acid treatment had been successfully used, and the same procedure was therefore adapted to the examination of sputum instead of the usual alkali method.

The culture media most frequently used were the Löwenstein-Jensen medium and a modification of the same in which the glycerin content was omitted. All specimens were cultured on both media in screw-cap bottles. Considerable economy in incubator space and the easy handling of large numbers of bottle cultures were secured by the use of a rack consisting of a wooden