REFERRED PAIN AND IN PARTICULAR THAT ASSOCIATED WITH DYSMENORRHOEA AND LABOUR

A PRELIMINARY REPORT

BY

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Hunter demonstrated that an animal could eat its food with relish while its viscera were being cut or burned, and this remarkable insensitivity of the abdominal viscera, together with the visceral peritoneum covering them, has aroused increased interest since the advent of abdominal surgery. A neurologist, Ross of Manchester (1888), was the first to suggest that disease of the abdominal organs occasioned two kinds of pain: a true splanchnic pain felt in the diseased organ, and an associated somatic pain felt in the body wall supplied by the cerebro-spinal nerves of the same segment of the cord. Mackenzie, who was already at work on this problem, developed the conception of referred pain, and postulated a viscerosensory and visceromotor reflex. Head (1893) and Hurst (1911) provided convincing evidence in favour of Mackenzie's theory, although the latter writer believed in a true visceral pain. Lennander (1903) adopted a more simple explanation, and concluded that the sensation of pain associated with disease of the abdominal organs arose in the peritoneum, its subserous coat, and, in the presence of inflammation, in the root of the mesentery, all these structures being supplied with cerebro-spinal nerves. This hypothesis, although attractive, is untenable, because it cannot explain certain facts.

Criticisms of Mackenzie's Theories

More recently Morley (1931) has challenged Mackenzie's theory, which he maintains was built on an unproved assumption. In his opinion "referred pain only arises from irritation of nerves which are sensitive to those stimuli that produce pain when applied to the surface of the body." He has therefore introduced the terms "peritoneo-cutaneous radiation" and "peritoneo-muscular rigidity," and his hypothesis may be regarded as being in one sense an extension of that advanced by Lennander. It is probably true to state that modern physiological opinion rejects the possibility of accurately localized abdominal pain, with somatic manifestations of tenderness and rigidity, being caused by irritation of autonomic nerves. The purpose of this communication is to record observations on uterine pain which support Mackenzie's conception of a viscerosensory reflex.

Referred Pain from Cervix

In an attempt to find a simple treatment for endocervicitis and erosion of the cervix which could be easily carried out in the out-patient department I introduced the stick of silver nitrate. This method has proved eminently satisfactory over a period of more than two years. Although patients in the post-natal clinic rarely, if ever, complained of any pain from this treatment, many in the gynaecological ward did. Although it is not possible to say beforehand which patient will not suffer pain, it soon became evident that pain was caused in every patient who suffered from dysmenorrhoea, and that the pain elicited was almost identical with that experienced during menstruation. It usually begins in the mid-line of the abdomen at a point about one-third of the distance from the symphysis pubis to the umbilicus and radiates from there across the lower abdomen. Some-

times the pain extends to the lateral region of the back over the crest of the ilium, and occasionally it is localized to the groins and to the insides of the thighs. On no occasion was sacral backache elicited, except in patients who normally suffer from pain in this region, due, it is believed, to traction on, or inflammation of, the pelvic peritoneum. The pain was sometimes felt almost immediately, but in many cases was deferred for from one-half to four hours after application of the silver. The duration of the pain varied considerably, and in some patients exceeded thirty-six hours. In patients who suffered from dysmenorrhoea the intensity was occasionally so great that morphine had to be injected. Beads of perspiration broke out over the face, and marked hyperalgesia, associated with muscle guarding, developed in the skin of the lower abdomen. The patient threw herself about in intense agony and vomited, although it is of interest to note that emesis occurred apart from intense pain.

The cervix uteri is considered to be more or less insensitive, and may be grasped with the vulsellum and cauterized without any anaesthetic. It is evident that the autonomic nerves with which it is richly supplied are, like the somatic nerves, stimulated by silver nitrate. It has not been possible to prove that these nerve endings are actually stained by the silver, but sections show the stain to reach as far as the submucosal layer. The pain elicited is localized to the area of skin supplied by branches of the first lumbar nerve, and although every patient described the pain as being "deep," it could, on several occasions, be abolished by anaesthetizing the nerve endings concerned. It seemed probable from these observations that the pain of dysmenorrhoea was likewise a referred pain which could be similarly relieved. This was found possible in the only case which has been observed since this deduction was made.

Observations on Labour Pain

The next obvious step was to determine whether the pains of labour were also an expression of pain referred from the uterus along the same nerve paths. It is not always realized that the abdominal pain often becomes increasingly severe until delivery, and for this reason low spinal anaesthesia is of relatively little value in the relief of the pangs of childbirth. Although only a few cases have been tried and the technique is at present experimental, there would appear to be but little doubt that the pains of labour, with the exception of the stretching of the perineum during delivery, are largely, if not entirely, referred along cutaneous nerves. The abdominal pain may be completely abolished by infiltrating the iliohypogastric and the ilio-inguinal nerves, and the sacral pain can be markedly diminished, if not completely relieved, by infiltrating the pudendal nerves. One example may be given.

A primigravida, aged 40, with auricular fibrillation, who had been admitted to the ante-natal ward with failure of compensation and kept there for three months before delivery, suffered considerable pain during the early hours of her labour. The pulse became more irregular and rapid and the lips cyanosed; the woman was worn out before the cervix was one-quarter dilated. At this juncture the nerves enumerated were infiltrated. All pain disappeared, her pulse improved remarkably, and she slept peacefully between the uterine contractions until delivery some twelve hours later.

It was, moreover, found possible to bring down a leg in a case of marginal placenta praevia at term and to effect subsequent delivery of the breech some hours later, under local anaesthesia.

It is interesting to note that the abdominal pain of labour is an example of viscerosensory referred pain, whereas the sacral pain of the second stage is referred from one somatic nerve to others of the same spinal segments. Pain is occasionally felt in the region of the

fundus and may be abolished by infiltrating the area of skin involved. This pain is probably an example of peritoneo-cutaneous radiation.

The local anaesthesia is effective for three to eight hours, and the fact that it has been found possible to ensure absolutely painless childbirth proves the truth of Mackenzie's theory of referred pain so far as the uterus is concerned, and at the same time offers the hope that an improved technique will ensure painless childbirth without any risk to the mother or the child, and without the continuous attendance of an anaesthetist.

Summary

1. Stimulation of the autonomic nerve endings in the cervix by silver nitrate causes a referred pain appreciated in the area of the skin supplied by branches of the first lumbar nerve. This pain may be abolished by local anaesthesia.

2. Dysmenorrhoea is largely, if not entirely, a referred pain appreciated in the area of skin supplied by branches of the first lumbar nerve, and the pain may be abolished by local anaesthesia.

3. The pain in the lower abdomen and the lateral backache of labour are manifestations of viscerosensory referred pain appreciated in the area of skin supplied by the first lumbar nerve. The sacral backache of labour is a pain referred from one somatic nerve to others of the same spinal segments.

4. While it is too early to be dogmatic there seems every reason to believe that a simple and safe technique can be evolved to render childbirth painless.

I am much indebted to Dr. John Kirk of University College for his help and demonstrations, and for allowing me to make dissections on the cadaver; and to Professor James Young for the opportunity of carrying out this investigation on patients admitted under his care. I wish also to thank Sir Frederick Menzies for permission to refer to patients admitted to the hospital services under the control of the London County Council.

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R. Dupérié, A. Fontan, J. Dubarry, and R. De Lachaud (*Gaz. Hebdomadaire des Sci. Méd. de Bordeaux*, September 20th, 1936, p. 597) record the case of a man aged 29, inoculated against typhoid fever nine years previously, who developed a severe attack of typhoid complicated in convalescence by a purulent pleural effusion, from which *B. typhosus* was cultivated, followed by paralysis of the left half of the diaphragm due to neuritis of the phrenic nerve. In a few days, however, the paralysis diminished and then disappeared. Further recovery was uneventful. Pleurisy is an uncommon complication of typhoid fever, occurring in only about 2 per cent. of all cases, and empyema is extremely rare and dangerous. The fluid was at first puriform and sterile, but on the fourth puncture intracellular and extracellular typhoid organisms were found.

R. J. H. Silvestre (*Thèse de Paris*, 1936, No. 693), who records two illustrative cases in a girl aged 15 and a woman aged 31, states that Parkinsonism in typhoid fever may occur in one of two ways. In the first place it may develop rapidly during typhoid encephalitis without in any way aggravating the course of the disease. Although this is always of a severe and often fatal character, if the patient survives complete recovery takes place. In the second type the Parkinsonian syndrome pursues a slower course, with successive aggravations of the condition which may prove fatal. But if the patient survives the attack of typhoid fever the syndrome persists, although it is always incomplete and is often very slight in character.

PENTOTHAL SODIUM ANAESTHESIA

BY

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Pentothal sodium is the most recent of the barbiturate intravenous anaesthetics, and with its introduction a distinct advance has been achieved. I have just completed one hundred personally conducted and selected cases. Stress must be laid on "selected," because one should always be particularly careful when using new anaesthetics, especially intravenous anaesthetics, for the first time. Having carefully digested the very helpful articles by Dr. Ronald Jarman and Mr. A. Lawrence Abel (*Lancet*, February 22nd and March 14th, 1936), I started off fully confident that pentothal sodium was well worthy of a trial. The appended list of cases in which I have used pentothal, either alone or in conjunction with gas-oxygen or ether, will demonstrate that a large variety of cases have been dealt with in this series.

From the beginning it was apparent that induction was smoother and quieter; the yawning and twitching which sometimes accompany induction by evipan sodium were absent. Administered at the rate of 1 c.cm. every twenty seconds, I find that considerations of age, weight, and physique being equal there was a wide range in the dose required to reach the stage at which patients no longer answer questions; this dose varied from 1.5 c.cm. to 4.5 c.cm. The dose necessary to produce surgical anaesthesia also varied considerably; sometimes 2 c.cm. sufficed, while on two occasions 10 c.cm. were totally inadequate for even minor surgical operations.

As anaesthesia deepens the pulse becomes accelerated and the pupils dilate, but both pulse and pupils soon return to normal. Respiration, except for some shallowness, remains unchanged; this shallowness, accompanied by slight cyanosis, becomes very marked if the injection is given too rapidly. A clear and unimpeded airway is an absolute essential. Oxygen should always be at hand, and if necessary used by itself or in conjunction with carbon dioxide. So far I have never had to fall back on either of these. In two cases in which there was some cyanosis with marked shallowness of respiration the surgical incision stimulated the patient to normal but quick respiration, with immediate return of colour. In operations of short duration—for example, teeth, tonsils, abscesses, etc.—not requiring that depth of anaesthesia necessary for abdominal relaxation, a little experience will soon enable the anaesthetist to gauge to a nicety the minimal dose required for each case. This is important, as it means a very rapid return to consciousness; most patients appreciate this. I find that recovery after pentothal administration takes place more rapidly than when evipan has been used, and there is no post-anaesthetic restlessness. In these cases, providing that no specific contraindications exist, pentothal can be used with absolute safety.

Use in Abdominal Surgery

In abdominal surgery I have used pentothal in twenty-three cases—twelve appendicectomies, five herniotomies, five cholecystectomies, and one case of bowel resection.

Eight of the twelve appendicectomies and three of the five herniotomies were done under pentothal alone; the others required a small supplement of ether. For the gall-bladder cases and bowel resection pentothal was only used as a basal anaesthetic, 5 c.cm. being given in each case. When pentothal alone is used in abdominal surgery I find that occasionally traction on the peritoneum or manipulation of the bowel causes a slight hiccup; a