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ASPECTS OF DIAGNOSIS AND TREATMENT*

Abdominal pain of spinal origin

Value of intercostal block

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Summary

A prospective study was made of 73 patients presenting in one year with abdominal pain provisionally diagnosed as of spinal origin. The criteria for audit of diagnosis and treatment are defined. The diagnosis was confirmed in 53 patients, 49 of whom had been treated with a lignocaine intercostal block in the relevant segment. Thirty-three of these (67.3%) had both complete and prolonged relief. It is suggested that the block causes interruption of a vicious circle of pain and muscle spasm in a 'spinal reflex pain syndrome'.

Introduction

Abdominal pain of essentially spinal origin may go unrecognized when there is no back pain. Its recognition may avoid unnecessary investigations and futile treatment. Here 'spinal' is used in the sense of both vertebrae and cord. The pains, whether root, referred, or both, are symptoms, not diagnoses[1], and occasionally reflect serious disease. With deep, dull, referred pains[2] no characteristic qualities distinguish a parietal from a visceral cause; both are frequently present[3] and each leads to reflex muscular rigidity, areas of reflex tenderness, and sensory changes.

In 1926 Carnett[4] described simulation of visceral pain by 'intercostal neuralgia'. The symptoms were acute or chronic, constant or intermittent, transient or spread over many years. His key sign was tenderness persisting when the abdominal muscles were tensed.

The pain may arise through one or more mechanisms: (1) primary root pain; (2) referred pain from structures of the vertebral axis; (3) secondary effects—(*a*) referred pain due to excessive reflexes provoking high-threshold receptors in joints and muscles[5] or (*b*) root pain due to compression by reflex muscle spasm.

Even when an initial painful stimulus has ceased the secondary effects may cause a 'vicious circle' of pain and spasm[6] or an excitatory state in which pain is provoked by trivial stimuli. Tension with depression or anxiety may perpetuate this state by enhancing muscle spasm, facilitating spinal reflexes, and causing a preoccupation with the site of pain. Summation may occur with multiple (including subthreshold) stimuli[7], such as those from minor degenerative vertebral lesions.

Treatment can be as difficult as diagnosis. Analgesic drugs are seldom curative in the chronic case. Relief from reduction of the secondary effects may follow manipulation or local anaesthetic injections into 'deep tender spots'[3] or into the epidural space[6].

In this paper the simpler procedure of lignocaine block of the segmental intercostal nerves is assessed. Relief by blocking nerves *distal* to painful lesions[8] occurs, according to the gate control theory[9], because of interruption of the pain synapse-facilitating afferent barrage.

Patients and methods

Records were kept of all patients presenting in 1973 whose abdominal pain was provisionally diagnosed as being of spinal origin. Those with concurrent back pain were excluded. The intercostal nerves of the relevant segments were blocked with 2 ml of plain 1% lignocaine solution just lateral to the sacrospinalis.

Based on a paper delivered at a College Conversazione at Chichester on 31st May 1975

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Steps in diagnosis The provisional diagnosis was made after (*a*) eliciting one of a number of patterns of symptoms and signs and (*b*) finding no primary cause of pain within the abdomen or abdominal wall.

Previous good descriptive accounts of abdominal pain of spinal origin[1, 4] have lacked criteria for audit of diagnosis and treatment. In this series the diagnosis was regarded as confirmed if *both* the following criteria were met:

1) *either (a)* the clinical features were *typical* —for example, cutaneous pain or marked postural aggravation
or (b) the clinical features were *compatible* and there was a sustained remission of pain for an arbitrary 3 months after intercostal block; *and*
2) no visceral or abdominal wall lesions manifested over an arbitrary year of follow-up.

Symptoms Root or peripheral nerve irritation was suggested by a purely cutaneous quality such as 'pricking', 'burning', or 'sore'. Referred pains were suspected from descriptions such as 'nagging', 'like a toothache', or 'difficult to describe'. The depressive or anxious patient frequently used terms such as 'twisting', 'dragging', and 'like a string tightening'.

Enquiry was made for provocation by vertebral movements or particular postures.

Signs If tenderness at the site of pain persisted or, especially, increased when the muscles were tensed a parietal cause was strongly suspected. For acute pains it was borne in mind that this could occur in peritonitis[4] and also with the visceroparietal reflex[10], though doubts have been expressed whether the latter could arise with purely visceral pain[4].

Sensory changes at the site of pain were sought. Tenderness near the tip of the vertebral transverse process was a particularly valuable sign as it indicated which nerves to inject. This almost invariably occurs in pain of spinal origin, though only rarely does pressure there reproduce the pain. Frequently it occurs in acute visceral pain, suggesting that it is neither the transverse process[4] nor the costotransverse joint[1] that is tender but more likely the intercostal nerve, which here is relatively exposed.

Lateral bending, rotation, flexion, and extension of the spine were tested in turn. Sacrospinalis tone in the painful segment was compared with that on the opposite side.

Diagnostic pitfalls Spinal root or referred pains often arise synchronously and in the same segments as visceral abnormalities either because of summation or through visceroparietal reflexes. The latter are occasionally so marked that the visceral source of trouble is obscured. Conversely parietal pain can cause reflex visceral symptoms.

Clinical features similar to root or referred spinal pain may arise from abdominal wall lesions. Malignant invasion of nerves causes more severe and constant pain seldom responding for long to intercostal block.

An acute abdomen may be simulated by aching from skeletal structures in febrile illnesses, while pyrexia and loin pains may not necessarily mean pyelonephritis.

Results

Final diagnosis Of 73 provisional diagnoses, 53 (72.6%) were confirmed on review at one year.

The remaining 20 cases were of interest. In 6 there arose, usually soon, objective evidence that visceral disease was the predominant cause, including 1 instance of right T8 referral from a carcinoma of the head of the pancreas. In 1 case the pain proved a day later to be pleuritic. Unremitting pain in 3 cases was due to intercostal nerve invasion by carcinoma of the lung (2) or pancreas (1). In 4 cases parietal lesions were later deemed to account for the pain (1 stitch abscess and 3 nerve entrapments by scar). Of 6 patients whose diagnosis was left open, 2 were lost to follow-up, in 3 the pain regressed before a definite conclusion was reached, and a depressive with a 20-year history claimed to have been improved by removal of a non-inflamed appendix.

Referring doctor's diagnoses Forty of the 53 patients had been referred primarily for their pains and for 30 diagnoses had been suggested by the referring doctor. These were appendicitis (5), biliary colic (4), ureteric or renal colic (9), testicular pain (2), neurotic pains (3), and miscellaneous (7).

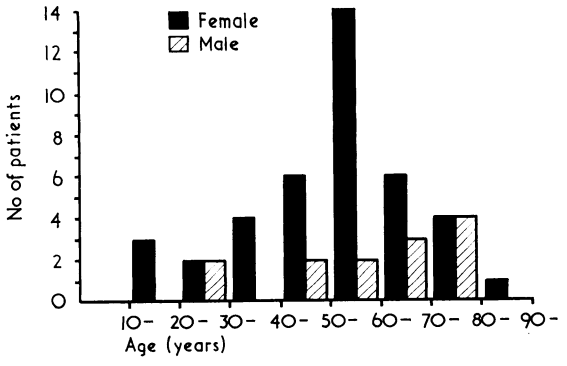

FIG. 1 *Age and sex incidence in 53 confirmed cases of abdominal pain of spinal origin.*

Clinical features Thirty-seven (69.8%) of the 53 patients were female, a significant ($P<0.01$) preponderance (see figure).

The average length of history was 55 weeks, ranging from 1 day to 10 years. It was more than a month in 43 cases (81.1%) and more than 6 months in 24 (45.3%).

TABLE I *Segments involved in abdominal pain of spinal origin*

Segment	*Right*	*Left*	*Total*
T6	2	1	3
T7	2	0	2
T8	3	2	5
T9	0	3	3
T10	3	4	7
T11	17	10	27
T12	9	6	15
Total	36	26	62

In some patients more than one segment was involved.

The type of pain was root in 11 cases (20.8%), referred in 28 (52.8%), and both in 14 (26.4%). Thirty-two patients had themselves noticed aggravation by posture. Thirteen had reflex visceral symptoms.

In 47 cases (88.7%) there was as much or more tenderness at the site of pain on tensing the muscles. Six patients examined when free of pain had no local tenderness but did show sacrospinalis spasm and posterior intercostal tenderness; the latter was found in 49 cases (92.5%). The pain was aggravated by one or more spinal movements in 43 cases (81.1%). Sensory changes occurred in all but 4 cases.

Usually the pain was predominantly in one segment, and predictably the right T11 was commonest (Table I).

Thirty-six patients (67.9%), including all 14 women in their fifties, had a history of medical treatment for spinal problems. Twenty-six (49.1%) had previously taken psychotropic drugs for depression (13) or anxiety (13). Twenty (37.7%) had both a spinal and a psychiatric history.

Results of lignocaine block In 4 patients the pains were subsiding at the time of their first visit but the other 49 were given intercostal blocks. Their response is shown in Table II.

Thirty-three (67.3%) of the 49 patients had complete relief of pain for at least 3 months, most for more than a year. In 13 (26.5%) the pain was less severe or less frequent or both. In the 3 (6.1%) with short-lived or no relief at 3 months the clinical features were particularly convincing regarding spinal origin and their pains were much less severe a year later.

TABLE II *Response to intercostal block of root and/or referred pain; results at 3 months*

	No of patients	*Full relief*	*Moderate relief*	*Short-lived or no relief*
Root	14	12 (85.7%)	1 (7.1%)	1 (7.1%)
Root + referred	11	9 (81.8%)	2 (18.2%)	0
Spinal referred	24	12 (50%)	10 (41.7%)	2 (8.3%)
Total	49	33 (67.3%)	13 (26.5%)	3 (6.1%)
Those with root pain component	25	21 (84%)	3 (12%)	1 (4%)

TABLE III *Response to intercostal block in relation to length of history; results at 3 months*

Length of history (months)	*No of patients*	*Full relief*	*Moderate relief*	*Short-lived or no relief*
<1	10	10 (100%)	0	0
⩾1 and <6	21	12 (57.1%)	9 (42.9%)	0
⩾6	18	11 (61.1%)	4 (22.2%)	3 (16.7%)
Total	49	33 (67.3%)	13 (26.5%)	3 (6.1%)

The results were much the same regardless of age, sex, or spinal or psychiatric history. Prospects of complete relief were better ($P<0.01$) with a root pain component (Table II) or ($P<0.05$) when the duration was less than a month (Table III).

This was not a controlled trial, but arguably remission was not usually due to placebo effect alone. The pains had often failed to respond to previous reassurance, analgesic or psychotropic drugs, physiotherapy, or even laparotomy. The centre of pain might shift up or down according to whether the lower or the upper of the intercostal nerves of adjacent involved segments was blocked. Failure when there was doubt as to correct placing of the injection might be followed by a good response when the injection was repeated.

Case reports

Some illustrative examples are given, with the referring doctors' diagnoses in parentheses.

Case 1 (Right iliac fossa pain and cancerphobia) A 40-year-old chronically anxious woman presented with an 18-month history of persistent 'burning', 'niggly' pain in the right iliac fossa. Previous negative investigations had included barium meal and enema and examination under anaesthesia with dilatation and curettage. There was no recurrence of her root pain after a right T10 intercostal block.

Case 2 (Gallbladder disease) A 41-year-old man with a history of back trouble presented with a 12-year history of right subcostal 'burning' or 'stabbing' pain. Previously 2 cholecystograms had been normal. There was no recurrence of his root pain after a right T8 intercostal block.

Case 3 (Renal tumour or stone) A 75-year-old man presented with a 3-month history of a persistent 'dull' left loin ache with 'sharp' exacerbations; there had been intermittent haematuria for 3 weeks. His root and referred pains were relieved by a left T12 intercostal block. An intravenous pyelogram was normal except for bladder outlet obstruction, and the haematuria ceased after a small middle-lobe adenoma had been resected.

Case 4 (Chronic appendix) A 23-year-old woman presented with a 3-month history of a frequent dull ache in the right iliac fossa. This was worse at the end of the day, came on in bed, and was relieved by standing. Relief by lignocaine injection was at first only partial, but the referred pain gradually subsided over the next week.

Case 5 (Abdominal pain—appendix) A 30-year-old ex-nurse with a history of back trouble presented with a 10-year history of 'nagging' right upper quadrant pains associated with nausea. These were worse when driving and she 'could not bear her clothes to touch her'. Previous investigations had included 2 cholecystograms, barium meal and enema, intravenous pyelography, and gastroscopy. She was expelled from the psychosomatic clinic for being normal. Her response to lignocaine block was complete but never prolonged, the longest remission being 3 months. Eighteen months after diagnosis the pains subsided spontaneously.

Discussion

In the course of one year in one general surgeon's practice one patient a week, on average, presented with abdominal pain of spinal origin. Treatment was based on two main hypotheses: (1) that transient painful 'trigger' stimuli can initiate a prolonged cycle of pain and spasm due to secondary effects of spinal reflexes and (2) that temporary interruption of the synapse-facilitating segmental afferent neuronal barrage by lignocaine intercostal block may give relief of pain provided that the initial source of painful stimuli is inactive. It is suggested that 'spinal reflex pain syndrome' might be a suitable term to describe this vicious circle of pain and spasm. The patients whose diagnosis was finally confirmed did not usually have vertebral column lesions requiring treatment. It is presumed

that those responding best to intercostal block owed the persistence of pain mainly to the 'spinal reflex pain syndrome'. Common minor degenerative lesions may play a part by providing the initial stimulus or by contributing to summation. The vertebral column was X-rayed to exclude any serious disorder if there was a poor response to lignocaine block, but in the past undue emphasis has been placed on the need to demonstrate orthopaedic abnormalities.

When the symptoms and signs are compatible with abdominal pain of spinal origin but a visceral cause remains possible, evidence of a visceral lesion may be sought with expensive and time-consuming laboratory and radiological investigations or even laparotomy. An alternative is to treat on the hypothesis that the pain is of spinal origin. A substantial proportion of patients will gain complete relief with an intercostal block. Should sustained relief not occur the case should be kept under review.

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