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Thermographic investigation of viscerogenic pain: a case report

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A case is presented with clinical, thermographic and radiographic evaluations of concurrent dorsalgia and abdominal symptoms. The radiographs demonstrated the presence of a duodenal ulcer, and the thermographs were interpreted as confirming the presence of thoracic and abdominal dysfunction. The patient's chiropractic management is outlined. The possible inter-relationship between the visceral pathology and spinal dysfunction is discussed. The case allows exploration of the unresolved issues of the clinical significance of somatovisceral/viscerosomatic reflex pathways and of their assessment by thermography.
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KEY WORDS: chiropractic, dorsalgia, peptic ulcer, manipulation, thermography, viscerogenic pain.

Un cas de dorsalgie avec symptômes abdominaux concomitants est présenté avec des évaluations cliniques, thermographiques et radiographiques. Les radiographies démontrent la présence d'un ulcère duodénal, et les thermographies ont été interprétées comme confirmant la présence de dysfonction dorsale et abdominale. La question chiropratique du patient est décrite. On y examine la corrélation possible entre la pathologie viscérale et la dysfonction spinale. Ce cas permet l'exploration des questions non résolues concernant l'importance clinique des réseaux du réflexe somato-viscéral/viscéro-somatique et de leur évaluation par la thermographie.
(JCCA 1990; 34(3):125–130)

MOTS CLES: chiropratique, dorsalgie, ulcère peptique, manipulation, thermographie, douleurs d'origine viscérale.

Introduction

The inter-relationship between the musculoskeletal system, particularly the thoracic spine, and visceral organs, subtended by synaptic communication between autonomic and central nervous system neurons in the spinal cord, has been part of the basis of chiropractic principles and practice. Though demonstrable in animal experiments,[1,2] it is difficult to ascertain a causal (as opposed to correlative[3]) relationship between co-existent somatic and visceral dysfunction in individual clinical cases. Much of this difficulty stems from the indirect means available for assessing autonomic dysfunction in patients. The validity and reliability of clinical procedures that have been used to detect changes in the temperature, moisture and texture of the skin have been questioned,[4] as have more traditional measures such as blood pressure.[5]

Electronic computerized thermography is a non-invasive diagnostic modality for mapping skin temperature.[6,7] The magnitude and distribution of cutaneous temperature changes are due to functional changes in the microvasculature, regulated by the postganglionic autonomic efferent fibres. (See references 8 to 10 for comprehensive reviews of the anatomic and physiologic bases of thermographic imaging.) Since the latter are distributed peripherally by the spinal nerves, abnormal thermographs are usually interpreted with reference to sources of dysfunction of the sensory nervous system[10,11] (e.g., intervertebral disc prolapse, entrapment syndromes, etc.).

However, pathology or dysfunction of visceral organs may reflexly effect changes in the thermographic imaging of the area of skin which shares the source of autonomic innervation. Such changes have been shown in cases of acute cholecystitis and appendicitis, for example.[12] The actual neurologic routing has not yet been elucidated. The following case presents the clinical, thermographic and radiographic investigation of a patient with dorsal and abdominal pain.

Case report

A 45-year-old male factory worker was referred for chiropractic treatment of increasing dorsalgia which had not responded to a

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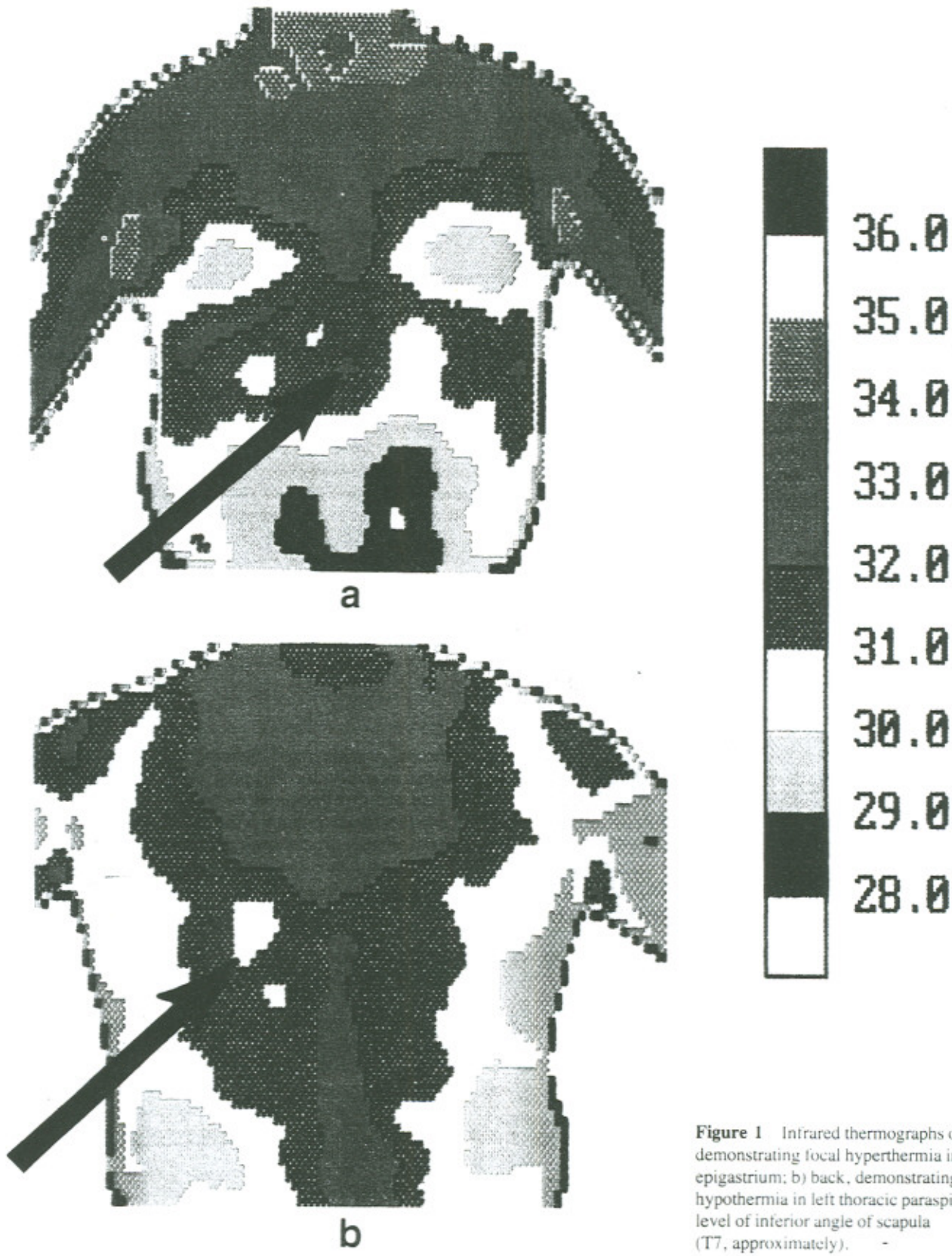

Figure 1 Infrared thermographs of a) abdomen, demonstrating focal hyperthermia in midline epigastrium; b) back, demonstrating focal hypothermia in left thoracic paraspinal area, at level of inferior angle of scapula (T7, approximately).

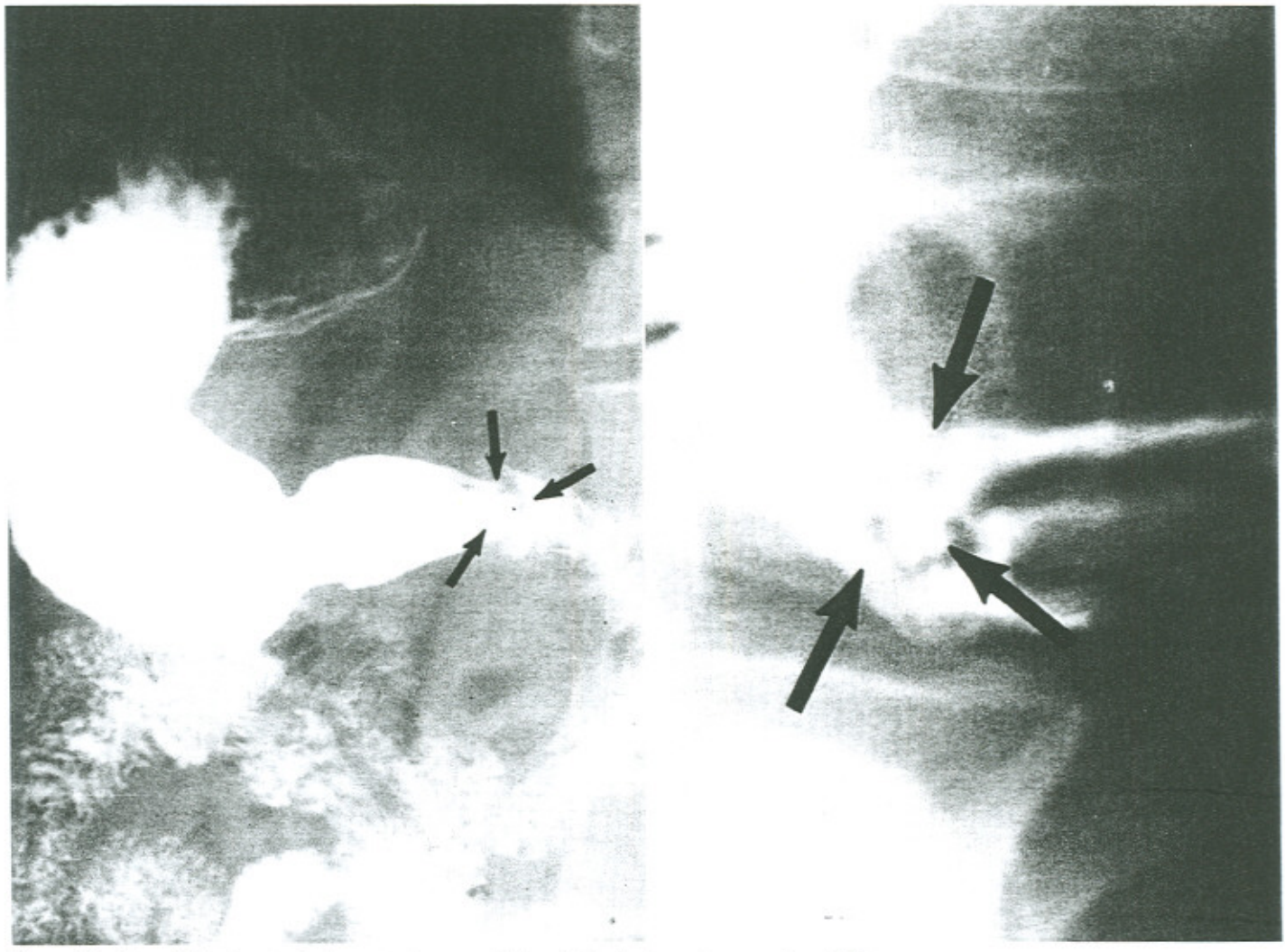

Figure 2 Upper GI barium study demonstrating a small ulcer in the duodenum (arrows; viewed PA).

course of analgesic and muscle relaxant medication. The pain, located over the mid-thoracic spine, had come on insidiously one month prior. Examination revealed mid-thoracic (T7–T9) segmental motion dysfunction to be the source of dorsalgia. Local spinal manipulation (SMT) provided immediate temporary relief which would last until the next day. The patient continued working since the onset of pain.

At the fourth visit the patient mentioned that the diffuse upper abdominal pain and bloating, relieved by eating, which he had experienced recurrently for a year, had increased. Physical examination was unremarkable. Spot thermographic studies (using AGA electronic computerized thermography with Viewscan medical software*) of the cervical and thoracic spine regions, the anterior chest and abdominal wall revealed a focal area of hypothermia (ΔT:1°C.) in the left mid-thoracic region, correlating precisely with the patient's location of dorsalgia; and a more significant area of hyperthermia (ΔT:1°C.) above the umbilicus (figure 1). The patient was referred for an upper GI radiographic examination, which demonstrated a duodenal ulcer (figure 2).

Dietary modifications and antacids were added to the patient's continued regimen of SMT. The dorsal and abdominal pain decreased considerably, but persisted. The patient was placed on a monthly treatment program. Follow-up at one month and three months after presentation revealed no further change in abdominal symptoms.

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Discussion

Duodenal peptic ulcers which have not perforated through the duodenal wall cause localized, sharp, burning, gnawing epigastric pain which is felt one to two hours postprandially and is relieved by ingestion of food or antacids.[13] Alternatively, an ill-defined aching, pressure or hunger sensation may be felt. Painful episodes recur for days to months, and remissions from them may last weeks to years.[14]

Peptic ulcers of the posterior duodenal wall may also refer sharp, localized pain to the thoracic region of the back, reflecting the T5–T9 spinal cord segment whence the sympathetic innervation of the duodenum originates.[15] Head zones of hyperalgesia, local tenderness, segmental skeletal muscle hypertonicity (which may become a secondary source of local pain), and segmental sympathetic vasomotor/sudomotor activity ". . . may frequently accompany and may rarely constitute the principal form of discomfort of an intra-abdominal disease".[13] The referred pain may be central, uni- or bilateral, or, if intense, encircle the body, and will share the characteristics of the inciting pathology (e.g., onset within two hours after eating, relief with ingestion of food or antacids).[16]

In such cases it is tempting to speculate upon the possible inter-relationship between back pain and visceral pathology. In the subject of this report, thermography suggested dysfunction in the mid-thoracic region and in the abdomen. Radiographs revealed a duodenal ulcer, probably accounting for the positive abdominal thermograph and the patient's year-old abdominal symptomatology.

The patient's back pain was of more recent onset. It may have been entirely due to referral of pain from the duodenal ulcer; since this pathology may remain asymptomatic,[14] it is conceivable that it may have given rise to symptoms some time after the actual ulceration. Alternatively, the back pain may have been solely due to more recent occupational strain of the thoracic spine in a man who coincidentally had a duodenal ulcer. A third possibility is that the dorsalgia was due to thoracic motion segment dysfunction caused by reflex segmental paraspinal muscle contraction in response to irritation of sympathetic afferents at the ulceration.[13] Finally, the visceral pathology may have induced a facilitated thoracic cord segment[2] which reflexly predisposed the homologous motion segments to become dysfunctional when affected by occupational exertion. Figure 3 is a diagramatic summary of these four possibilities.

The patient's dorsalgia responded to both, local SMT and dietary modifications, although it still persisted at a diminished level. This response to therapy seems incongruous with the first two (purely visceral or musculoskeletal) etiologies postulated above. Thermography revealed focal hypothermia in the thoracic region (see figure 1). Since both hyperthermia[12] and hypothermia[9] have been associated with areas of referred pain, thermographic findings do not differentiate the source of the dorsal symptomatology (i.e., spinal vs visceral dysfunction) in this case.

The third and fourth postulated etiologic mechanisms only differ from each other in the immediate cause of the symptomatic spinal motion segment dysfunction generated by a viscerosomatic reflex. A somatovisceral etiology is considered unlikely in this case because of the lack of any effect of SMT on the abdominal symptoms which preceded the dorsalgia by a year.[17] The levels of thoracic motion segment dysfunction, as detected by palpation and infrared thermography, correlated to the origin of sympathetic innervation of the duodenum.[15] Thus the patient's dorsalgia was likely due to a viscerosomatic reflex. Support for this etiologic mechanism would be found in the complete resolution of the dorsalgia with a short course of SMT once the ulcer heals.

Our conclusion is in agreement with Lewit.[18] He found the T5–T6, sacroiliac and atlanto-occipital joints more frequently "lesioned" in peptic ulcer patients. He also felt that the spinal dysfunction resulted from visceral disease, not vice versa.

It must be noted that this case report addresses at least two controversial topics. First, there is no universal agreement upon the cause/effect roles of somatic and visceral dysfunction, let alone upon the most effective means of treating either, when a reflex appears to link their symptomatology. Second, the role of thermography in detecting deep visceral dysfunction or pathology is a more recent – and thus controversial – application than its use in neuromusculoskeletal cases.

Clinical trials would seem the most appropriate means of eventually resolving these controversies. In the interim, case reports such as this can serve several purposes. They focus attention on these issues while contributing bits of data towards the foundation of experimental hypotheses. Of more immediate importance, such reports should provoke thoughtful re-evaluation of the rationales underlying both, diagnostic (e.g., thermography vs radiography) and therapeutic (e.g., the role of SMT in treatment of primary pathology vs secondary symptomatic effects of viscerosomatic/somatovisceral reflexes) decisions by the clinician.

Summary

Thermography and radiography demonstrated thoracic dysfunction and visceral pathology in a patient affected by dorsalgia and abdominal symptomatology. Customary conservative treatment for the visceral pathology provided partial relief of both complaints. Temporary relief of the dorsalgia was provided by local SMT.

The imaging and response to therapy indicate a viscerosomatic reflex as the likely cause of the back pain. However, the thoracic and abdominal symptoms may have been due to two unrelated, coincidental etiologies. Thus, each patient presenting with symptoms related to spinal segmental dysfunction and concurrent viscerogenic symptomatology must be carefully assessed by history, examination and ancillary studies to discover the most likely etiologic mechanisms affecting that individual.

The non-invasive nature of infrared thermography renders it a useful complement to the history and physical examination of

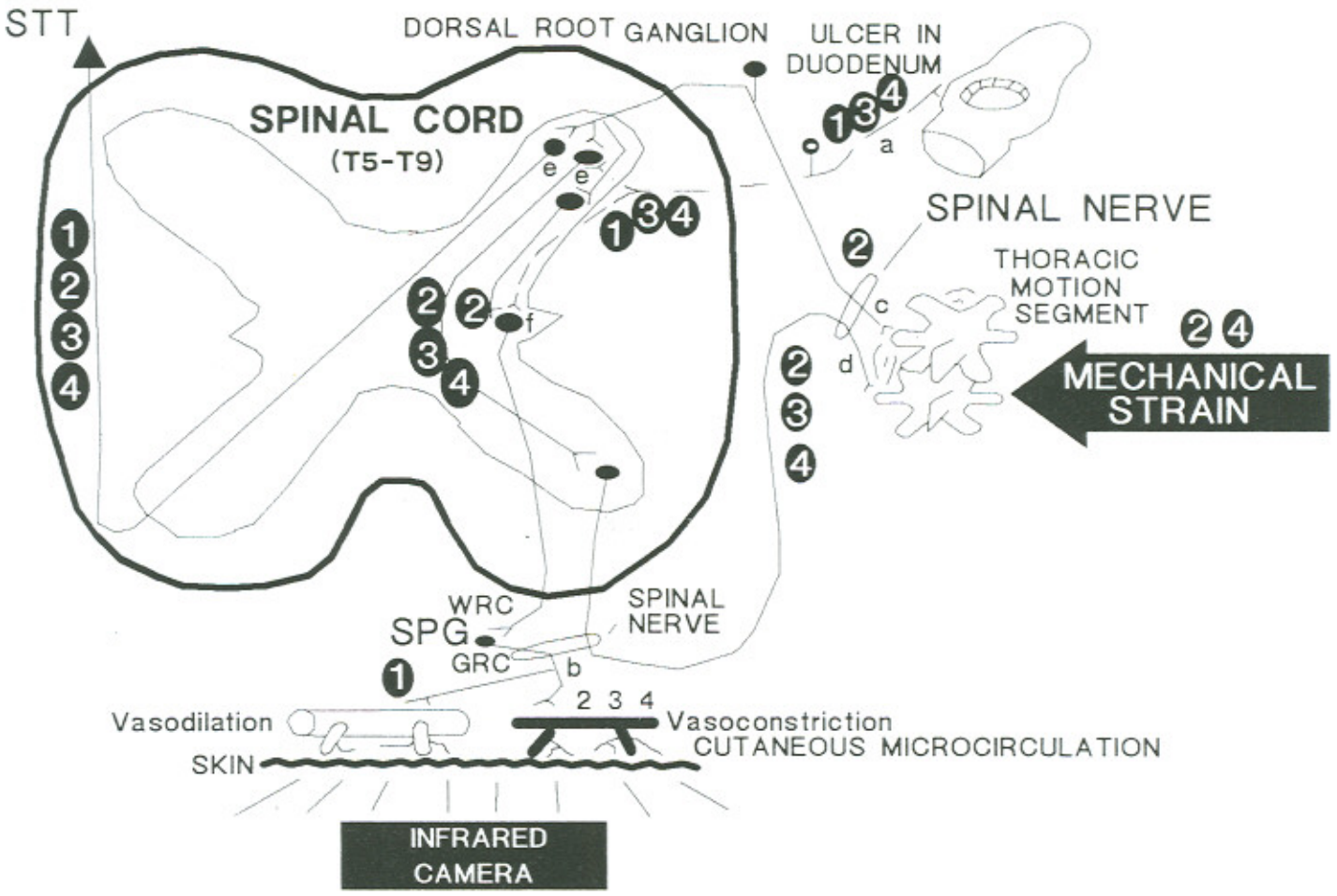

Figure 3 Schema of postulated mechanisms of dorsal pain.

1 Referred dorsalgia from duodenal ulcer
2 Mechanical strain
3 & 4 Viscerosomatic reflex (see discussion for details)

GRC grey ramus communicans
WRC white ramus communicans
STT spinothalamic tract
SPG sympathetic paravertebral ganglion

a afferent, via dorsal root ganglia
b sympathetic efferent, via sympathetic paravertebral ganglia, celiac plexus, splanchnic nerves
c somatosensory nerve
d somatomotor nerve
e interneurons
f sympathetic neuron

the patient, capable of confirming the presence of somatic and visceral dysfunction. The anatomical structures implicated by clinical and thermographic findings may then be examined radiographically.

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