

Diagnostic Usefulness of Carnett's Test in Psychogenic Abdominal Pain

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Abstract

Objective Carnett's test is a simple clinical test in which abdominal tenderness is evaluated while the patient tenses the abdominal muscles. It is useful for differentiating abdominal wall pain from intra-abdominal pain. However, no study has reported its association with psychogenic abdominal pain. We evaluated its diagnostic usefulness in psychogenic abdominal pain.

Methods Two physicians performed Carnett's test on each patient, but only one received the medical history. The other physician only conducted the test. Based on the final diagnosis, patients were categorized into 3 groups: psychogenic pain, abdominal wall pain, or intra-abdominal pain. Each group was analyzed in association with the results of Carnett's test conducted by the blinded physician.

Patients A total of 130 outpatients with the chief complaint of abdominal pain who had abdominal tenderness.

Results There were 22 patients with psychogenic abdominal pain, 19 with abdominal wall pain and 62 with intra-abdominal pain. In patients with psychogenic pain or abdominal wall pain, Carnett's test was usually positive, whereas the test was usually negative in patients with intra-abdominal pain ($p < 0.001$, respectively). The positive likelihood ratio of Carnett's test for psychogenic abdominal pain was 2.91 (95% confidence interval [CI], 2.71-3.13), while the negative likelihood ratio was 0.19 (95% CI, 0.11-0.34). The corresponding values for abdominal wall pain were 2.62 (95% CI, 2.45-2.81) and 0.23 (95% CI, 0.13-0.41), respectively.

Conclusion Carnett's test may be useful for ruling in and ruling out psychogenic abdominal pain in addition to distinguishing between abdominal wall pain and intra-abdominal pain.

Key words: Carnett's test, psychogenic abdominal pain, abdominal wall pain

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Introduction

Abdominal pain is a common complaint in outpatient practice. Its etiology is diverse, since abdominal pain can arise from the intra-abdominal viscera (parenchymal organs, gastrointestinal tract, urogenital organs, and vasculature), abdominal wall structures (skin, subcutaneous tissue, and musculoskeletal system), intrathoracic viscera, metabolic/endocrine disorders, and psychogenic conditions. Some patients have no organic disease despite prominent symptoms, while others with mild abdominal pain may actually have a surgical emergency. Therefore, making an accurate diagnosis of

abdominal pain and providing appropriate management is crucial.

Carnett proposed his eponymous test as a method of detecting abdominal wall pain during physical examination (1). After routine examination of the abdomen, the site of maximum tenderness is determined. The patient is then asked to contract the abdominal muscles by raising his/her head from the examination table while the examiner continues to apply pressure to the tender site. The test is positive if tenderness becomes more severe or is unchanged. A positive test suggests that the abdominal wall is the source of pain. On the other hand, the test is negative when tenderness is reduced, which suggests that the pain has an intra-abdominal source.

Carnett's test is based on the theory that the tensed abdominal wall muscles will protect the underlying structures and reduce abdominal tenderness during the test in patients with intra-abdominal disease.

There have been numerous reports on the usefulness of Carnett's test for differentiating abdominal wall pain from intra-abdominal pain (2-17). Accurate diagnosis of abdominal wall pain based on the history and physical findings can alleviate the need for expensive tests such as endoscopy and computed tomography, reducing health care expenditure (18-20).

To our knowledge, there have been no previous reports on the applicability of Carnett's test for the detection of psychogenic abdominal pain. It was reported that 85% of patients with recurrent or persistent abdominal pain with no obvious organic causes have psychogenic pain and more than 50% of them respond to psychiatric treatment (21). Thus, the correct identification of psychogenic abdominal pain is important to improve the management of such patients. If Carnett's test shows specific findings in patients with psychogenic abdominal pain, its application might facilitate a more efficient diagnosis of such pain. Accordingly, we evaluated the usefulness of Carnett's test for making a diagnosis of psychogenic abdominal pain in the present study.

Methods

Setting

The Department of General Medicine in Chiba University Hospital, a tertiary care center, is involved in the diagnosis of patients with unidentified conditions in which psychogenic disorders tend to be more frequent than in clinics or municipal hospitals.

Patients and study design

The subjects of this study were patients who presented with the chief complaint of abdominal pain and had abdominal tenderness and were seen by any of 8 participating physicians at the outpatient clinic of the department of General Medicine, Chiba University Hospital (Chiba City, Japan) from February 2004 to November 2006. Eight physicians with experiences of 3-15 years (mean: 7.4 years, \pm standard deviation [SD] 4.3) as a general physician participated. One physician performed Carnett's test after taking a complete medical history. Another physician, who was randomly selected from the other seven physicians and blinded to the history, conducted Carnett's test separately to exclude the influence of information about the patient on the outcome. The final diagnosis was confirmed by specialist referral to other departments or by our departmental case conference, and patients were classified as having psychogenic pain, abdominal wall pain, or intra-abdominal pain. Psychogenic pain was diagnosed and classified based on the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition,

Text Revision (DSM-IV-TR) (22). Patients who had functional gastrointestinal disorders such as functional dyspepsia or irritable bowel syndrome were excluded from the analysis because of the potential for comorbidity by psychiatric disorders (23). The Rome II criteria (24) were used for diagnosis of functional gastrointestinal disorders.

The results of Carnett's test performed by the blinded physicians were compared with the final diagnoses. The reproducibility of Carnett's test was also analyzed by comparing the results between the blinded and unblinded physicians.

This study was conducted with the approval of the Ethics Review Board of Chiba University Graduate School of Medical Research and written informed consent was obtained from all of the subjects.

Statistical analysis

The results of Carnett's test were analyzed by using Fisher's exact test. Positive and negative likelihood ratios (LR+, LR-) were calculated for each diagnostic group to assess the usefulness of the test. Cohen's Kappa (κ) coefficient was also calculated for the data obtained by the two groups of physicians to assess the reproducibility of Carnett's test. StatsDirect version 2.7.3 (StatsDirect Ltd., Cheshire, England) was employed for all analyses.

Results

Of the total of 5,399 patients who visited the outpatient clinic of our department during the study period, 247 had abdominal pain, and 139 of them were seen by participating physicians. Among those 139 patients, 130 had abdominal tenderness (all were Japanese, 52 males [40%], age range: 15-78 years, mean \pm SD: 40.2 \pm 16.6 years, including 16 referred patients, symptom duration: mean \pm SD: 202.7 \pm 1,034.5 days). We analyzed 103 patients, excluding 3 in whom Carnett's test was unevaluable, 8 with an unknown diagnosis (pain resolved before confirmation of the diagnosis in 4 and 4 could not be followed up), and 16 who had functional gastrointestinal disorders such as irritable bowel syndrome or functional dyspepsia (Fig. 1). The 103 patients included 22 with psychogenic pain, 19 with abdominal wall pain, and 62 with intra-abdominal pain (symptom duration: mean \pm SD 452.2 \pm 832.1, 39.5 \pm 121.9, 19.0 \pm 52.1 days, respectively). Although all patients with psychogenic pain were referred for psychiatric consultation, 7 patients (2 with factitious disorder, 2 with undifferentiated somatoform disorder, 2 with hypochondriasis and 1 with pain disorder) refused and their final diagnosis was made at our departmental conference based on DSM-IV-TR criteria. In the other 15 patients, the final diagnosis was made by assessment of psychiatrists. The diagnoses of each group (psychogenic pain, abdominal wall pain, and intra-abdominal pain) are listed in Table 1-3, and the results of Carnett's test are shown in Table 4. Comparison between patients with psychogenic pain and intra-abdominal pain, or those with abdominal wall pain

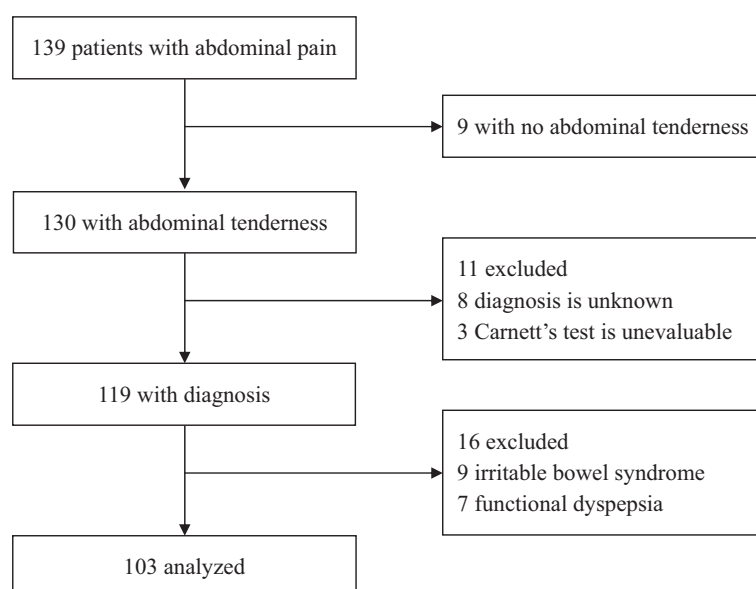


Figure 1. Study profile.

Table 1. Diagnoses of the Patients with Psychogenic Abdominal Pain

Diagnosis	Carnett (+)	Carnett (-)	Total
Major depressive disorder	4	2	6
Schizophrenia	5	0	5
Undifferentiated somatoform disorder	3	0	3
Somatization disorder	2	0	2
Hypochondriasis	1	1	2
Factitious disorder	2	0	2
Pain disorder	1	0	1
Generalized anxiety disorder	1	0	1
Total	19	3	22

Table 2. Diagnoses of the Patients with Abdominal Wall Pain

Diagnosis	Carnett (+)	Carnett (-)	Total
Idiopathic myofascial syndrome	6	0	6
Radiculopathy	3	2	5
Epidemic pleurodynia	4	0	4
Peripheral nerve entrapment	2	1	3
Cellulitis	1	0	1
Total	16	3	19

and intra-abdominal pain revealed significant differences, and psychogenic pain and abdominal wall pain were positive in Carnett's test, whereas intra-abdominal pain was negative ($p < 0.001$, respectively). There were 8 patients (3 with gastroenteritis, 2 with Fitz-Hugh-Curtis syndrome, 1 with acute appendicitis, 1 with cholecystitis, 1 with ulcerative colitis) with intra-abdominal pain who had a positive Carnett's test. The LR+ of Carnett's test for psychogenic abdominal pain was 2.91 (95% confidence interval [CI], 2.71-3.13), and its LR- was 0.19 (95% CI, 0.11-0.34). The LR+ and LR- values for abdominal wall pain were 2.62 (95% CI, 2.45-2.81) and 0.23 (95% CI, 0.13-0.41), respectively. The reproducibility of Carnett's test between physicians was high (κ

value=0.81). There were no significant differences among the reproducibility of each group (Fisher's exact test $p = 0.97$).

Discussion

The results of this study suggested that Carnett's test is useful for making a diagnosis of psychogenic abdominal pain, as well as for detecting abdominal wall pain. Previously, Srinivasan and Greenbaum (12) investigated the accuracy of this test for detection of abdominal wall pain, and reported LR+ and LR- values of 6.50 and 0.25, respectively. However, they did not investigate the detection of psycho-

Table 3. Diagnoses of the Patients with Intra-Abdominal Pain

Diagnosis	Carnett (+)	Carnett (-)	Total
Gastroenteritis	2	25	27
Peptic ulcer	1	5	6
Acute appendicitis	1	4	5
Diverticulitis	0	5	5
Perihepatitis	2	2	4
Cholecystitis	1	1	2
Renal colic	0	2	2
Bowel obstruction	0	2	2
Acute pancreatitis	0	2	2
Cystitis	0	2	2
Ulcerative colitis	1	0	1
Anaphylactoid purpura	0	1	1
Familial Mediterranean fever	0	1	1
Endometriosis	0	1	1
Eosinophilic gastroenteritis	0	1	1
Total	8	54	62

Table 4. Results of Carnett's Test

	Positive	Negative	p value*
Intra-abdominal pain	8	54	-
Psychogenic abdominal pain	19	3	<0.001
Abdominal wall pain	16	3	<0.001

*Comparison with intra-abdominal pain by Fisher's exact test.

genic pain by Carnett's test. The reason for a positive Carnett's test in patients with psychogenic abdominal pain remains to be clarified, but somatosensory amplification may play a role. In this condition, there is excessive activation and increased attention is directed towards relatively weak stimuli. There is also a tendency to misinterpret physiological visceral or somatic stimuli as abnormal or morbid. Several studies have detected an association between somatosensory amplification and various psychiatric disorders (25-27). Therefore, we hypothesize that somatosensory amplification may cause hypersensitivity to stimuli resulting in a positive Carnett's test.

Previous studies have suggested that Carnett's test is useful for ruling out life-threatening intra-abdominal disease. Thomson and Francis reported 24 emergency patients with a positive Carnett's test, among whom subsequent investigations (including laparotomy) did not reveal the cause of pain in 23 cases (28). In another study (29), 72 patients with idiopathic abdominal pain and a positive Carnett's test were followed for 8 years, but the cause of pain was never identified in 69 of them and none of the patients had a severe underlying condition. In the present study, Carnett's test was useful for identifying patients with psychogenic abdominal pain or abdominal wall pain, while it was rarely positive in patients with intra-abdominal disorders. In psychogenic abdominal pain and abdominal wall pain, the severity is usually less than that of intra-abdominal organic disease. Therefore, as previously reported, a positive Carnett's test suggests that the underlying cause of abdominal pain is unlikely to be life-threatening.

However, some patients with intra-abdominal pain had a positive Carnett's test. Carnett reported that the test could be positive when peritonitis involves the abdominal wall or when the abdominal musculature is thin (1). In the present study, the intra-abdominal disorders associated with a positive Carnett's test included one case of appendicitis and two cases of perihepatitis (Fitz-Hugh-Curtis syndrome). The patient with appendicitis had an abscess and peritonitis involved the abdominal wall. Gray et al reported that 5 out of 53 patients with acute appendicitis had a positive Carnett's test, although the presence or absence of peritonitis in these 5 patients was not described (30). Thus, when Carnett's test is performed in a patient with suspected acute appendicitis, the possibility of a positive result must always be kept in mind. In patients with perihepatitis, elevation of the upper body can cause friction between the parietal peritoneum and the liver capsule, resulting in aggravation of pain.

We found a high reproducibility of Carnett's test (κ value=0.81) between the physicians who were aware of the medical history and physicians who did not have any information about the patients. In a previous study, the reproducibility of detecting muscular guarding and rebound tenderness was found to be low (κ value of 0.36 and 0.25, respectively) (31). The much higher κ value obtained in the present study suggests the greater reliability of Carnett's test.

Diagnosis of abdominal wall pain and psychogenic pain is often difficult and needs exclusion of intra-abdominal origin and careful observation is crucial. And it can be difficult to differentiate between abdominal wall pain and psychogenic

pain with Carnett's test. Abdominal wall pain is usually exacerbated by exercise or postural changes, is well localized, and is associated with a trigger point. In contrast, the characteristics of psychogenic pain include long symptom duration, an absence of relieving factors, an extensive painful region with a poorly defined border, and no change in the severity of pain regardless of the site of palpation. The operating characteristics of these factors for differentiating the two types of abdominal pain should be further investigated.

In conclusion, Carnett's test may be useful for ruling in and ruling out psychogenic abdominal pain in addition to differentiating abdominal wall pain from intra-abdominal pain. Its application may facilitate the identification of patients with psychogenic pain.

The authors state that they have no Conflict of Interest (COI).

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