Does usage of peritonism tests in an emergency department have any benefit?

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ABSTRACT

Aim To evaluate the usage of inspiration, expiration, cough, and heel drop jarring tests that are applied for determination of peritonism in cases with acute abdominal pain.

Methods A prospective study based on observation of patients between 16-65 years of age and presented to the Emergency Department within a 3-month period starting from June 2007, was conducted. The patients were asked to rate their pain level between “0” and “10”. Following the measurement of the vital signs, 4 tests were conducted by an emergency medicine resident. The medical records of all the patients were reviewed after 3 months. Data concerning clinical diagnosis, hospital admission and discharge processes, and surgical results, were all recorded.

Results Seventy-seven patients had peritonism tests performed. Inspiration test was positive in 29 (of 51, 56.9%) patients admitted to the hospital. However, there was no correlation between the cases admitted to the hospital and the other 3 tests (p>0.05). Twenty-one (of 34, 61.8%) patients which have been subjected to surgical treatment, showed positive inspiration test results. Surgical treatment was performed on nine (of 11, 81.8%) patients who showed positive results for all 4 tests.

Conclusion The applied tests are helpful in determining a serious abdominal disease, particularly alongside findings of rebound, tenderness, and laboratory results.

Key words: abdominal pain, decision making, diagnosis.
INTRODUCTION

Abdominal pain makes 4-5% of all emergency department admittance (1,2). While some patients with abdominal pain present with a serious pathology, a significant number of those patients have no specific cause explaining for the pain (3,4). Therefore, the management of abdominal pain cases poses a considerable problem within the emergency settings (1,5).

It is important to determine a cause underlying abdominal pain, and whether it requires surgical intervention or not. Abdominal rigidity, reflex spasm or involuntary contractions of abdominal muscles suggest peritoneal irritation (6). Although rebound tenderness has several limitations, it is recognized as the standard clinical criterion for peritonism (6-8).

Clinically, peritonism tests are used in alternative clinical maneuvers which are based on the principle of moving peritoneal surfaces for detecting peritonism (7). Aim of this study was to evaluate the usage of inspiration, expiration, cough, and heel drop jarring tests for determination of peritonism in cases with acute abdominal pain. Moreover, it was investigated whether there was any correlation between the test results and the prevalence of surgical intervention within the following period.

PATIENTS AND METHODS

This study was carried out with the permission of the Ethics Committee of the Erciyes University. A prospective, observational study was conducted on patients between 16-65 years of age presented to the Emergency Department of the Erciyes University with a non-traumatic acute abdominal pain within a 3-month period starting from June 2007. The patients, whose abdominal pain started in a week, were enrolled in this present study. Patients who required resuscitation, had history of diabetes, renal insufficiency, pregnancy, previous abdominal operation, and those who were analgesia or uncooperative were excluded from the study.

A pre-designed form containing the patients’ clinical data was filled out. The patients were asked to rate their pain level between “0” (no pain) and “10” (most severe pain) according to numeric pain scale. Following the measurement of the vital signs, 4 tests were conducted by an emergency medicine resident in the order mentioned below. Then, abdominal examination was performed.

The patients were asked to do the following during the tests: take a breath as deep as possible for the inspiration test; exhale as deep as possible for the expiration test; cough very hard following a complete relaxation for cough test; and look at the face of the physician running the test and come down with all his/her weight on one’s heels after standing on his/her toes on a smooth surface. During these actions the findings indicative of a perceived pain (a vocal response, grimace, or movement of hands towards abdomen) were evaluated as a positive result. All tests were carried out by a physician other than the one who examined, evaluated, and treated the patient in emergency department. The medical records of all patients were reviewed after 3 months. Data concerning clinical diagnosis, hospital admission and discharge from hospital, and surgical results, were all recorded. Groups were compared by $\chi^2$ and Fisher’s exact test.

RESULTS

The present study was conducted on 77 patients with acute abdominal pain. Forty-two (54.5%) patients were males, and the mean age was 52.3 (median 54, range: 17-80). The mean duration between the onset of the pain and presentation to the hospital was 36.3 hours (median: 40, range: 2-72). Median pain score determined by numeric pain scale was 7 (range: 3-10).

While 51 (66.2%) patients were admitted to the hospital, surgery was performed only on 34 (66.6%) patients.

There was no correlation between the numeric pain scale, and hospital admission and surgical treatment. No significant correlation could be found between each of the applied tests and numeric pain scale (Table 1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean values of numeric pain scale</th>
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<tbody>
<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Inspiration</td>
<td>7.1</td>
</tr>
<tr>
<td>Expiration</td>
<td>7.4</td>
</tr>
<tr>
<td>Cough</td>
<td>7.1</td>
</tr>
<tr>
<td>Heel drop jarring</td>
<td>7.3</td>
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</table>
The analysis of the tests revealed a significant difference between inspiration test and admission to hospital (p<0.05). Inspiration test was positive in 29 (56.9%) of 51 patients admitted to the hospital. However, there was no correlation between the cases admitted to the hospital and the other 3 tests (p>0.05) (Table 2).

While sensitivity of inspiration test for admittance to hospital was 56.8%, its specificity was 73% patients with negative result were discharged, negative predictive value was 46.3% (probability of admitting a patient with negative inspiration test result), and positive predictive value was 80.5% (admittance probability of a patient with positive inspiration test result) (Table 3).

A total number of 21 (61.8%) of 34 patients, who had been subjected to a surgical treatment, showed positive inspiration test. A significant correlation was found between the inspiration test and the surgical treatment (p<0.05). Regarding surgical treatment, inspiration test sensitivity was 61.7%, specificity was 65.1%, negative predictive value was 68.2%, and positive predictive value was 58.3% (Table 3).

A correlation was found between surgical treatment and the patients who showed positive results for all tests (p<0.05). Regarding surgical treatment, positive results for all tests showed a sensitivity of 26.4%, specificity of 95.3%, negative predictive value of 62.1%, and positive predictive value of 81.8%. There was correlation between hospital admittance and positiveness of all of the tests (Table 4).

Five patients, who had shown negative results for all tests, were admitted to the hospital. Surgical treatment was applied on those five patients in the hospital. While three of those patients developed acute abdomen profile, two of them were found to be diagnosed as acute appendicitis and the remaining one as ruptured ovarian cyst. One patient experienced percutaneous drainage due to determination of intraabdominal abscess formation, one patient underwent an operation due to the presence of hydatid cyst.

Patients who had shown a rebound tenderness during initial examination was presented in 12 (86.6%) patients of 15 underwent surgical treatment (Table 5).
Examination of the hospital records revealed that none of the patients had been subjected to surgical treatment and observation during the first 3 months after the discharge.

**DISCUSSION**

Management of the patients with acute abdominal pain in emergency room should be fast and practical (9). Peritonism is an indicator that is important in the management of patients with acute abdominal pain (10). Emergency physicians may act on their intuitions for determining diffuse or regional irritation (peritonism) of peritoneum in patients with acute abdominal pain (11). However, the decision mostly depends on the results of the diagnostic tests (11,12). Majority of those tests are based on the principle of detecting a serious acute abdominal pathology or peritonitis (11). During early period of abdominal pain methods such as X-ray, urine analysis, and blood tests are known to have the potential false negative results (11,12).

Rebound tenderness is recognized as a strong indicator of peritonism (7,13). By employing the classic technique, the difference between pains of voluntary contraction and peritonitis may not be definitely determined. Approximately every fourth patient may experience false positive results (6). This probably occurs as a result of a non-specific recoil/reflex response and may misleadingly suggest that rebound tenderness might not have the adequate predictive values for diagnosing the true condition of patients (6). Physicians may need additional test or examination methods in order to reach a definite peritonism diagnosis. For this purpose, many tests which are based on maneuvers that move the abdominal wall, diaphragm, and peritoneum, are used in clinics (7, 11).

In the present study it was found that all tests failed in predicting clinical results of the cases with an exception of inspiration. The meaningfulness of inspiration test was probably a consequence of downwards movement of diaphragm (7). Moreover, the fact that inspiration test was the first test applied to the patients, might have been a factor for reaching a different evaluation and perception (7). However, assessing results with all 4 tests together can be more informative regarding the need for surgical intervention on the index patient.

According to our results, negative results obtained from all tests, will help with a discharge decision made by practitioners. However, it should be always born in mind that these tests do not have any diagnostic value (2). The peritonism tests should be employed only for reassessment of patients with acute abdominal pain and for elimination of peritonism.

According to our study, despite low sensitivity, patients who had positive results in all four tests need more attention for the necessity of hospital admission and surgery. Patients with negative results for all four tests may rarely require surgical intervention.

The comparison of the test result in this study revealed higher sensitivity and specificity values for rebound tenderness. This result supports the view that rebound tenderness is an important parameter for the management of cases with acute abdominal pain (13).

The applied tests in this study (inspiration, expiration, cough, and heel drop jarring test) seemed to be easily accomplished in emergency settings. However, there were conditions which limit their use. For example, these tests were performed by more than one practitioner, for this reason, there may be differences in the interpretation of the test. During the application of most of those tests, pain severity increased and that made repeating of the tests difficult. Moreover, these tests required attention and cooperation of the patient. For example, cough test can be assessed only when a contraction follows relaxation of patient’s abdominal wall muscles (14). Bending knees and changing posture in order to lower the tension of the abdominal wall in cases with peritonitis was an important factor that made the application of the tests difficult (15). Cough occurs with pain in many cases which involve acute inflammation of abdomen (10). Particularly, the presence of cough and pain, provides useful information in patients with peritonitis (6). Patients mostly move their hands towards the painful area and this helps physicians to localize the lesion (10). The same principle was also seen in heel drop jarring test involves the same benefits.

One of the limitations of this study was the reviewing of the 3-month follow-up period of the patients from hospital records after the discharge. Discharged patients may have received a treatment in another health center (it assumed that a very low possibility).
Particularly in patients who displayed negative results for all the tests and admitted to hospital, the changes in test results during the following period, was an important issue to be addressed. Similar further studies can benefit from those data as well. However, we believe that these factors did not have a significant influence over results of the present study.

In conclusion, if all 4 tests are carried out, especially inspiration test could be useful in the management of patients presenting with acute abdominal pain. Tests alone are not effective in determining peritonism, however, they are valuable when evaluated together. The applied tests are helpful in determining a serious abdominal disease, particularly alongside the findings of the rebound, tenderness, and laboratory results.

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TRANSPARENCY DECLARATIONS
Competing interests: none to declare.

REFERENCES