Evaluation by Kampo medical faculty of a simulator for teaching abdominal palpation

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Abstract

Abdominal palpation is a necessary technique, particular to Japanese Kampo medicine, based on the theory that physiological changes in illness will manifest themselves in the abdomen. Because this technique is used widely in clinical practice for all kinds of conditions, a suitable way of teaching this technique to doctors is called for. To this end, we have developed an abdominal palpation educational simulator, which we call the Fukushin Simulator, consisting of 6 abdominal models exhibiting the typical disease patterns of excessive strain of abdominal muscles (Fukuchokukinkincho), stiffness and rigidity below the heart (Shinkahiko), fullness in the chest and hypochondrium (Kyokyokuman), lower abdominal fullness (Shofukukoman), lower abdominal numbness (Shofukufujin), and abdominal fluid congestion (Shinkabushinsuion). Fourteen Kampo educators in medical faculties in Japan tested the models and then responded to a questionnaire. The results show that, while abdominal fluid congestion was considered to be unsatisfactory in its current form, the other 5 models were all considered to be satisfactory. Evaluators’ comments included advice on specific points that could be improved and ideas for future directions, along with opinions to the effect that this simulator could be of great use as an educational tool. In this study, 85.7% of respondents expressed interest or great interest in the simulator, while 78.6% considered it useful or very useful, leading us to believe that it may have a large role to play in educational settings.

Key words Kampo medicine, abdominal palpation, simulator, questionnaire, medical faculty.

Introduction

In abdominal palpation, a physician palpates a patient’s abdomen in order to determine the disease pattern present. This technique, which originated in Chinese medicine but has undergone independent development in Japan, is peculiar to Kampo medicine, and is based on the theory that physiological changes in illness will manifest themselves in the abdomen. The technique is used as a diagnostic tool in all kinds of conditions.\(^1\)\(^2\)

In Introduction to Kampo, edited by the Japan Association for Oriental Medicine and considered the de facto textbook of Kampo medicine, it is stated that practitioners need to know the correct Kampo terminology for the parts of the abdomen and understand the representative abdominal disease patterns of clinical significance.\(^1\)

At universities, it is necessary to educate large numbers of students in a limited time, and to this end charts and videos and other aids are used to teach the techniques of abdominal palpation, and there are initiatives to use computers to offer further efficiencies.\(^6\)

There is an aspect to abdominal palpation that is

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very difficult to teach, relying as it does on the experience of the practitioner, including such elements as the precise movements of hand and fingers, the appropriate amount of pressure to apply, and the sensation of resistance when applying pressure. And while it is possible to use healthy subjects for practice, students are unlikely to encounter all the clinically important patterns in this way.

In medical education we already have access to simulators for some phenomena of this kind, such as cardiac diseases, and these are recognized as being useful. However, abdominal palpation simulation initiatives have been insufficient, and in fact no simulator has hitherto been created for Japan's unique tradition of abdominal palpation.

As described elsewhere, we have developed an abdominal palpation educational simulator (the Fukushin Simulator; Fig. 1, Table 1), consisting of 6 models representing the 6 abdominal disease patterns described below.

*Excessive strain of abdominal muscles* (Fukuchokukinkincho) refers to abnormal strain or tension in the rectus abdominis muscles.

*Stiffness and rigidity below the heart* (Shinkahiko) refers to a feeling of discomfort and tenderness in the epigastric region.

*Fullness in the chest and hypochondrium* (Kyokyo-kuman) indicates a strong feeling of resistance in the hypochondrium, with tenderness in the lower hypochondriac region.

In *lower abdominal fullness* (Shofukukoman), the physician encounters a strong feeling of resistance in the U shape in the lower abdomen.

In *lower abdominal numbness* (Shofukufujin), the physician encounters areas of decreased resistance to the touch in the center of the lower abdominal area.

*Abdominal fluid congestion* (Shinkabushinsuion) refers to a pattern in which percussion of the abdominal wall gives rise to a succussion sound, indicating the presence of “stagnant” fluid in the stomach.

With a view to mass production in the future, we asked Kampo medicine educators to test the abdominal palpation educational simulator and then answer an anonymous questionnaire.

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**Fig. 1.** The present abdominal palpation educational simulator consisting of 6 abdominal models.
Table 1. Elements of the present abdominal palpation educational simulator

<table>
<thead>
<tr>
<th>Abdominal Model</th>
<th>(Disease Pattern)</th>
<th>Materials &amp; Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>fullness in the chest and hypochondrium</td>
<td>(resistance in hypochondrium)</td>
<td>polyurethane fixed to artificial ribs in lower hypochondrium</td>
</tr>
<tr>
<td>excessive strain of abdominal muscles</td>
<td>(resistance in rectus abdominis)</td>
<td>rubber-coated materials in area corresponding with rectus abdominis</td>
</tr>
<tr>
<td>stiffness and rigidity below the heart</td>
<td>(resistance in epigastric region)</td>
<td>hard polyurethane in area of resistance in epigastric region</td>
</tr>
<tr>
<td>lower abdominal fullness</td>
<td>(lower abdominal letter U resistance)</td>
<td>hard polyester in area of resistance in lower abdomen</td>
</tr>
<tr>
<td>lower abdominal numbness</td>
<td>(weakening of resistance in central lower abdomen)</td>
<td>soft inner cotton in central lower abdomen</td>
</tr>
<tr>
<td>abdominal fluid congestion</td>
<td>(sound of fluid in epigastric region)</td>
<td>rubber balloon containing water in abdomen</td>
</tr>
</tbody>
</table>

Subjects and Methods

The Kampo educators whom we approached numbered 14. They each had between 6 and 25 years of Kampo clinical experience. Eleven of them were board certified members of the Japan Society for Oriental Medicine.

The abdominal palpation educational simulator was designed to recreate the abdominal disease patterns recognized in Kampo medicine. It consists of 6 models showing the adult human abdomen at actual size, from the chest to 30 cm below the navel (Fig. 1). In creating it, we used polyester type synthetic plastic, synthetic leather, pile fabric, arborescent cotton, jersey, polyurethane, natural rubber, and other materials. We made artificial ribs and set the aforementioned materials of varying hardnesses at the key sites of the abdomen as shown in Table 1. The default settings were all set at the intermediate point on a strong-weak scale of abdominal strength.

After trying out the simulator, the Kampo educators were invited to answer our questionnaire, to ascertain their overall ranking of the simulator on a 5-point Likert scale from 0 (very satisfied) to very dissatisfied (4 points). The questionnaire also included a section where respondents were asked to write their impressions and opinions freely.

Results

The scores obtained in the questionnaire are as follows (and shown in Fig. 2): excessive strain of abdominal muscles model: 0.6 ± 0.8; stiffness and rigidity...
below the heart model: 0.81 ± 1.1; lower abdominal numbness model: 1.0 ± 1.1; fullness in the chest and hypochondrium model: 1.2 ± 1.3; lower abdominal fullness model: 1.0 ± 1.1.

We can conclude that the above 5 models are satisfactory for educational purposes. However, the results for the abdominal fluid congestion model were 2.8 ± 1.1, representing a high degree of dissatisfaction. It appears that the artificial leather used for the skin was too hard for this model to be truly useful.

Table 2 shows some of the comments given in the section of the questionnaire inviting respondents to comment freely on the simulator. Generally, the respondents have a favorable impression of the simulator’s usefulness in educating students, and there are some useful criticisms and suggestions.

The responses to the questionnaire item asking the educators’ degree of interest in the simulator are shown in Fig. 3. We found that 50.0% of respondents were “very interested”, while 35.7% were interested. The total of 85.7% who were interested or very interested was encouragingly high.

The responses to the questionnaire item asking the educators’ opinion on the usefulness of the simulator showed that 35.7% considered the simulator “very useful” while 42.9% considered it “useful”. Again, the combined total percentage of 78.6% who found it useful or very useful was encouragingly high, reflecting the high expectations of the educators we polled towards the abdominal palpation educational simulator.

**Discussion**

Currently in Japan, the modern western system of biomedicine holds sway. Becoming conscious of the limits of this system, many doctors have high expectations of Kampo medicine. There are reports that as many as 72.1% of practicing doctors in Japan have prescribed Kampo formulas at least once.\(^{10}\)

However, medical schools and University medical departments have until recently rather neglected education of Kampo medicine, considering Japan’s rich Kampo tradition. This is illustrated by the fact that in

<table>
<thead>
<tr>
<th>Degree of Interest</th>
<th>Very Interesting (50.0%)</th>
<th>Interesting (35.9%)</th>
<th>Equivocal (7.1%)</th>
<th>Not Interesting (7.1%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of Usefulness</td>
<td>Very Useful (36.7%)</td>
<td>Useful (42.9%)</td>
<td>Equivocal (14.3%)</td>
<td>Not Useful (7.1%)</td>
</tr>
</tbody>
</table>

Fig. 3. Evaluation of the present abdominal palpation educational simulator

**Table 2.** Kampo educators’ opinions on the present abdominal palpation educational simulator

- Students using this simulator will find it easy to understand abdominal diagnosis.
- The abdominal palpation educational simulator is most interesting.
- In addition to these single site/symptom models, one that can deal with multiple sites/symptoms at the same time is necessary: for example, one that can teach students to differentiate between the patterns that distinguish between the use of the various bupleurum-based formulas (shigyakusan (Si-ni-san), shosaikoto (Xiao-chai-hu-tang), saikokaryotsuboreito (Chai-hu-jia-long-gu-mu-li-tang), daisaikoto (Da-chai-hu-tang), saikokeishito (Chai-hu-gui-zhi-tang)), and so on.
- It would be even better if we could check the points in the abdomen where pain might be experienced.
- The surface is too stiff to adequately represent skin; improvements in the abdominal surface are necessary.
- It would be preferable to show the position of the groin clearly.
1999 only 38 of Japan’s 80 medical schools and University medical departments offered education in this field.

The figure has, however, been rising, and the March 27, 2001, Ministry of Education, Culture, Sports, Science and Technology’s Council on the Future of Medical & Dental Education contained in its list of goals for those graduating from such programs that they should “be able to describe Wakan (Japanese-style Kampo) medicine”. From 2004, every medical department in Japan has included an element of Kampo education in its curriculum.\(^{(1)}\)

In Kampo, abdominal palpation is an important diagnostic tool, and thus is included in all lecture programs on Kampo medicine for practitioners.\(^{(12)}\)

A questionnaire survey that we earlier conducted with 149 practitioners attending a Kampo education lecture program showed that 70.4% of practitioners understood abdominal palpation just “a little” or “couldn’t really say” whether they understood it or not, while 23.5% reported that they “didn’t know it”.\(^{(13)}\) This finding that practitioners’ understanding of abdominal palpation is very limited, combined with the fact that education of Kampo medicine in medical schools and University medical departments is still in its dawn, was the original impetus for our development of the abdominal palpation teaching simulator.\(^{(9)}\)

In an earlier survey, using the same questionnaire as in this study, conducted at a lecture program that included hands-on experience with the abdominal palpation educational simulator, the percentage of practitioners responding that they now understood abdominal palpation either “very well” or “well” was 58.4%.\(^{(13)}\)

Practitioners mentioned that, with the simulator present, abdominal palpation was easier to understand as they could picture how it was actually done better than they were able to when listening to a lecture and referring to accompanying handouts. Some respondents said that the abstract concepts from the lectures were made more concrete thanks to the models provided in the simulator.

Those judging the simulator as either “very useful” or “useful” accounted for 77.2%. Our conclusion was that for a diagnostic tool that relies on the sense of touch a simulator of this sort is of benefit.

In the present study, the Kampo educators answered the questionnaire after actually using the simulator. Their responses suggest that the lower abdominal fullness, fullness in the chest and hypochondrium, lower abdominal numbness, stiffness and rigidity below the heart, and excessive strain of abdominal muscles models are satisfactory for educational use. Unfortunately, the abdominal fluid congestion model was judged unsatisfactory due to the excessive hardness of the synthetic leather used for the skin. We are considering ways to improve this model in the future.

Amongst the respondents’ comments was the view that the stiffness of the surface was such that it was unable to reproduce the sensation of human skin, and that the model would need improvements for this purpose. One opinion expressed was that the inguinal area needs to be clearly marked.

Other opinions were that it would be useful to be able to experience multiple abdominal sights at once, rather than one at a time, and that sound effects to represent points that may be painful to the touch would be a useful enhancement.

As mentioned above, the percentage of respondents interested or very interested in the simulator was 85.7%, while the percentage of those judging it to be useful or very useful was 78.6%, some judging that with the help of the simulator it would be easy to adopt abdominal palpation in their practice.

Moving forward, we aim to make use of materials of variable hardnesses at the diagnostic sites, and set up a variable abdominal simulator that can be adjusted remotely. Another direction for future development is a device to simulate abdominal palpitations; in addition, we hope to develop some means to simulate patients’ expressions of discomfort or pain when palpated at specific sites. Finally, using a pressure sensor, we aim to monitor the pressure exerted by physicians’ hands and fingers when performing abdominal palpation.

**Conclusion**

Abdominal palpation is an important diagnostic tool in Kampo medicine. The abdominal palpation educational simulator recreates the typical examination points used in this modality. We invited Kampo educators to try out the simulator and then to answer an
anonymized questionnaire. The responses yielded several directions for improvement of the simulator and also revealed that the simulator is useful as an educational tool.

Kampo medical education in university is still in its dawn in Japan, and educators have access to few educational tools. We believe the simulator described can play an important role in fostering greater proficiency in this touch-dependent skill, and will continue to improve it based on the suggestions garnered from the Kampo educators who responded to our questionnaire.

References