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Original Article

Location of Back-shu Points of the Bladder Meridian in the Lumbar Region through Patient Measurement

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ABSTRACT

Background: The purpose of this study was to compare the first branch of the bladder meridian (FBBM) as determined by the proportional bone measurement method (PBMM), to the line formed by the erector spinae muscle group, and to establish an academic basis for selection of acupuncture points and needling.
Methods: Sixty participants were divided into 3 groups based on body mass index (BMI) and into 2 groups based on waist/height ratios. The distance from the midline of the spine to the first branch of the bladder meridian with PBMM (DFBBM), and the distance from the midline of the spine to the most elevated fleshy region of the erector spinae (DMEFR), at the same level as the inferior border of the spinous processes of L1-L5, were measured. The DFBBM and the 5 DMEFRs were then analyzed according to BMI and the waist/height ratio.
Results: DFBBM was statistically different from DMEFR in all back-shu points in the lumbar region. DFBBM was not significantly different from DMEFR in the groups with a high BMI or waist/height ratio. However, there was a statistical difference in the groups with a low or moderate BMI or low waist/height ratio.
Conclusion: Since the location of the most elevated fleshy region of the erector spinae does not coincide with the location of the FBBM, the selection of back-shu points in the lumbar region must be performed precisely by PBMM.

Introduction

The bladder meridian (BM) starts at the jingming (BM1), at the medial canthus of the eye, and runs along the vertebrae through the head and nuchal region, and down to the waist, buttocks, and the back of the lower limbs, terminating at the zhiyin (BM67) on the lateral side of the tip of the small toe [1].

The BM is a meridian involved in the treatment of bladder, kidney, spinal, genitourinary system, and mental health diseases, as well as in the control of body temperature. Notably, back-shu points are attached to the first branch of the BM. Back-shu points can be used not only to regulate the function of the viscera and bowels, but also as acupuncture points for related diagnoses and treatments [2]. Back-shu points can even be applied to pathological conditions related to deficiencies of yin, yang, and the blood [3]. The BM has 2 parallel branches, the first branch descends the back at 1.5 cun from the spine, and the second branch descends the back at 3 cun from the spine [1].

The erector spinae is a set of muscles located on both sides of the spinal column. It is made up of 3 muscle columns, the iliocostalis, longissimus, and spinalis. Each of these consists of 3 parts, the cervical, thoracic, and lumbar regions. Longissimus is the most prominent and the largest [4]. All 5 back-shu points in the lumbar region are located in the longissimus [2]. It forms a thick, fleshy mass at the side of the spine, and is considered the first branch of the BM [5]. However, there appears to be a difference in location when this line is compared to a line using the proportional bone measurement method.

The purpose of this study is to compare the location of the first branch of the BM, based on the proportional bone measurement

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method and the line formed by the erector spinae, and to establish an academic basis for the selection of acupuncture points and needling.

Materials and Methods

Participants

The participants of the study were ≥19 years old, and all signed a research participation agreement related to this study. Based on the following selection and exclusion criteria, a total of 60 participants (30 men and 30 women) were included in the study. (IRB No.:SJ IRB – 16 -003).

Selection criteria
1) People over 19 years of age
2) Those who agree to the research participation agreement

Exclusion criteria
1) If the above criteria are not met
2) Women who are pregnant
3) Any person who is judged to have a condition that may influence the evaluation of this research (in the researcher's judgment)

How the acupuncture point was measured

The participants were placed in a prone position, with both shoulders abducted 90 degrees and the elbows flexed 90 degrees. Half the distance from the midline of the back, to the medial borders of the scapula, was recorded as the distance from the midline to the first branch of the BM (DFBBM). The distances from the midline of the back, to the most elevated fleshy region of the erector spinae (DMEFR), at the same level as the inferior border of the spinous process of the first lumbar vertebra (L1), the second lumbar vertebra (L2), the third lumbar vertebra (L3), the fourth lumbar vertebra (L4), and the fifth lumbar vertebra (L5), were also measured with a tape measure (CH9-220, Jukebox, China). Values were rounded off to the nearest hundredth of a centimeter.

Body mass index (BMI)

Height and weight were measured with the participants in an upright position with their shoes removed, on an automatic height-weight measuring instrument (GL-100, JITECH International, Korea, 2014). BMI was calculated by dividing body weight by the square of the height. Height was measured to 2 decimal places, and weight was measured to 1 decimal place. BMI was calculated to 1 decimal place.

Waist/Height ratio

Waist circumference was measured to 1 decimal place using a tape measure (CH9-220, Jukebox, China) placed in a horizontal position, passing around the umbilicus with the participant in a comfortable, standing posture. waist/height ratio was calculated by dividing the waist circumference by the height [6].

Statistical analyses

BMIs of the participants were divided into 3 groups for each gender: ≤20 kg/m² (males; Group 1, females; Group 4), 20 - 25 kg/m² (males; Group 2, females; Group 5), >25 kg/m² (males; Group 3, females; Group 6). A Mann–Whitney U test was used to check for statistical differences between DFBBM and DMEFR according to BMI group. Two groups for each gender were created based on the weight/height ratio: ≤50 (males; Group A, females; Group C) and >50 (males; Group B, females; Group D). A Mann–Whitney U test was performed to see if there was a statistical difference between DFBBM and DMEFR according to weight/height ratio group. Statistical analysis was performed using SPSS 19.0 and a 0.05 confidence level was set.

Results

A total of 60 participants (30 men and 30 women) were included in this study. The mean age was 35.40 ± 15.57 years (Table 1). The DFBBMs, measured by the proportional bone measurement method were 4.48 ± 0.55 cm for men, and 3.65 ± 0.52 cm for women. The DMEFRs corresponding to Sanjiaoshu (BM22, L1) - Guanyuanshu (BM26, L5) from the DFBBMs were statistically significantly higher for men compared with women ($p<0.05$, Table 2).

The average DFBBMs and DMEFRs were calculated based on BMI groups. The average DFBBMs for men were 4.63 ± 0.43 (Group 1), 4.46 ± 0.54 (Group 2), and 4.49 ± 0.58 (Group 3), and the DMEFR showed a tendency to increase as BMI increased. The average DFBBMs for women were 3.57 ± 0.53 (Group 4), 3.63 ± 0.50 (Group 5), and 4.02 ± 0.54 (Group 6), and the DMEFR showed a tendency to increase as BMI increased. For the men, there was no significant difference between the DFBBM and the DMEFR for BM22 in Group 3 ($p>0.05$), although differences were found in all other positions, based on the BMI groups ($p<0.05$). For the female groups, there were differences in Group 4 and the lower back-shu points of Group 5, but there was no significant difference between the DFBBM and the DMEFR for BM22 of Group 5, and all acupuncture points of Group 6 ($p<0.05$, Table 3, Table 4).

The average DFBBM and DMEFR were calculated for the 4 waist/height groups, 2 for each gender. For the male groups, the

Table 1. Patient Characteristics.

	Number (*n*)	Age (*y*)
Male	30	30.80 ± 14.71
Female	30	40.00 ± 15.25
Total	60	35.40 ± 15.57

Table 2. Location of the Most Elevated Fleshy Region of the Erector Spinae Corresponding to BL22-BL26.

	Male		Female	
	Distance (cm)	p‡	Distance (cm)	p‡
DFBBM*	4.48 ± 0.55		3.65 ± 0.52	
BL22†	3.91 ± 0.60	0	3.34 ± 0.67	0.005
BL23†	3.66 ± 0.60	0	3.16 ± 0.70	0
BL24†	3.45 ± 0.63	0	2.97 ± 0.68	0
BL25†	3.34 ± 0.66	0	2.88 ± 0.72	0
BL26†	3.22 ± 0.66	0	2.78 ± 0.71	0

Data are presented as mean ± SD.
* The distance from the midline of the spine to the first branch of bladder meridian by the proportional bone measured method.
† The most elevated fleshy region of the erector spinae corresponding to BL22-BL26.
‡ Mann–Whitney U test.

Table 3. The Distance from the Midline of the Spine to the First Branch of the Bladder Meridian Based on Body Mass Index of Male Participants.

	Group 1*		Group 2†		Group 3‡	
	Distance (cm)	p¶	Distance (cm)	p¶	Distance (cm)	p¶
DFBBM§	4.63 ± 0.43		4.46 ± 0.54		4.49 ± 0.58	
BL22‖	3.55 ± 0.39	0.028	3.67 ± 0.61	0	4.25 ± 0.45	0.096
BL23‖	3.08 ± 0.30	0.020	3.42 ± 0.60	0	4.01 ± 0.43	0.002
BL24‖	2.83 ± 0.34	0.019	3.23 ± 0.58	0	3.81 ± 0.52	0
BL25‖	2.85 ± 0.45	0.020	3.06 ± 0.60	0	3.73 ± 0.55	0
BL26‖	2.85 ± 0.44	0.019	2.87 ± 0.49	0	3.69 ± 0.58	0

Data are presented as mean ± SD.
* Body Mass Index is 20 or less than 20 kg/m².
† Body Mass Index is 20 - 25 kg/m².
‡ Body Mass Index is over 25 kg/m².
§ The distance from midline of the spine to the first branch of the bladder meridian by the proportional bone measured method.
|| The most elevated fleshy region of the erector spinae corresponding to BL22–BL26.
¶ Mann–Whitney U test.

Table 4. The Distance from Midline of the Spine to the First Branch of the Bladder Meridian Based on Body Mass Index of Female Participants.

	Group 4*		Group 5†		Group 6‡	
	Distance (cm)	p¶	Distance (cm)	p¶	Distance (cm)	p¶
DFBBM§	3.57 ± 0.53		3.63 ± 0.50		4.02 ± 0.54	
BL22‖	2.78 ± 0.56	0	3.44 ± 0.44	0.126	4.33 ± 0.72	0.470
BL23‖	2.61 ± 0.51	0	3.24 ± 0.48	0.001	4.28 ± 0.73	0.688
BL24‖	2.43 ± 0.48	0	3.07 ± 0.51	0	3.98 ± 0.69	0.873
BL25‖	2.26 ± 0.40	0	3.00 ± 0.60	0	3.98 ± 0.58	0.810
BL26‖	2.18 ± 0.35	0	2.89 ± 0.55	0	3.93 ± 0.64	0.687

Data are presented as mean ± SD.
* Body Mass Index is 20 or less than 20 kg/m².
† Body Mass Index is 20 - 25 kg/m².
‡ Body Mass Index is over 25 kg/m².
§ The distance from midline of the spine to the first branch of the bladder meridian by the proportional bone measured method.
|| The most elevated fleshy region of the erector spinae corresponding to BL22–BL26.
¶ Mann–Whitney U test.

Table 5. The Distance from Midline of the Spine to the First Branch of the Bladder Meridian Based on the Waist/height Ratio of Male Participants.

	Group A*		Group B†	
	Distance (cm)	p‖	Distance (cm)	p‖
DFBBM‡	4.54 ± 0.53		4.41 ± 0.57	
BL22§	3.61 ± 0.58	0	4.25 ± 0.44	0.285
BL23§	3.32 ± 0.55	0	4.04 ± 0.41	0.008
BL24§	3.09 ± 0.51	0	3.86 ± 0.49	0.001
BL25§	2.97 ± 0.50	0	3.76 ± 0.55	0
BL26§	2.86 ± 0.47	0	3.64 ± 0.62	0

Data are presented as mean ± SD.
* waist/height ratio is 50 or less than 50.
† waist/height ratio is over 50.
‡ The distance from midline of the spine to the first branch of the bladder meridian by the proportional bone measured method.
§ The most elevated fleshy region of the erector spinae corresponding to BL22–BL26
|| Mann–Whitney U test.

Table 6. The Distance from Midline of the Spine to the First Branch of the Bladder Meridian Based on the Waist/height Ratio of Female Participants.

	Group C*		Group D†	
	Distance (cm)	p‖	Distance (cm)	p‖
DFBBM‡	3.63 ± 0.53		3.72 ± 0.49	
BL22§	3.11 ± 0.53	0	4.08 ± 0.55	0.072
BL23§	2.92 ± 0.53	0	3.94 ± 0.62	0.369
BL24§	2.74 ± 0.52	0	3.71 ± 0.61	0.908
BL25§	2.62 ± 0.53	0	3.71 ± 0.60	0.926
BL26§	2.53 ± 0.53	0	3.59 ± 0.63	0.420

Data are presented as mean ± SD.
* waist/height ratio is 50 or less than 50.
† waist/height ratio is over 50.
‡ The distance from midline of the spine to the first branch of the bladder meridian by the proportional bone measured method.
§ The most elevated fleshy region of the erector spinae corresponding to BL22–BL26.
|| Mann–Whitney U test.

average DFBBMs were 4.54 ± 0.53 (Group A) and 4.41 ± 0.57 (Group B). The average DMEFRs are shown in Table 5. For the female groups, the average DFBBM was 3.63 ± 0.53 (Group C) and 3.72 ± 0.49 (Group D). The average DMEFRs are shown in Table 6. A comparison of the DFBBM and DMEFR averages by the waist/height ratio groups showed differences in almost all the acupuncture points in men for both groups (p<0.05), but there was no significant difference for the distance at BM22 in Group B (p>0.05). In the female groups, there were no statistically significant differences in all points of Group D (p>0.05), whereas there were differences in all points of Group C (p<0.05, Table 6).

Discussion

Though the first branch of the bladder meridian (FBBM) is positioned differently in some reference books [7], the points of BM in this study were selected according to the World Health Organization Standard Acupuncture Point Locations in the Western Pacific Region [8]. The distance between the bilateral medial borders of the scapula is 6 cun with the proportional bone measurement method, according to Zhenjiu Jiayi Jing, and all acupuncture points on the back and lumbar regions are selected using this principle.

The erector spinae muscle group is important for maintaining an upright posture of the trunk [9] and it is the most noticeable human muscle group when the patient lies prone on the bed. In some cases, the portion of the most elevated fleshy region of the erector spinae (MEFR) at the side of spine has been considered the FBBM [4]. However, the findings in this study showed that the MEFR was attached closer to the vertebrae than FBBM, using the proportional bone measurement method.

The DMEFRs were different, based on body type, increasing for participants with higher BMIs or waist/height ratios. Therefore, for patients with a higher BMI or a large waist circumference, it may be possible to refer to MEFR as FBBM, but in general, the application is not appropriate.

The proportional bone measurement method is a typical selection method for acupuncture points in acupuncture medicine. As the name indicates, the selection of acupuncture points on the patient should be conducted following the shape of the bones, in the lumbar region as well. However, in comparison with the thoracic region, selecting acupuncture points in the lumbar region using the distance between the bilateral medial borders of the scapula, is difficult and inconvenient. Therefore, further studies on methods that can help the selection of back-shu points of the lumbar spine are needed. In addition, the number of participants in this study was small, increasing the likelihood of bias in each group. Therefore, it is necessary to supplement this work with studies that include more participants.

The results of this study suggest that because the location of the MEFR does not coincide with the location of the FBBM, the selection of acupuncture points within the lumbar region must be performed more precisely by using the proportional bone measurement method.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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