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사상체질에 따른 늑골각의 형태학적 연구

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Abstract

A Morphologocal Study of the Angle of Costal Arch according to the Sasang Constitution

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1. Objectives

To examine appearances and body shapes is essential of diagnosing Sasang constitution. Although there are many parts and ways to examine appearances, examination of abdomen would be so necessary and important. We focused on angles of costal arch according to Sasang constitution so that we can find some specialty of each constitution.

2. Methods

We measured the angles of costal arch of 173 participants who were diagnosed as Sasang constitution after treatments and analyzed by ANOVA and using Scheffe's t-test or t-test for some independent parameters.

3. Results and Conclusions

81 Taeumin's mean costal angle is 93.64° to be the widest one. 51 Soyangin have 87.27° mean angle of costal arch to be the second widest one. The next one is Taeyangin's mean angle of costal arch as 81.66° but the number of them were only 3. The sharpest costal angle which is 71.02° is owned by 38 Soeumin. Male participants have wider costal arch than female in all the constitutional groups.

Key Words : Angle of Costal Arch, Costal Arch, Sasang Constitution

Ⅰ. Introduction

Appearances and body shapes are used to be one of the most useful diagnostic methods of Sasang Constitutional Medicine(SCM). Not only appearances and body shapes but also personalities and symptoms should be concerned to distinguish one's constitution to another but external conditions are still such important factors. Until now, there are many articles about how to measure or characterize facial or body shapes of each constitutions. To objectify how to observe the appearances and body shapes, many different ways like tape-measuring, measurement method with 3D body measuring instrument (IBS-2000 compensator)[1,2] or 3D face automatic recognition apparatus(3D-FARA)[3~7] are being developed recently. But the study about how to examine abdomen has rarely developed.

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Table 1. Age Distribution of 173 Patients who Were Measured Costal Arch and Diagnosed Sasang Constitutions

	≤19	20~39	40~59	≥60	Total
Male	0	15(8.7%)	30(17.3%)	33(19.1%)	78(45.1%)
Female	2(1.1%)	19(11.0%)	42(24.3%)	32(18.5%)	95(54.9%)
Total	2(1.1%)	34(19.7%)	72(41.6%)	65(37.6%)	173(100.0%)

Fig. 1. Graduator

Fig. 2. How to Measure the Angle of Costal Arch

Anatomically costal arch is the front arch supported on the medial margin of costal cartilages of 7^{th}~10^{th}ribs.[8] An angle of costal arch determines the general shape of the trunkand the capacity of upper abdomen. For this reason, we suppose that bigger capacity of upper abdomen can produce superior digestion. So to study and to get object data about the costal arch angle will be meaningful to find a way to diagnose Sasang constitutions with abdominal examination. There is few articles[9,10] written about costal arch, and few of them mentioned general shape of each constitution's costal arch. But none of them were about clinical study or record.

Therefore the clinical records about the angle of costal arch analyzed in this article can be another meaningful way to examine abdomen to diagnose Sasang constitutions.

Ⅱ. Methods

1. Subjects

To get the data of distribution of costal arch according to Sasang constitution, 173patients were selected after treated with Sasang constitutional acupuncture and herb medicines diagnosed by Sasang constitutional medical specialists and special resident doctors. There are 81 Taeumins, 51 Soyangins, 38 Soeumins and 3 Taeyangins in the participants. The average age of total is 52.26 years(Female-51.00, Male-53.80). The female to male ratio is 95 to 78(Table 1).

2. Experimental Procedures

1) How to research data

Angles of costal arch of all the patients were hand measured by graduator(Fig. 1, Kawasa, Japan) with face up lied position.

The center of graduator is put on the end of xiphoid process and we measured the angle between medial margins of costal cartilage. To find medial margins of costal cartilage, we palpated near by costal arch and put the graduator to be parallel to medial margins of costal cartilage(Fig. 2). There are many variations on shapes of costal arch so we measured just their general angles. As far as we know, there is not

any special method to measure angle of costal arch.

2) Statistical Analysis

We analyzed the data using SPSS 12.0 for windows. All data obtained about costal arch are analyzed by ANOVA and using Scheffe's t-test or t-test for some independent parameters. The results are considered significant if P-value(significant probability) < 0.05 as compared each group.[11]

Ⅲ. Results

1. Sasang Constitutional distribution

Taeumin group have the most number as 81(46.8%) of 173 participants. Soyangin are 51(29.5%) and Soeumin are 38(22.0%). There are 95(54.9%) of female participants and 78(45.1%) of male. Also Taeumin is the most in female and male groups(Table 2).

1) Analysis according to Sasang constitution

Most of Soeumin are concentrated in narrow angle range as between 41 and 90°. Soyangin and Taeumin seem to make similar distribution in the range of costal arch angle as 71~110°. Soyangin are rather concentrated in between 71~100° while Taeumin are between 71~110°(Table 3).

The mean angle of costal arch of Taeumin is 93.64° to be the widest one. Soeumin group have the sharpest angle of costal arch as 71.02° among

Table 2. Sasang Constitutional Distribution(N=number)

Sasang constitution	Female(N)	Male(N)	Total(N)
Taeyangin	0	3(1.7%)	3(1.7%)
Soyangin	19(11.0%)	32(18.5%)	51(29.5%)
Taeumin	40(23.1%)	41(23.7%)	81(46.8%)
Soeumin	36(20.8%)	2(1.2%)	38(22.0%)
total	95(54.9%)	78(45.1%)	173(100%)

Table 3. Distribution according to Each Constitution and the Range of Costal Arch Angle

	Taeyangin(N)	Soyangin(N)	Taeumin(N)	Soeumin(N)
41~50°	0	0	0	3
51~60°	0	1	0	8
61~70°	0	1	1	6
71~80°	1	16	12	14
81~90°	2	13	26	6
91~100°	0	17	24	1
101~110°	0	3	13	1
111~120°	0	0	4	0
121~130°	0	0	1	0

Table 4. Mean of Costal Arch Angle according to Each Constitution(unit; degree)

Sasang Constitution	Total	N
Taeyangin	81.66±5.77	3
Soyangin	87.27±10.57	51
Taeumin	93.64±12.02	81
Soeumin	71.02±12.38	38
Total	86.58±14.51	173

Values are means±standard deviation.

all the constitution. The second widest costal arch belong to Soyangin as 87.27°. In Taeyangin's case, their mean angle of costal arch is 81.66°(Table 4).

Taeyangin group is eliminated in this test for their minority. After ANOVA test we found that all the groups(Soyangin, Taeumin and Soeumin) have significant differences to each other. There is the biggest difference between Taeumin and Soeumin group with 22.61 mean difference(Table 5).

2) Analysis according to sex

In all the constitutions, male groups showed wider costal arch than female groups. The mean angle of female group is 80.98° and male group is 93.41°. Taeumin male have the widest costal arch among all the constitutions as 98.31°. The next widest one is Soyangin male group who have mean of 89.53°. Soyangin female have wider angle than Soeumin male as 83.47°. Soeumin male's mean costal angle is 72.50° and Soeumin female's is 70.94° to be the sharpest one(Table 6). Male group is considered to have wider costal arch than female significantly(Table 7).

The Soeumin male group is eliminated in this test for its small number as 2. The mean costal arch angle of Soyangin male is 89.53° and it is significantly smaller than Taeumin male having 98.31° as mean angle. The data is analyzed using t-test(Table 8).

ANOVA test is used to analyze the data about

Table 5. Mean Difference between Two Constitution Groups and Its Significant Probability(unit; degree)

Sasang Constitutional groups	Mean difference
Soyangin - Taeumin	-6.36*
Soyangin - Soeumin	16.24*
Taeumin - Soeumin	22.61*

*p<0.05: significantly different from baseline.

Table 6. Mean of Costal Arch Angle According to Sex

Sasang Constitution	Female(°)	Male(°)	N
Taeyangin	-	81.66±5.77	3
Soyangin	83.47±11.28	89.53±9.61	51
Taeumin	88.85±10.61	98.31±11.57	81
Soeumin	70.94±12.37	72.50±17.67	38
Total	80.98±13.94	93.41±12.14	173

Values are means±standard deviation.

Table 7. Means According to Sex(unit; degree)

Sex	N	mean
Male	78	93.41±12.14**
Female	95	80.98±13.94**

Values are means±standard deviation, **p<0.01: significantly different from baseline.

Table 8. The Means of Soyangin Male and Taeumin Male Participants About Angle of Costal Arch(unit; degree)

Male Sasang constitutional group	mean
Soyangin	89.53±9.61**
Taeumin	98.31±11.57**

Values are means±standard deviation, **p<0.01: significantly different from baseline.

Table 9. The Mean Differencebetween Female Sasang Constitutional Groups

Female Sasang constitutional groups	Mean difference(°)	p-value
Soyangin - Taeumin	-5.37	.247
Soyangin - Soeumin	12.52	.001
Taeumin - Soeumin	17.90	.000

Table 10. The Range of Costal Arch Angle of Sasang Constitution

Sasang Constitution	Female(°)	Male(°)	Total(°)
Taeyangin	-	75~85	75~85
Soyangin	60~107	72~105	60~107
Taeumin	70~110	70~130	70~130
Soeumin	45~100	60~85	45~100

Table 11. Sasang Constitutional Distributions with Wider Costal Arch than Mean(mean+standard deviation) Range

Sasang Constitution	Female(%)	Male(%)	Total(%)
Taeyangin	-	0	0
Soyangin	0.5	1.2	1.7
Taeumin	2.9	7.5	10.4
Soeumin	0	0	0

Table 12. Sasang Constitutional Distributions with Narrower Costal Arch than Mean(mean -standard eviation) Range

Sasang Constitution	Female(%)	Male(%)	Total(%)
Taeyangin	-	0	0
Soyangin	1.2	0	1.2
Taeumin	0	0.5	0.5
Soeumin	9.2	0.5	9.8

female participants for they are 3 groups. As the result shows, there is not significant difference between Soyangin and Taeumin female groups. But Soyangin female have significantly wider angle of costal arch than Soeumin female as 12.53°. Also Taeumin female group is considered to have significant wider angle of costal arch than Soeumin female group as big as 17.90°(Table 9).

The widest angle of costal arch belongs to Taeumin and the sharpest one belongs to Soeumin. Also we can see that there are Soeumin who have wide costal arch angle as 100° and Taeumin who have narrow costal angle as 70°(Table 10).

More than 10% of participants having wider costal arch than mean range(101.32°) are Taeumin. Among them, 7.5% are Taeumin male and 2.9% are Taeumin female. Also there are 1.7% of participants with wider costal arch as Soyangin. None of Soeumin has wider costal arch than mean range(Table 11).

9.8% of all the participants who have narrower costal arch than mean range are Soeumin. 1.2% are Soyangin female and 0.5% are Taeumin male(Table 12).

Ⅳ. Discussion

To diagnose Sasang Constitutions appearances, characters and symptoms need to be concerned. And appearances are one of the most important factors to diagnose Sasang Constitutions.[12] Even personal minds need to be considered carefully to decide the constitu-

tion, many of patients having mental problems like dementia, coma caused by brain damage, alcoholic or badly educated are not available to be checked. Therefore further study and objectification about appearances are necessary to develop the diagnostic methods. There are many studies how to diagnose Sasang Constitutions by appearances as 'a Morphological Study of Hand and Foot according to Sasang Constitution'[13], 'The Body Measuring Method to Classify Sasang Constitutions'[9], 'a Morphologic Study of Sasang Constitution'[14], and 'A Study on the morphologic characteristics of each constitution's trunk'[15]. And also there have been many studies to develop diagnostic machines like 3D Automatic Face Recognition Apparatus(3D-AFRA)[2)~7)], IBS-2000 Compensator[16].

According to the several articles general information of Sasangin's costal arch is written. In Park's article[17], there are average relative bust circumferences((RB)=Bust Circumference/Height×100(%)) about Sasangin. The average of Taeyangin is 50.26, Taeumin 54.33, Soyangin 50.57 and Soeumin 49.88. This statics mean that Taeumin have the widest trunk among them, Soeumin have the narrowest trunk. Also we can assume that Soyangin has wider trunk than Taeyangin in these results.

There are more specific explanations about Costal arch of each Sasang Constitution in Huh's article[9]. Soyangin's costal arch make wider acute angle than Soeumin's. Taeumin's costal arch make gentle parabola so that the shape of abdomen used to be like a drum. But Soeumin and Taeyangin are not mentioned in this article.

Simple figures of each Sasangin's trunks are presented in Huh's article[10] so that we can get an idea of general shape of each costal archand each trunk. The outline and the length of trunks in next four figures are referred to Huh's[10] and Kim's[18] study.

To get clinical results about costal arch we hand measured 173 patients' costal arch and examined their abdomens. We calculated the average about costal arch angle of each patient and compared them to be aware of characters of Sasangin's abdominal appearances. And also the Sasang constitutional distributions are estimated as numbers and percentage. The average of total patients is 86.59°. Taeumin have the largest angle among Sasangin as 93.64° of costal arch and Soeumin have the sharpest one as 71.02°. Taeumin used to have well developed waist and lower abdomen in their external appearances. In Soyangin's case, they have the second widest angle of costal arch so that they have enough abdominal cavity capacity to have strong digestion ability. For their chest region being developed, it is equitable that they have second widest costal arch. And it can be applied to Soeumin's smallest costal arch. The average angle of Taeyangin's costal arch is 81.66° and it must be significant data for its rarity.

After it was analyzed using ANOVA test and t-test to find significant differences between each Sasang constitutions, Taeumin, Soyangin and Soeumin have significant differences to each other. But for their minority Taeyangin group is eliminated from this analysis. Also male and female participants are examined using t-test and they are considered to be significantly different as mean angle of male participants being 93.41° and female being 80.99°.

Except for Taeyangin group, all the Sasang Constitutions have wide rangeof costal arch angle as 60~107° of Soyangin, 70~130° of Taeumin and 45~100° of Soeumin. There are 18 Taeumin and 3 Soyangin who have wider costal arch angle than mean range. Also 2 Soyangin and 1 Taeumin have narrower costal arch angle than mean range. 17 of Soeumin have narrower angle of costal arch than mean range.

After divided into male and female groups to examine significant difference between Sasang Constitution, Taeyangin and male Soeumin groups are eliminated from this analysis for its numeral minority. Male Taeumin have significant wider costal arch than

male Soyangin. But in female Taeumin's case, they do not have enough significant difference between female Soyangin. But female Soeumin have significant narrower angle of costal arch than female Taeumin or Soyangin.

Also it is not enough to have only 2 Soeumin male participants about analyzing angles of costal arch according to Sasang constitution. Therefore we suggest to research data of fair distribution of constitution for further studies. We can say that there are tendency of angle of costal arch and Sasang constitution or digestion but cannot simplify it.

After we got the statistical analysis, it is able to have obvious scheme of each constitutional costal arch shape. However, the range of costal arch is still broad, so it is not enough to diagnose Sasang constitutions only with costal arch angle. For this reason, we suggest that it is necessary to evaluate further study about diagnostic methods of Sasang Constitutional Medicine with abdominal examinations.

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