

Measuring Research about Several Indices for Maxillofacial Contouring Plastic Surgery

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Abstract We have made facial contouring programme by computer to resolve measurement index necessary to quantity diagnosis, treatment and effect judgement of maxillofacial contouring plastic surgery and measured several indices for maxillofacial contouring plastic surgery of 400 volunteers. As a measurement result, there is no significant difference between direct and indirect and especially as programme measurement, several indices such as Zy-Zy, CMI, CMr, RMI, RMr, Mal, Mar, MeA are 123.93 ± 15.02 , 68.90 ± 12.33 , 69.12 ± 11.52 , 71.36 ± 3.87 , 72.15 ± 4.73 , 108.18 ± 11.58 , 109.75 ± 12.5 , 114.4 ± 11.56 . And proportion of distance between bilateral zygomatic points and distance between bilateral gonions is 1.12 for male and 1.05 for female.

Key words maxillofacial contouring, facial measurement, computer measurement programme

Introduction

The great leader Comrade **Kim Jong Il** said as follows.

“The most important factor in the current development of medical science and technology is to concentrate on solving the pressing scientific and technological problems in the health service.”(“ON THE FURTHER IMPROVEMENT OF THE HEALTH SERVICE” P. 18)

We have maxillofacial contouring plastic surgery because of feature transformation after facial trauma, tumor excision and abnormality of jaw development.

Recently maxillofacial contouring plastic surgery has gradually turning into quantity diagnosis and treatment from quality in the worldwide.

According to recent data, there is method which makes human face model by 3D program and manages the result [1], manufactures 3D face model by using some radiographic films [2] and manufactures 3D face model automatically by several measurement points [3, 4] on images.

And individualizing method of face and calculating method of several directions pattern images [7, 8] by research about wrinkle pattern images are also suggested. According to the other data, it is suggested method which reconstruct 3D facial contouring by synthesizing facial photo and data which input digital image to computer, measure facial contouring indices and uses it to diagnosis, treatment and operation effect judgment [5, 6, 10]. But most of them must use expensive instruments such as specialized 3DCT (three dimensions computer tomography) [9] and MRI and complicated handling and long processing time and need experts.

And in the maxillofacial contouring plastic department there is no data about measuring and analyzing program.

We have made computer program by using digital image, confirmed its possibility and taken measuring research for measuring reference indices necessary to maxillofacial contouring plastic surgery.

1. Experimental Instruments and Method

1.1. Experimental instruments

As used instruments for measurement, there are digital camera (SONY), computer [CPU 1.8G, 1.79G, RAM 496MB], a division ruler and a protractor and our facial measurement program 1.0.

1.2. Research object

There are 400 volunteers whose body is healthy, development is normal, craniofacial relation is harmonious and facial contouring is normal and symmetry without deformation and transformation. The male is 100 members and female is 300 members and their age is 18 to 35(the average is 22.2).

1.3. Research method

1.3.1. Measurement index on the face for maxillofacial contouring plastic surgery

As facial measurement indices, there are zygomatic distance (bilateral zygomatic points distance; zygomata, Zy-Zy), gonion distance (bilateral gonion points distance), length of ramus of mandible(distance to point of mandible angle from condylar process: left and right is noted respectively as RMI and RMr), length of corpus of mandible(distance to inferior margin of mandible corresponding anterior margin of ramus of mandible from central symphysis of mandible, left and right is noted respectively as CMI and CMr), Degree of mandibular angle(Angle that inferior margin of mandibular ramus crosses with posterior margin of mandibular ramus: left and right is noted respectively as Mal and Mar), degree of mental angle and ratio of zygomatic points distance and mandibular angle point distance.

1.3.2. Measuring method

We took photographs of them with a little upper chin and eyes of saggital plane to perfect in measurement.

1.3.3. Direct measurement

We used direct measurement method of facial surface.

In a short, under the natural light intensity, volunteer is sat at seat and bilateral eye's line is straight.

Measurement unit is millimeter and accuracy is 0.1mm.

Angle measurement unit is degree (°).

Measurement object is 60 members of male and 60 members of female of 400 volunteers.

1.3.4. Measurement method by facial measuring program

We took pictures of them with security and body posture a little upper jaw and eyes of saggital plane to perfect in measurement.

Under the normal light intensity, we input pictures after we took ones of front side, right and left side of face and underside of jaw.

And we get started program and analyzed images.

Measurement object is 100 members of male and 300 members of female.

2. Results and Conclusion

2.1. Relation between direct and program measurement

At first, we examined accuracy and usage possibility of facial measurement program made by us. The index measured by direct and program in male is as table 1, 2.

For each index, significant difference between direct and program measurement index has not been recognized.

In table 2, for each index in female, significant difference between direct and program measurement index has not been recognized.

Table 1. Result of measured by direct and program in male

Index	Direct	Program
Zy-Zy/mm	121.46±15.57	123.93±15.02
CMI/mm	68.86±11.45	68.90±12.33
CMr/mm	69.92±12.07	69.12±11.52
RMI/mm	70.65±2.47	71.36±3.87
RMr/mm	71.75±4.58	72.15±4.73
Mal/mm	108.29±11.1	108.18±11.58
Mar/mm	109.39±12.34	109.75±12.5
MeA/mm	112.34±11.7	114.4±11.56

$p > 0.05$, $n = 60$

Table 2. Result of measured by direct and program in female

Index	Direct	Program
Zy-Zy/mm	126.02±14.91	124.72±14.95
CMI/mm	70.12±10.91	70.88±10.63
CMr/mm	70.6±11.3	70.8±12.1
RMI/mm	5.15±2.22	5.35±2.94
RMr/mm	5.75±2.6	6.05±2.56
Mal/mm	111.08±13.8	112.18±14.63
Mar/mm	111.77±13.91	111.52±14.26
MeA/mm	115.36±11.7	111.52±14.26

$p > 0.05$, $n = 60$

2.2. Measurement results of several indices by facial measurement program

2.2.1. Relation between male and female by several indices

After confirming that there is no significant difference between direct and program measurement index, we examined relation between male and female according to indices by facial measurement program.

Table 3. Distance(mm) between bilateral zygomata by sex/mm

Index	Max	Min	Average	SD	SE
Male	140.30	106.26	124.13	13.26	4.69
Female	147.11	96.00	111.50	11.7	2.21

$p > 0.05$, $n = 400$

Table 4. Distance(mm) between bilateral mandibular angle by sex

Index	Max	Min	Average	SD	SE
Male	133.40	100.20	109.37	11.62	3.45
Female	131.52	98.60	106.57	15.94	2.61

$p > 0.05$, $n = 400$

As you can see in table 3, distance between bilateral zygomata by sex is average of 124.13mm (male), 111.50mm (female) and has not been significant difference.

As you can see in table 4, distance between bilateral mandibular angles by sex is average of 109.37mm, 106.57mm and has not been significant difference.

As you can see in table 5, mandibular corpus length by sex has no significant difference between male and female and between left and right.

As you can see in table 6, mandibular ramus length by sex has no significant difference between male and female and between left and right.

Table 5. Mandibular corpus length(mm) by sex

	Index	Max	Min	Average	SD	SE
Male	RMI	87.00	40.00	55.00	5.87	2.07
	RMr	65.00	42.00	52.13	5.57	1.97
Female	RMI	66.00	34.42	49.21	5.01	0.94
	RMr	65.00	32.00	47.64	4.85	0.91

$p>0.05$, $n=400$

Table 6. Mandibular ramus length(mm) by sex

	Index	Max	Min	Average	SD	SE
Male	RMI	104.00	76.38	47.00	8.16	2.88
	RMr	100.04	72.63	40.70	7.76	2.74
Female	RMI	116.07	85.86	52.31	8.74	1.65
	RMr	118.00	80.36	54.40	8.18	1.54

$p>0.05$, $n=400$

2.2.2. Mandibular angle by sex

As you can see in table 7, mandibular angle by sex has no significant difference between male and female and between left and right.

As you can see in table 8, mental angle by sex has no significant difference between male and female.

Table 7. Mandibular angle by sex /mm ($n=400$)

	Index	Max	Min	Average	SD	SE
Male	RMI	121.40	112.32	103.70	12.08	42.45
	RMr	124.70	115.36	108.00	12.32	43.60
Female	RMI	129.40	111.54	100.40	13.66	21.87
	RMr	118.00	80.36	54.40	8.18	1.54

$p>0.05$

Table 8. Mental angle by sex /mm ($n=400$)

	Index	Max	Min	Average	SD	SE
Male		129.90	101.80	119.85	18.12	45.29
Female		127.60	94.40	113.93	16.19	22.78

$p>0.05$

As you can see in table 9, ration of zygomatic and gonion distance by sex is 1.12 of male and 1.05 of female.

Table 9. Ration of zygomatic and gonion distance by sex ($n=400$)

Sex	Zygomatic distance /mm	Gonion distance /mm	Ration of zygomatic and gonion distance
Male	124.13	109.37	1.12
Female	111.50	106.57	1.05

$p>0.05$

Conclusion

This research results show that the computer facial measuring program made by us can be used in the diagnosis, treatment and curative expectancy of the maxillofacial plastic surgery.

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