

An analysis of mandibular characteristics according to biological sex using 3D CT scans in Koreans

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Introduction

With the increasing demand for facial feminization surgery (FFS), precise knowledge of sex-based andibular morphology has become clinically relevant. In this study, “male” and “female” refer to biological sex as recorded in medical records; gender identity was not assessed. We aimed to analyze sex differences in mandibular morphology using three-dimensional (3D) computed tomography (CT) in a Korean population and to provide anatomic data applicable to mandibular contouring in FFS.

Methods

A retrospective analysis was conducted on 275 Korean patients who underwent facial CT between 2017 and 2019. Three-dimensional cephalometric analysis was performed to evaluate angular, linear, and transverse mandibular parameters, as well as non-metric features including chin shape and inferior mandibular border contour. Statistical comparisons were performed between sexes.

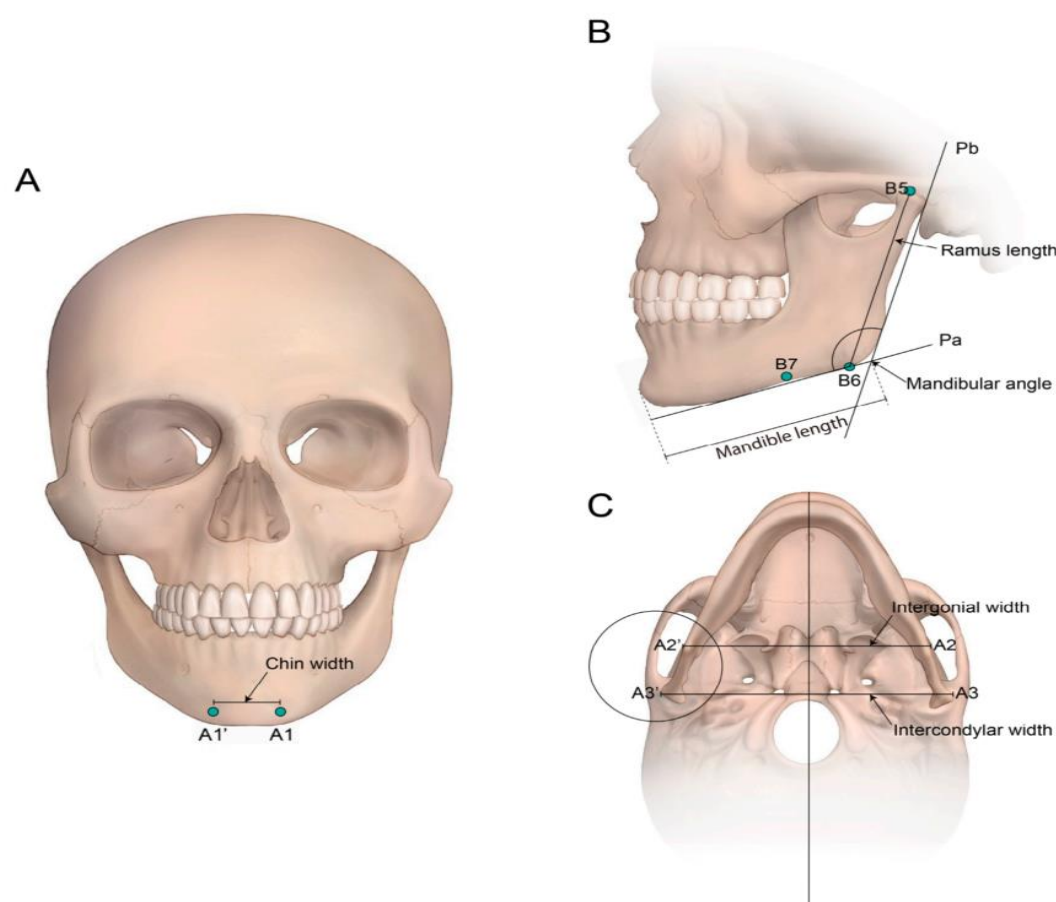


Figure 1. Linear and angular measurements of the mandible. (A) A frontal view illustrating chin width, defined as the distance between the right and left mental tubercles (A1-A1'). (B) A lateral view demonstrating the mandibular angle, formed by the intersection of the bottom plane of the mandibular corpus (Pa) and the posterior plane of the mandibular ramus (Pb). Mandible length was defined as the distance from the most anterior point of the chin to a line placed along the posterior border of the ramus, and ramus length was defined as the distance between B2 and B3. (C) An inferior view showing transverse measurements, including intergonial width (A2-A2') and intercondylar width (A3-A3').

Table 1. Definitions of CT-based mandibular measurements.

Measurement	Definition
Ramus length	The distance from the highest point on the condyle (B5) to the gonion (B6)
Mandible length	The distance from the most anterior point of the chin to a line placed along the posterior border of the ramus
Mandibular angle	The angle formed by the inferior border of the mandibular body (Pa) and the posterior border of the ramus (Pb)
Intercondylar width	The distance between the most lateral points of the right and left condyle heads (A3-A3')
Intergonial width	The distance between the right and left gonions (A2-A2')
Chin width	The distance between the right and left mental tubercles (A1-A1')
Antegonial notch distance	The distance between the most concave part of the lower border of the mandible (B7) and the mandibular plane line (Pa)

All sagittal linear and angular measurements were recorded on the left side.

Results

Significant gender differences were observed in mandibular angle, mandible length, antegonial notch distance, intercondylar width, and intergonial width (all $p < 0.001$). Ramus length and chin width did not demonstrate statistically significant differences. Non-metric analysis revealed significant gender differences in chin morphology and inferior mandibular border contour ($p < 0.001$). Males predominantly exhibited a round or square chin (79.5%) and a rocker-shaped inferior border, whereas females commonly demonstrated a pointed chin (82.3%) and a straight inferior mandibular border (94.4%).

Table 2. Statistical analysis of CT-based mandibular measurements between male and female.

Measurements		Male	Female	<i>p</i> -Value ^{(a), (b)}
Number		151	124	
Intercondylar width		126.9 ± 7.6	122.6 ± 6.1	<0.001
Intergonial width		101.3 ± 4.5	98.4 ± 2.2	<0.001
Mandibular angle		120.7 ± 3.7	123.3 ± 4.0	<0.001
Mandible length		73.5 ± 2.3	68.6 ± 4.2	<0.001
Ramus length		58.3 ± 4.8	56.1 ± 2.6	0.073
Chin width		22.7 ± 4.3	22.1 ± 3.7	0.703
Antegonial notch distance		2.6 ± 0.7	1.2 ± 0.3	<0.001
Chin shape	Pointed	31	102	<0.001
	Round/Square	120	22	
Lower border	Notch	102	7	<0.001
	Straight	49	117	

(a) t -test; $p < 0.05$, statistically significant, (b) Chi square test; $p < 0.05$, statistically significant.

Conclusion

The gender-specific mandible features are characterized by differences in angularity, transverse width, antegonial morphology, and inferior border contour. These findings provide population-specific morphological reference ranges that may support individualized preoperative assessment for mandibular contouring in facial feminization surgery.

Figure 2. Non-metric mandibular morphology classification. Representative three-dimensional CT images demonstrating the categorical classification of non-metric mandibular features. (A) Pointed chin morphology. (B) Square chin morphology. (C) Round chin morphology. (D) Straight inferior mandibular border contour. (E) Notched inferior mandibular border contour.

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