

cone beam

a b b c a d e

computed tomography (CBCT)
2008 6 2008 11

cone beam
2

CBCT 106 , 212
(normal), (flattening), (sclerosis),
(osteophyte), (erosion)
(weighted kappa: 0.714),
CBCT (weighted kappa: 0.727) A

82.4%, 58.1% B 84.3%, 61.5% CBCT

CBCT 5% CBCT

80% CBCT

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: , CBCT,

a , c , d ,
b ,
e ,

28,
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3
 4
 56
 7-10
 11-14
 2
 15-18
 19-23
 (com-
 puted tomography, CT)
 CBCT
 CT
 19,20

, 3
 CT
 19,21-24
 CBCT
 2008 6 2008 11 /
 106 212
 CBCT
 (Table 1).

, FH
 (Planmeca Proline XC with
 Dimax3 digital system, Planmeca OY, Finland)
 68 kVp,
 8 mA
 CBCT
 FH

Table 1. Distribution of gender and age in this study

Sex	Number	Average age (range)
Male	19	25.8 years (15.3 - 49.4)
Female	87	30.0 years (12.4 - 72.0)
Total	106	29.3 years (12.4 - 72.0)

Table 2. Comparison of diagnoses of temporomandibular joint disorders between observers A and B

Bony change of condyle	Panorama		Cone beam computed tomography	
	A	B	A	B
Normal (N)	75 (35.4%)	75 (35.4%)	93 (43.9%)	91 (42.9%)
Flattening (F)	97 (45.8%)	93 (43.9%)	42 (19.8%)	38 (17.9%)
Osteophyte (O)	2 (0.9%)	2 (0.9%)	6 (2.8%)	3 (1.4%)
Erosion (E)	7 (3.3%)	11 (5.2%)	15 (7.1%)	19 (9.0%)
Sclerosis (S)	8 (3.8%)	4 (1.9%)	0 (0.0%)	2 (0.9%)
Unclassified (U)	4 (1.9%)	4 (1.9%)	2 (0.9%)	2 (0.9%)
Complex*	19 (9.0%)	23 (10.8%)	54 (25.5%)	57 (26.9%)
Total	212 (100.0%)	212 (100.0%)	212 (100.0%)	212 (100.0%)

*Type of condyle that has multiple bony changes at the same time.

Table 3. Detailed diagnoses of complex groups between observer A and B

Bony change of condyle	Panorama		Cone beam computed tomography	
	A	B	A	B
F E	18	20	32	25
F E S	0	0	0	2
F E U	0	0	1	1
F O	1	0	12	7
F O E	0	1	3	4
F O E S	0	0	1	1
F O S	0	1	1	2
F S	0	0	1	6
F S U	0	0	2	1
F U	0	1	0	1
O E	0	0	1	6
O S	0	0	0	1
Total	19	23	54	57

F, Flattening; O, osteophyte; E, erosion; S, sclerosis; U, unclassified.

212 19, 23 9.0, 10.9% CBCT
 54, 57 25.5, 26.9%

(Tables 2 and 3).

(Sensitivity) (Specificity) (Tables 4 and 5)

gold standard 24 CBCT
 , CBCT A 199 98
 82.4%, B 121
 102 84.3% .
 , CBCT A 93 54
 58.1%, B 91 56
 61.5% .
 McNemar CBCT
 (p = 0.05), 5% (p = 0.405).

(Inter/intra- observer reliability) (Table 6)

(inter-observer agreement) (weighted kappa) (p = 0.0001). CBCT

Table 4. Diagnosis rates of abnormality of mandibular condyle according to observers

		Cone beam computed tomography					
		Observer A			Observer B		
		Abnormal	Normal	Total	Abnormal	Normal	Total
Panorama	Abnormal	98	39	137	102	35	137
	Normal	21	54	75	19	56	75
	Total	119	93	212	121	91	212
McNemar test	<i>p</i> value	0.027			0.040		

Table 5. Diagnosis agreement rates of abnormality of mandibular condyle between panorama and CBCT images

		Observer B		
		Abnormal	Normal	Total
Observer A	Abnormal	137	15	152
	Normal	21	39	60
	Total	158	54	212
McNemar test	<i>p</i> value	0.405		

Table 6. Statistical values regarding diagnostic agreement of observers

Diagnosis		Generalized McNemar test	Weighted kappa value	<i>p</i> value
Interobserver	Between panoramic images	0.992	0.714	0.001
	Between CBCT images	1	0.727	
Intraobserver	Between panoramic and CBCT image from observer A	2E-04*	0.328	
	Between panoramic and CBCT image from observer B	0.279	0.311	

**p* < 0.05

(weighted kappa) 0.727
(*p* = 0.0001).
CBCT generalized McNemar
(*p* = 0.05).
0.05).
A CBCT general-
ized McNemar (*p* = 0.05) 4
0.328
B generalized McNemar
(*p* = 0.05),
0.311

25

0.714, CBCT 0.727

26,27

2

43.9%, 42.9%

CBCT (Table

2).

25.5, 26.9% CBCT

(Table

3).

Lindvall²⁹

28

Akerman³⁰ Cholitgul³¹

CBCT

CBCT

CBCT

CBCT (sagittal plan), (axial plan)

CBCT 1 mm (coronal plan),

Hintze³² TMJ nography, cross-sectional tomography, sca-

CBCT

CT, CBCT

Nah³³

CT^{21,22} gold standard

CBCT

CT

CBCT

5%

19,21,22

84.3% CBCT 82.4 106 , 212 cone beam (CBCT)

(false negative)

34 58.1% 61.5% CBCT

A , B CBCT 80%

1. (weighted kappa: 0.7139), CBCT (weighted kappa: 0.7266)
- 2 CBCT A 82.35%, 58.06% B 84.30%, 61.54%
- 3 CBCT 5% A, B ($p = 0.027, 0.040$).

(Table 6). CBCT

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Comparison of bony changes between panoramic radiograph and cone beam computed tomographic images in patients with temporomandibular joint disorders

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Objective: This study was designed to assess the diagnostic validity of digital panoramic radiographs compared to cone beam computed tomography (CBCT) in patients with temporomandibular joint disorders. **Methods:** Panoramic radiograph and CBCT were taken from a total of 212 joints from 106 subjects. The joints were examined by two dentists and divided into the following six groups: normal, flattening, osteophyte formation, erosion, sclerosis, and unclassified. The sensitivity and specificity of each observer and inter-observer reliability were statistically analyzed. **Results:** The results showed relatively high intra-observer reliability in the diagnosis of both panoramic and CBCT images and the weighted Kappa indices of panoramic and CBCT images were 0.714 and 0.727, respectively. The sensitivities of panoramic images of observer A and B to CBCT images was 82.35% and 84.30%, respectively, while the specificity of observer A and B was 58.06% and 61.54%, respectively. However, guided diagnosis from panoramic and CBCT images were statistically different ($p = 0.05$). **Conclusions:** The present study suggests that the panoramic radiograph could be used as a primary diagnostic device to detect bony changes of temporomandibular joints in clinical orthodontics, because panoramic images showed relatively high sensitivity compared to CBCT images. However, CBCT images may be one of the best choices when a more accurate diagnosis is necessary. (*Korean J Orthod* 2010;40(6):364-372)

Key words: Temporomandibular joint, Bony change, CBCT, Panoramic radiograph

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