A Master Dissertation

Computed Tomographic Features of the Temporomandibular Joint in Jeju Horses

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Department of Veterinary Medicine

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Computed Tomographic Features of the Temporomandibular Joint in Jeju Horses

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List of Abbreviations

CT	computed tomography
HU	Hounsfield unit
H:W	height to width ratio
MRI	magnetic resonance imaging
TMJ	temporomandibular joint

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1. Introduction

The equine temporomandibular joint (TMJ) is a synovial joint between the zygomatic process of the temporal bone and the condyle of the mandible. Due to incomplete conjugation of the articular surface, the oval-shaped articular disc and two non-communicating synovial pouches are centrally situated (Carmalt *et al*., 2016; May *et al*., 2001; Rodriguez *et al*., 2006). The articular capsule surrounds the joint. Lateral and caudal ligaments surround the TMJ laterally. Other surrounding structures include vessels, nerves, and muscles on the lateral side: maxillary vessels, transverse facial vessels, superficial facial temporal vessels, facial nerve, transverse facial branch of the auriculotemporal nerve, masseter muscle, and temporal muscle. The parotid salivary gland is located caudolateral to the TMJ. On the medial side, the temporohyoid joint, especially the dorsal part of the stylohyoid bone is close to the TMJ; the guttural pouch, pterygoid venous plexus, mandible nerve, and external acoustic meatus are also located adjacent to the TMJ (Carmalt *et al.,* 2016; Rodriguez *et al*., 2006).

Free-ranging horses spend 21 hours a day grazing (Carmalt, 2014). However, TMJ disorders in horses have been sparsely reported. Headshaking, quidding, and difficulty in chewing ar oftne observed in horses with TMJ disorders (Carmalt *et al*., 2016). These clinical signs are easily confused with those of neurological disorders, dental disorders, and behavioral problems. The most frequently reported cases of TMJ disorders are trauma or septic arthritis because of their obvious clinical symptoms (Barnett *et al*., 2014; Carmalt and Wilson, 2005; Elzer *et al*., 2020; Nagy and Simhofer, 2006; Wamerdam *et al*., 1997). Considering the ambiguity of symptoms and the complex structures of the TMJ, TMJ disorders in horses might be under-diagnosed.

Conventional imaging has limitations in showings abnormalities of the TMJ (May *et al*., 2001; Ramzan *et al*., 2008; Rodriguez *et al*., 2007). Radiography has been the preferred method for the diagnosis of osseous changes in the TMJ. Although radiography is a practical and non-invasive technique, only the lateral portion and bone of the TMJ can be observed on radiographs (Ramzan *et al*., 2008). Ultrasonography can reveal changes in soft tissue and bone on the lateral TMJ (Rodriguez *et al*., 2007). Additionally, arthroscopy could be employed as a method of diagnosis and treatment, but this tool may not only be unable to examine the TMJ thoroughly but would also be invasive (Ramzan *et al*., 2008). Advanced imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) have allowed clinicians to evaluate the TMJ from the lateral aspect to the medial aspect. (Rodriguez *et al*., 2010, Rodriguez *et al*., 2008). Research on the equine TMJ using CT and MRI has been recently reported (Barnett et al., 2014; Carmalt *et al*., 2016; Jorgensen *et al*., 2015; Rodriguez *et al*., 2010; Rodriguez *et al*., 2008; Smyth *et al*., 2015; Wamerdam *et al*.,1997).

Jeju horses are native to the Jeju－Province, South Korea. The mean height and weight of these horses are reported as 123.72 cm (Oh *et al*., 2014) and 267.00 kg, respectively (Kong *et al*., 2011). Genetic, anatomical, and physiological differences between Jeju horses and Thoroughbreds have been discussed (Khunmmaung *et al.,* 2020; Oh *et al*., 2014; Yoon *et al*., 2017). The value of Jeju horses has increased with the commencement of horse racing in South Korea. However, veterinary research on Jeju horses is still lacking, and TMJ disorders in these horses have also not been reported to date.

The objectives of this study were to describe the CT features of the TMJ in Jeju horses and to compare these features with those of Thoroughbreds.

2. Materials and methods

2.1. Animals

Sixteen horses were used in this study: 10 Jeju horses (age: 3–9 years; mean age: 4.5 ± 1.9 years old, bodyweight: 243–380 kg; mean weight: 282.6 ± 40.3 kg) and 6 Thoroughbreds (age: 4–5 years; mean age: 7.3 ± 1.6 years, bodyweight: 443.5–560 kg; mean weight: 479.7 ± 43.9 kg; Table 1). Physical examination and blood analysis were performed as pre-anesthetic examinations (complete blood count: VetScan HM5, Abaxis, Inc. UnionCity, California, United States; serum chemistry examination: VetScan VS2, Abaxis, Inc. UnionCity, California, United States). All animal procedures were approved by the Institutional Animal Care and Use Committee at the Jeju National University (2020-0400).

Table 1. Signalment of horses

	No.	Age(years)	Sex	Bodyweight(kg)
Jeju horses	1	4	F	305
	2	3	F	277
	3	3	F	280
	4	3	M	280
	5	4	M	274
	6	3	M	243
	7	9	F	380
	8	6	F	230
	9	6	G	270
	10	4	G	287
Mean ± SD		**4.5 ± 1.9**		**282.6 ± 40.3**
Thoroughbreds	1	9	F	490
	2	8	G	480
	3	8	G	465
	4	4	G	444
	5	7	F	440
	6	8	F	560
Mean ± SD		**7.3 ± 1.6**		**479.8 ± 43.9**

Sex: female (F), male (M), gelding (G), SD: Standard deviation.

2.2. Radiography and ultrasonography

Radiography and ultrasonography were performed to exclude horses with TMJ abnormalities (Buttler *et al.*, 2017; Ramzan *et al.*, 2008; Rodriguez *et al.*, 2007). Two radiographs of each TMJ were obtained (Figure 1): the lateral-lateral view and the rostral 35° lateral 50° ventral-caudal dorsal oblique view. Three ultrasonographic images of each TMJ were also obtained (Figure 2): the latero 45° dorso 45° caudal-medio ventro-rostral oblique plane, the rostro 20° latero 15° dorsal-caudo medio-ventral oblique plane, and the caudo 10° dorso 45° lateral-rostro ventro-medial oblique plane.

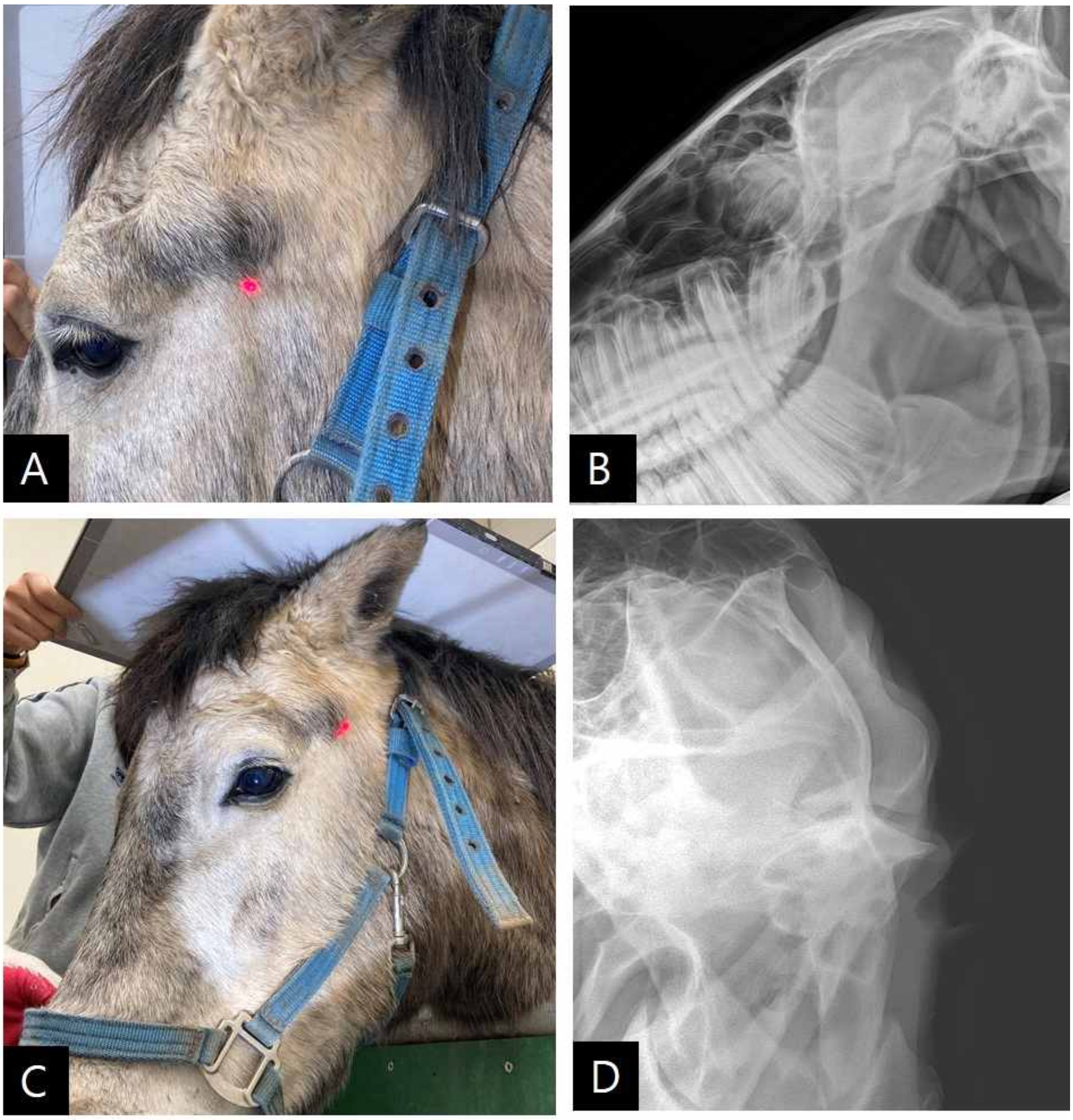

Figure 1. Radiographs of the temporomandibular joint (TMJ) in horses. (A) and (B) Lateral-lateral view of the temporomandibular joint. (C) and (D) Rostral 35° lateral 50° ventral-caudal dorsal oblique view.

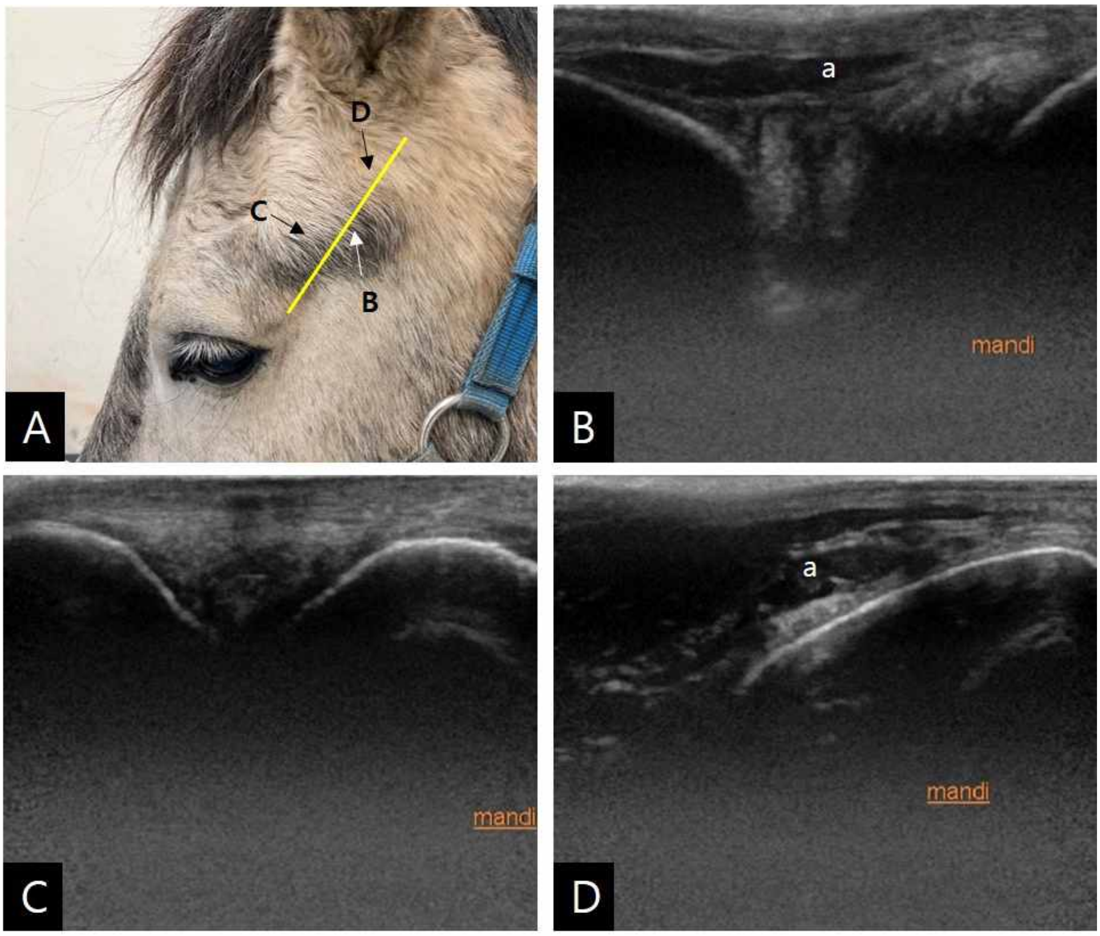

Figure 2. Ultrasonography of the temporomandibular joint (TMJ) (A) Lateral aspect of the equine head. Each view is marked with a letter on the imaginary line from the lateral canthus of the eye to the base of the ear. (B) Latero 45° dorso 45° caudal-medio ventro-rostral oblique plane. (C) Rostro 20° latero 15° dorsal-caudo medio-ventral oblique plane. (D) Caudo 10° dorso 45° lateral-rostro ventro-medial oblique plane. a: the parotid salivary gland.

2.3. CT scanning

Each horse was sedated using detomidine hydrochloride (0.01 mg/kg, I.V., Equadin, DongBang Co. Ltd; Anseong, Korea). Diazepam (0.05 mg/kg, I.V., Diazepam inj., Samjin pharm. Co. Ltd; Seoul, Korea) and ketamine (2.2 mg/kg, I.V., Ketamine 50 inj. Yuhan; Seoul, Korea) were injected as induction agents (Figure 3A). The anesthesia was maintained with isoflurane (Ifran®, Hana Pharm. Co. Ltd. Kyonggi-Do, Korea) with a 100% oxygen supply. A helical CT scanner (Aquilion Lightning, Canon; Otawara, Japan, 32 multislice CT) was employed. Horses were placed in dorsal recumbency on the custom-made table and put under general anesthesia (Figure 3C). The scanning parameters were as follows: 120 kV, 250 mA, 1 mm slice thickness, and rotation time, 0.75 s. The horses were allowed to recover in padded stall after CT scanning.

Figure 3. Process of computed tomography (CT) scanning. (A) Anesthesia induction in a horse using the swing door system in a padded stall. (B) Transportation to CT room using hoists. (C) CT scanning of the head of a Jeju horse.

2.4. Evaluation of CT images

CT images were evaluated based on transverse, sagittal, and coronal axes. Bone evaluation was performed with reconstructed images using the bone algorithm (window level: 429, window width: 1078); soft tissue evaluation was performed with reconstructed images using the soft tissue algorithm (window level: 135, window width: 394). The hounsfield units (HU) and the height to width ratio (H:W) of bilateral mandibular condyles were measured as previously reported (Carmalt *et al*., 2016) (Figure 4). The HU of the mandibular condyle was measured in the lateral, central, and medial sites (Figure 4B) and the mean HU was calculated. Height and width of the mandibular condyle were measured (Figure 4A). Height was measured from the neck of the mandibular condyle to the dorsal surface; width was measured from the lateral to the medial extent of the head of the mandibular condyle. All measurements were processed on the plane in which the width of the mandibular condyle was the widest. H:W was then calculated (Carmalt *et al*., 2016). Additionally, the following TMJ CT findings were recorded: an irregular margin of the medial mandibular condyle attached to the pterygoid muscle, a focal hypodense region with a hyperdense rim, diffuse hyperdensity in the mandibular condyle, and mineralization of adjacent soft tissue.

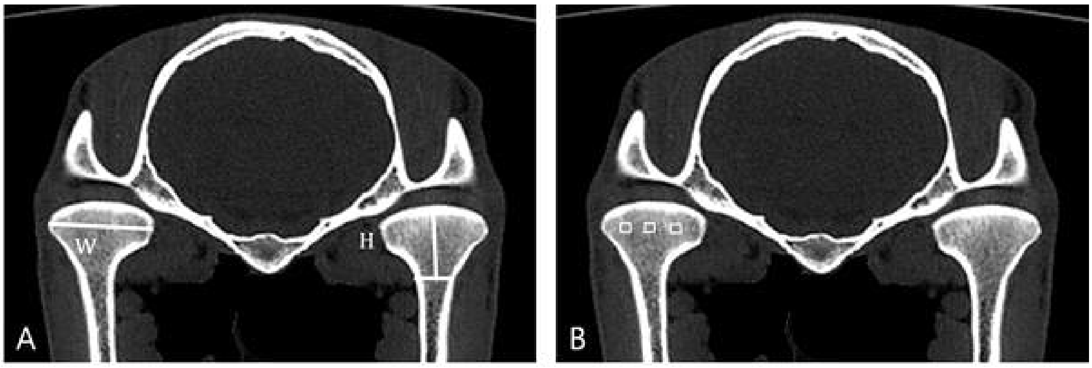

Figure 4. Measurement of width and height of the mandibular condyle in CT scans. Measurement was processed at the widest point of the mandibular condyle. (A) Width (W) was estimated from the lateral condyle to the medial condyle. Height (H) was measured from the neck of the mandibular condyle to the dorsal surface of the mandibular condyle at the highest point. (B) Hounsfield unit (HU) measurement of the mandibular condyle. Mean HU was measured in a square in lateral, central, and medial regions of the mandibular condyle.

2.5. Statistical analysis

Statistical tests were performed using RStudio (RStudio; Boston, the United States). A Shapiro–Wilk test was performed for normality. Based on normality and variance, Welch's-*t*-test was selected to evaluate differences in the HU; the T-test was selected to evaluate H:W between Jeju horses and Thoroughbreds. $p < 0.05$ was considered statistically significant.

3. Results

3.1. Physical examination and blood analysis

None of the horses in this study had significant findings in physical examinations or blood analysis.

3.2. Radiography and ultrasonography

Radiography showed no bony changes in any of the TMJs. No structural changes were observed during ultrasonography.

3.3 H:W and HU measurements

All horses recovered from anesthesia uneventfully. The mean HU in the mandibular condyle of Jeju horses was 489.89 ± 82.03 and that of Thoroughbreds was 562.56 ± 205.96. This result was not statistically significant (p = 0.32; Table 3). The mean H:W in Jeju horses was 0.57 ± 0.07 and in Thoroughbreds was 0.68 ± 0.04. The mean H:W of Jeju horses was significantly lower than that of Thoroughbreds (p = 0.004; Table 2).

Table 2. Height, width, and height to width ratio(H:W) of the mandibular condyle

	No.		Right	Left	Bilateral
Jeju horses	1	Height (H)	26.40	24.80	25.60
		Width (W)	53.50	52.40	52.95
		H:W	0.49	0.47	0.48
	2	Height (H)	26.80	22.40	24.60
		Width (W)	47.30	50.60	48.95
		H:W	0.57	0.44	0.51
	3	Height (H)	29.10	27.00	28.05
		Width (W)	45.10	47.30	46.20
		H:W	0.65	0.57	0.61
	4	Height (H)	27.30	25.40	26.35
		Width (W)	43.50	42.20	42.85
		H:W	0.63	0.60	0.62
	5	Height (H)	28.90	24.20	26.55
		Width (W)	51.80	54.00	52.90
		H:W	0.56	0.45	0.50
	6	Height (H)	25.90	24.50	25.20
		Width (W)	43.00	41.70	42.35
		H:W	0.60	0.59	0.59
	7	Height (H)	29.20	28.30	28.75
		Width (W)	47.30	44.60	45.95
		H:W	0.62	0.63	0.63
	8	Height (H)	22.60	24.00	23.30
		Width (W)	43.00	41.60	42.30
		H:W	0.53	0.58	0.55
	9	Height (H)	31.00	28.70	29.85
		Width (W)	42.60	43.10	42.85
		H:W	0.73	0.67	0.70
	10	Height (H)	27.20	28.00	27.60
		Width (W)	50.90	48.30	49.60
		H:W	0.53	0.58	0.56
	Mean ± SD	**Height (H)**	**27.50 ± 52.30**	**25.70 ± 2.10**	**26.30 ± 2.0**
		Width (W)	**46.80 ± 4.10**	**46.60 ± 4.60**	**46.00 ± 4.20**
		H:W	**0.59 ± 0.07***	**0.56 ± 0.08***	**0.57 ± 0.07***

*Comparison of H:W between Jeju horses and Thoroughbreds was statistically significant (p < 0.05). SD: Standard deviation.

Table 2. Continued

	No.		Right	Left	Bilateral
Thoroughbreds	1	Height (H)	30.70	29.90	30.30
		Width (W)	42.40	42.50	42.45
		H:W	0.72	0.70	0.71
	2	Height (H)	34.40	36.10	35.25
		Width (W)	53.20	51.10	52.35
		H:W	0.65	0.70	0.67
	3	Height (H)	30.50	30.50	30.50
		Width (W)	49.50	45.50	47.50
		H:W	0.62	0.67	0.64
	4	Height (H)	35.90	34.60	35.25
		Width (W)	56.00	55.50	55.75
		H:W	0.64	0.62	0.63
	5	Height (H)	36.00	36.00	36.00
		Width (W)	50.30	50.40	50.35
		H:W	0.72	0.71	0.71
	6	Height (H)	30.20	30.90	30.55
		Width (W)	47.60	46.70	47.15
		H:W	0.63	0.66	0.65
	Mean ± SD	**Height (H)**	**33.00 ± 2.80**	**33.00 ± 2.90**	**33.00 ± 2.80**
		Width (W)	**49.80 ± 4.70**	**48.70 ± 4.90**	**49.30 ± 2.60**
		H:W	**0.66 ± 0.05***	**0.68 ± 0.03***	**0.67 ± 0.04***

*Comparison of H:W between Jeju horses and Thoroughbreds was statistically significant (p < 0.05). SD: Standard deviation.

Table 3. Hounsfield units (HU) of the mandibular condyle

	No.		Right	Left	Bilateral
Jeju horses	1	Lateral	314.86	296.08	305.47
		Central	421.08	390.97	406.03
		Medial	438.76	369.43	404.1
	2	Lateral	391.23	404.39	397.81
		Central	533.14	478.94	506.04
		Medial	607.81	658.78	633.30
	3	Lateral	552.51	571.59	562.05
		Central	552.69	527.79	525.24
		Medial	389.76	447.95	418.86
	4	Lateral	464.40	428.80	446.60
		Central	422.64	440.48	431.56
		Medial	455.76	460.48	458.12
	5	Lateral	355.94	398.67	377.31
		Central	384.89	469.38	427.14
		Medial	573.33	536.19	554.76
	6	Lateral	644.56	603.97	624.27
		Central	577.84	468.00	522.92
		Medial	498.57	498.57	498.57
	7	Lateral	533.06	643.82	588.44
		Central	624.71	605.72	615.22
		Medial	562.96	558.29	560.63
	8	Lateral	467.50	602.10	534.8
		Central	524.00	601.36	562.68
		Medial	505.94	531.64	518.79
	9	Lateral	503.63	447.92	475.78
		Central	544.08	452.86	498.47
		Medial	558.73	538.53	548.63
	10	Lateral	353.19	376.42	364.81
		Central	473.42	481.83	477.63
		Medial	434.86	466.86	450.86
	Mean ± SD	**Lateral**	**456.21 ± 107.31**	**479.25 ± 115.22**	**467.73 ± 106.96**
		Central	**499.84 ± 79.98**	**494.74 ± 63.84**	**497.29 ± 64.68**
		Medial	**495.72 ± 81.42**	**513.62 ± 66.40**	**504.66 ± 72.18**
		Mean	**483.92 ± 89.53**	**495.87 ± 83.41**	**489.89 ± 82.03**

SD: Standard deviation.

Table 3. Continued

	No.		Right	Left	Bilateral
Thoroughbreds	1	Lateral	707.19	538.33	622.76
		Central	567.14	722.22	644.68
		Medial	438.15	649.14	543.65
	2	Lateral	531.28	415.94	473.61
		Central	357.64	605.78	331.71
		Medial	276.97	241.42	259.20
	3	Lateral	1149.33	1070.3	1109.82
		Central	597.33	1061.36	829.35
		Medial	460.64	433.31	446.98
	4	Lateral	435.33	396.61	415.97
		Central	410.46	413.36	411.91
		Medial	415.16	425.53	420.35
	5	Lateral	602.16	605.12	603.64
		Central	413.47	418.03	415.75
		Medial	487.76	464.12	475.94
	6	Lateral	624.44	670.40	647.42
		Central	808.32	807.76	808.04
		Medial	695.12	635.43	665.28
	Mean ± SD	**Lateral**	**675.96 ± 249.79**	**616.12 ± 246.44**	**645.54 ± 244.89**
		Central	**525.73 ± 167.83**	**621.42 ± 290.76**	**573.57 ± 216.79**
		Medial	**462.30 ± 135.65**	**474.83 ± 151.61**	**468.56 ± 134.92**
		Mean	**554.33 ± 201.15**	**570.79± 233.17**	**562.56 ± 205.96**

SD: Standard deviation.

3.4. CT findings

Most horses had more than one finding for the mandibular condyle in CT images (Table 4). The most frequent CT finding was the irregular margin of the mandibular condyle, shown in 5 of the 10 Jeju horses and all 6 Thoroughbreds (Figure 5F). Although diffuse hyperdensity was found in 2 Thoroughbreds (Figure 5B), none of the Jeju horses shared this finding. The focal hypodense region with the hyperdense rim was found in 2 Jeju horses and in 1 Thoroughbreds (Figure 5C and 5D). Mineralization of adjacent soft tissue was found in a single Thoroughbred mare (Figure 5E).

Table 4. CT findings of the TMJ

	No.	CT finding 1	CT finding 2	CT finding 3	CT finding 4
Jeju horses	1	O			
	2		O		
	3		O		
	4				
	5	O			
	6	O			
	7	O			
	8	O			
	9				
	10	O	O		
Thoroughbreds	1	O			O
	2	O		O	
	3	O	O	O	
	4	O			
	5	O			
	6	O			

CT finding 1: Irregular margin of the medial mandibular condyle attached to the pterygoid muscle. **CT finding 2:** Hypodense region with hyperdense rim. **CT finding 3:** Diffuse hyperdensity of the mandibular condyle. **CT finding 4:** Mineralization of soft tissue around the temporomandibular joint.

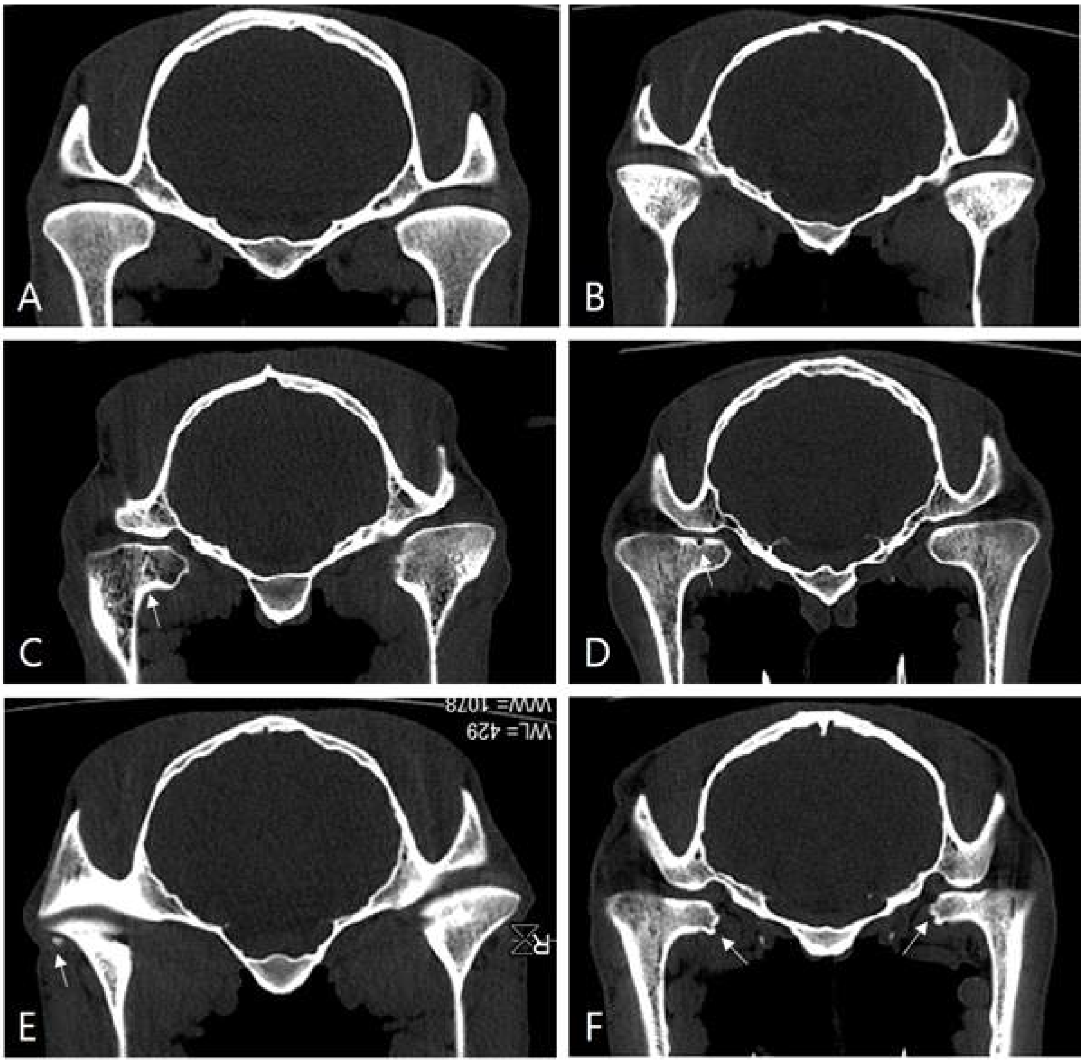

Figure 5. Computed tomography (CT) findings of the temporomandibular joint (TMJ). (A) No significant findings in the mandibular condyle of a 3-year-old male Jeju horse. (B) Diffuse hyperdensity in a 9-year-old Thoroughbred mare. (C) Focal hypodense region with a hyperdense rim (arrow) in an 8-year-old Thoroughbred gelding. (D) Focal hypodense region with a hyperdense rim (arrow) in the cortical articular surface of a 4-year-old an Jeju horse gelding. (E) Mineralization of soft tissue adjacent to the TMJ (arrow) of an 8-year-old Thoroughbred mare. (F) Irregular margin of the medial mandibular condyle attached to the pterygoid muscle (arrow) of a 9-year-old Jeju horse mare.

4. Discussion

The present study is the first to describe the CT characteristics of the TMJ in Jeju horses and to compare these features with those of Thoroughbreds. The authors measured the H:W and HU of the mandibular condyle. CT findings of the TMJ were also recorded. We observed a difference in the shape of the mandibular condyle between Jeju horses and Thoroughbreds as well as anatomical variations in the TMJ of asymptomatic horses.

In this report, the H:W in Jeju horses was significantly lower than that in Thoroughbreds, indicating that the shape of the mandibular condyle in Jeju horses is flatter than that in Thoroughbreds. Two factors affecting the shape of the mandibular condyle were reported: immaturity, and pathological remodeling by degenerative diseases. In a previous report, the mean H:W in horses aged <1 year old was higher than that in older horses (Carmalt *et al*., 2016). The report showed that the shape of the mandibular condyle became flat during the first 1 year (Carmalt *et al*., 2016). In this study, the result of H:W was not influenced by immaturity considering only horses over 3 years of age were used. A flatter mandibular condyle was also detected on the sagittal plane in human patients with degenerative joint disease of the TMJ (Boendding and Whyte, 2013). However, there have not been any reports on the relationship between degenerative joint diseases and the shape of the mandibular condyle in horses. The horses in this study showed no symptoms of TMJ disorders such as crepitus or masticatory difficulty. This condition also did not affect the study result. Therefore, a flatter shape of the mandibular condyle could be considered a characteristic of Jeju horses.

In a previous report, the prevalence of TMJ osteoarthritis differed depending on the breeds of dogs (Arzi *et al.*, 2013). Osteoarthritis was more frequently observed in mesaticephalic breeds than other breeds. In this study, we found a difference in the shape of the mandibular condyle between Jeju horses and Thoroughbreds. Although the relationship between skull conformation and TMJ disorders has still not been reported, differences in skull conformation might also influence the prevalence of TMJ diseases in horses.

The HU indicates the linear attenuation coefficient of observed tissue relative to the attenuation of water as 0 and air as -1000 at standard temperature and pressure (Saunders and Schwarz, 2011). In this study, The mean HU of the mandibular condyle in Jeju horses was lower than that in Thoroughbreds; however, this difference was not significant. In a previous report, the difference in HU was reported between sites (Carmalt *et al.*, 2016); the HU of the medial mandibular condyle was significantly lower than that of other sites. However, in this study, the differences in the mean HU were not significantly different between sites. In Jeju horses, the HU of the medial mandibular condyle was relatively higher compared with other sites. Further research is needed to determine the differences in HU between breeds and the HU value of the mandibular condyle.

In a previous study, 40.2% of asymptomatic horses showed anatomical variations on CT (Carmalt *et al.*, 2016). In this study, anatomical variations were identified by CT in all Thoroughbreds (6/6) and 9 Jeju horses (9/10); however, the prevalence of anatomical variations in Jeju horses was lower than that in Thoroughbreds. This might be due to the differences in average

age (mean age of Jeju horses: 4.5 ± 1.9 years, mean age of Thoroughbreds: 7.3 ± 1.6 years) between two groups or usage of horses. Most Thoroughbreds were used for riding but Jeju horses were used for breeding in this study. The most common finding in this study was an irregular margin of the medial mandibular condyle that attached to the pterygoid muscle. The degree of change varied across horses. This finding was suggested as an age-related change (Carmalt *et al*., 2016). A focal hypodense region with a hyperdense rim was found in 2 of the 10 Jeju horses and 1 of the 6 Thoroughbreds. In a previous study, this finding was indicative of a bone cyst with sclerosis (Carmalt *et al*., 2016). Additionally, mineralization of the soft tissue adjacent to the TMJ was detected in an 8-year-old Thoroughbred mare. In a previous study, this characteristic was usually reported as a dystrophic change caused by inflammation (Smyth *et al.*, 2015); however, the horse in this study had no existing symptoms of chewing difficulty or reduced performance. This might be interpreted as an incidental finding but needs to be followed up.

Approximately 28% of humans have TMJ disorders and 3–7% of adults have degenerative joint disease in the TMJ (Guralnick *et al*., 1978, Tanaka *et al*., 2008). However, TMJ disorders have rarely been reported in horses. Trauma and septic arthritis were the most frequently reported cases due to obvious signs and history (Barnett *et al*., 2014; Carmalt and Wilson., 2005; Elzer *et al.*, 2020; Nagy and Simhofer, 2006; Wamerdam *et al.,* 1997). Other cases such as those with degenerative joint disease in the TMJ have been sparsely reported (Smyth *et al*., 2015). Recently, Jorgensen *et al.* reported improved performance after local steroid injection into the TMJ of a horse (Jorgensen *et al*., 2015); there were some anecdotal reports on the improvement of performance after local anesthesia in the TMJ of horses with low-grade lameness (Carmalt, 2014). Considering the reports mentioned above and the fact that horses graze up to 21 hours a day (Carmalt, 2014), TMJ disorders in horses might be under-diagnosed.

Imaging plays a key role in the evaluation of the TMJ. Among the imaging techniques, MRI is considered the golden standard in diagnosing TMJ disorder because of the ability to observe soft tissue such as the articular disc and synovial pouch. However, MRI is not currently available in equine medicine in South Korea. Horses usually require general anesthesia when CT or MRI is employed. MRI scanning requires a longer duration of anesthesia, suggesting that more anesthetic-related complications could be expected. In this study, CT was employed to examine the equine TMJ the first in South Korea. CT could be utilized for diagnosis and future research in equine medicine.

5. Conclusion

This report described CT features of the TMJ in 10 Jeju horses and compared these with those of 6 Thoroughbreds. We found that the mandibular condyle shape in Jeju horses was flatter than that in Thoroughbreds. We also detected several anatomical variations and an incidental finding in the TMJ of asymptomatic horses. This report might be helpful in the development of our understanding of the TMJ in Jeju horses.

6. References

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Abstract in Korean

제주마 턱관절의 전산화 단층 촬영 영상 특징

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말의 턱관절은 여러 구조물이 중첩되어 있어, 턱관절 질병 진단이 비교적 어렵다. 수의학에서 전산화 단층 촬영(Computed tomography: CT)의 활용도가 높아지면서, 이를 통한 턱관절의 평가가 용이해졌다. 본 연구의 목적은 CT를 이용하여 제주마의 턱관절의 특징을 조사하고 더러브렛과 비교하는 것이다. 이 연구에서 사용된 10마리의 제주마(평균 연령: 4.5 ± 1.9세, 평균 체중: 282.6 ± 40.3 kg)와 6마리의 더러브렛(평균 연령: 7.3 ± 1.6 세 , 평균 체중: 479.7 ± 44.0 kg)의 턱관절을 전신마취 하에 CT 촬영하였다. CT 촬영 후, 하악골의 관절돌기 높이 대 너비 비율(H:W)과 Hounsfield units(HU)값을 측정하고, 턱관절의 CT 소견도 함께 기록했다. 제주마의 H:W은 더러브렛에 비해 통계적으로 유의하게 낮았다($p < 0.05$). 이는 제주마의 하악골 관절돌기의 모양이 더러브렛와 비교하여 편평하다는 것을 의미한다. 평균 HU값은 제주마가 더러브렛보다 낮게 측정되었으나, 통계적 유의성은 없었다. 가장 흔하게 확인되었던 CT 소견은 제주마와 더러브렛 모두에서 하악골 관절 융기 내측의 불규칙한 변화였다. 이러한 결과가 향후 제주마 턱관절의 이해와 턱관절 질환의 진단에 유용한 자료가 될 것으로 본다.

주요어: 턱관절, 전산화 단층 촬영(CT), 제주마, 말