Sex Determination from Teeth Size in Thais

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Abstract

Sex determination is a vital step in reconstructing an individual profile from unidentified skeletal remains. Among various skeletal parts, pelvis and skull are traditional sex indicators, but teeth can often be useful when such favor segments are not available. Many studies on sex determination by population's teeth had been studied and each finding indicated different level of sexual dimorphism. This study aimed to determine the degree of Thais' sexual dimorphism using univariate statistical methods and develop function applied from discriminant analysis. Mesiodistal (MD) and buccolingual (BL) dimensions of all teeth except the third molars were measured from dental models of 177 individuals (67 males and 110 females), kindly supplied by the Faculty of Dentistry, Mahidol University. The result showed that males' teeth were statistically significant ($p < 0.05$) larger than females' in 45 out of 56 variables by both MD and BL dimensions, mostly from BL. The BL dimension of upper second molars was the most dimorphic variable, followed by the canines. The latter showed the greatest level of sexual dimorphism in many studies. As for stepwise discriminant analysis, groups of function were designed based on possible scenarios which dental remains were found. Besides, for all teeth, BL dimension of lower right canine (C) was the best discriminatory variable followed by lower left second molar (M_2) in MD measurement. This function gave 70% accuracy in sexual dimorphism indicated that it is population-specific. Multivariate analysis (Discriminant function) expressed different results from univariate analysis. This re-confirmed the earlier findings that considering teeth as a unit (multivariate) was more reliable than focusing each particular tooth (univariate) since they are correlated with each other. This is the first study on sex determination from teeth size in Thai population.

Key words: SEX DETERMINATION / ODONTOMETRICS / THAIS / DISCRIMINANT FUNCTION

1. Introduction

Sex assessment of skeletal remains is an important step in building the biological profile of unidentified skeletons recovered in forensic contexts. It enables a more focused search of missing person files, with the potential of recovering ante mortem records for comparison and establishing identity. This wills decreases getting the number of wanted individuals to a probability of 50%, which can results in a more accurate way of identifying the person sought. The sexual difference in the human skeleton has been well studied in many populations (Bilge, et al., 2003). Accuracy rate of determining the correct sex has been as much as 100% (Iscan and Kedici, 2003).

Among skeletal parameters, the pelvic and skull bones are known to produce approximately 100% success in sex identification. The teeth, while not as accurate, are considered a useful adjunct in sex assessment (Kieser, 1990). The major advantage of the dentition is that it is often preserved and highly resistant to postmortem insults better than any other skeletal structure, even when the bony structures of the body are destroyed because of its physical characteristics and the protection it gets from the jaw bone. For these reasons, the use of dental morphology to determine sexual dimorphism is a procedure established in anthropological and biological studies; especially in forensic odontology, it determines sex from fragmented jaws and dentition. Many of these studies have shown that there is a varying degree of sexual dimorphism in human dentition (Schwartz and Dean, 2005). The existence of sexual dimorphism in permanent teeth is a known phenomenon, as observed by several investigators (Kondo and Townsend, 2004; Moorrees, et al., 1957). This behavior morphogenetically determined that the shape and dimensions of the tooth are fairly stable that has been seen as a determining factor in providing sexual dimorphism in skeletal remains, which is required for forensic identification purposes (Rodríguez, 2004), especially when anatomical parameter is not reliable for identifying a particular subject. As mention earlier, sex dimorphism is a population specific. However, in Thailand, there is no study on sex determination using teeth, and no standard in using teeth to identify sex in Thai population. Therefore, the present study has ventured to evaluate the degree of sexual dimorphism in Thais by using univariate and multivariate statistical analysis and develop discriminant functions to be used in sex determination.

2. Materials and methods

The sample composed of 177 dental models that belonged to 110 females and 67 males (age 16−32 years old), the patients who started orthodontic treatment at Orthodontics clinic, the Department of Orthodontics, Faculty of Dentistry, Mahidol University. The objective of limiting the sample to young adults was to ensure that dentitions were relatively intact, free of pathology and wear, and thereby maximise odontometric information. If restorations, caries, excessive wear or casting defects were presented and such obstructions impeded tooth measurements, they would not included in the analysis. The sample was a composite of ethnic groups since the aim was to assess sex dimorphism in Thais as a whole. The mesiodistal (MD) and buccolingual (BL) dimensions of all teeth, excluding third molars, were measured on the models using a digital caliper calibrated to 0.01 mm (Mitutoyo, Japan). The MD dimension was defined as the greatest distance between contact points on the approximate surfaces of the tooth crown and was measured with the caliper beaks placed occlusally along the long axis of the tooth. In cases where the teeth were rotated or malposed, measurements were taken between points on the approximate surfaces of the crown where it was considered that contact with adjacent teeth would have normally occurred. The BL measurement was defined as the greatest distance between the labial/buccal surface and the lingual surface of the tooth crown, measured with the caliper beaks held at right angles to the MD dimension (Moorrees, et al., 1957). All measurements were repeated 3 times. All statistical analyses were performed using SPSS version 18.0. Sexual dimorphism was analyzed using the independent samples t-test. Stepwise discriminant functions were developed for assessing sex and their accuracy in sex prediction. A number of tooth groups were developed accounting for the presence or absence of various teeth and/or jaws in forensic scenarios.

Nine Tooth Groups of BL and MD measurements and **(F)** denoted derived functions from each tooth group in stepwise discriminant analysis:

F1: all teeth

F2: all maxillary teeth

F3: all mandibular teeth

F4: maxillary anterior teeth

F5: mandibular anterior teeth

F6: anterior teeth

F7: mandibular posterior teeth

F8: maxillary posterior teeth

F9: posterior teeth

3. Results

3.1 Student's *t*-test

Tables 1 and 2 depict descriptive statistics and t-values for all tooth dimensions of males and females included in this study. BL dimension of maxillary second left molar showed the greatest sexual dimorphism, while mandibular canines which traditionally expressed as the best dimorphic tooth in many studies were at the second rank of sexual dimorphism's level among all considered teeth. Males' teeth exceeded females' in 45 out of 56 variables measured. On 45 statistically significant different variables, most of them were BL measurements which were 27 variables. Furthermore, maxillary teeth had significantly difference closed to the mandibular ones which were 23 and 22 measured variables, respectively. All tooth variables which were not significantly different were MD measurements except for BL dimension of lower left lateral incisor. These MD dimensions were belonged to upper left first and second premolars, lower left central incisor and right lateral incisor, and upper and lower left lateral incisors, right central incisors, and right second premolars. All molars and canines were also showed significantly sexual dimorphism in all dimensions measured.

3.2 Discriminant analysis

Table 3 shows tooth variables, selected and ordered in discriminant analysis. Wilk's lambda denotes how useful a given variable is in the stepwise analysis and determines the order in which the variables enter the analysis, while the F statistic determines how much variation exists between sexes and the significance level of the variance (Iscan and Kedici, 2003). Wilk's lambda method was used as selecting and ordering the variables according to their discriminatory power. In the present study, nine tooth groups were set up, based on the assumption that teeth might be found forensically. The measurements from each group were computed in the analysis to evaluate which functions, derived from each group, discriminated sex the best. At F1, all measured variables (56 variables) from all teeth were entered in the analysis. Buccolingual dimension of lower right canine was entered first to the function followed by lower left second molar in mesiodistal dimension. For F2, only maxillary teeth were analyzed, upper right second molar and canine were the most discriminator in buccolingual and mesiodistal dimensions, respectively. In contrast, buccolingual right canine and mesiodistal left second molar were strong contributory variables for F3, in case of only mandibular teeth were found. In the situation that only mandibular anterior teeth could be recovered, mesiodistal dimension of lower right canine and left lateral incisor were selected for F4. On the counterpart, maxillary anterior teeth were variables entered the analysis (F5), mesiodistally measured variable of upper right canine was selected. When previous two groups (F4 and F5) were merged, anterior

Table 1. Descriptive statistics and *t*-values of MD and BL dimensions in Thais' upper teeth

Tooth variable	Male			Female			*t*-Value
	N	Mean	S.D.	*N*	Mean	S.D.	
Left M^2							
MD	63	10.3860	0.66604	99	10.1770	0.63229	2.009*
BL	64	11.8455	0.72872	99	11.2193	0.58078	6.074**
Left M^1							
MD	65	10.7028	0.72944	107	10.4738	0.64855	2.142*
BL	65	11.6626	0.68095	107	11.2926	0.56988	3.831**
Left P^2							
MD	61	7.1242	0.52709	106	6.9850	0.51592	1.665
BL	61	9.8151	0.68525	105	9.4394	0.59192	3.719**
Left P^1							
MD	62	7.5966	0.48937	101	7.4716	0.43893	1.689
BL	61	9.9301	0.53103	102	9.6127	0.53378	3.680**
Left C							
MD	65	8.1337	0.48753	108	7.8821	0.45256	3.440**
BL	66	8.4989	0.62440	107	8.0748	0.59542	4.468**
Left I^2							
MD	65	7.1943	0.66411	102	7.1219	0.63967	0.702
BL	65	6.6984	0.56186	101	6.3983	0.64719	3.067**
Left I^1							
MD	65	8.6733	0.58494	110	8.4983	0.55268	1.981*
BL	66	7.2704	0.68951	107	6.9747	0.56519	3.069**
Right I^1							
MD	67	8.7051	0.56565	110	8.5014	0.54005	2.390*
BL	67	7.2925	0.56346	107	6.9243	0.54512	4.280**
Right I^2							
MD	62	8.5014	0.64733	103	7.1514	0.64153	0.929
BL	64	6.7101	0.58915	100	6.3996	0.58676	3.300**
Right C							
MD	66	8.2317	0.48424	108	7.8940	0.45374	4.644**
BL	66	8.4946	0.65484	105	8.1197	0.61367	3.789**
Right P^1							
MD	61	7.6367	0.42235	98	7.3996	0.41402	3.485**
BL	61	9.9200	0.65245	98	9.6087	0.48922	3.426**
Right P^2							
MD	61	7.0628	0.52752	104	6.9842	0.52013	0.932
BL	62	9.8294	0.62809	104	9.4113	0.58226	4.345**
Right M^1							
MD	66	10.6421	0.61018	109	10.4100	0.71690	2.193*
BL	66	11.7485	0.67020	108	11.2835	0.56086	4.923**
Right M^2							
MD	63	10.2867	0.75844	90	9.9604	0.60053	2.966**
BL	63	11.8312	0.73209	95	11.2672	0.61793	5.215**

* Significant at *p*-value < 0.05; ** significant at *p*-value < 0.01

-teeth (F6) entered to the analysis, all mesiodiatal variables from the former, upper right canine, lower left lateral incisor and right canine were selected orderly. In group of posterior teeth and only mandibular posterior teeth (F7) were tested; mesiodistal dimension of lower left second molar was selected.

Table 2. Descriptive statistics and *t*-values of MD and BL dimensions in Thais' lower teeth

Tooth variable	Male			Female			*t*-Value
	N	**Mean**	**S.D.**	***N***	**Mean**	**S.D.**	
Left M_2							
MD	56	11.3529	0.84710	87	10.7535	.81925	4.214**
BL	60	10.8162	0.59070	97	10.4779	.59299	3.478**
Left M_1							
MD	64	11.7690	0.66327	106	11.2702	.72132	4.501**
BL	64	10.8411	0.66546	105	10.5792	.53276	2.817**
Left P_2							
MD	63	7.5970	0.56875	105	7.4039	.46915	2.382*
BL	64	8.8776	0.52337	105	8.6368	.52808	2.885**
Left P_1							
MD	60	7.5520	0.58322	102	7.3457	.51101	2.354*
BL	60	8.4253	0.52447	102	8.0898	.44144	4.353**
Left C							
MD	66	7.1889	0.47375	109	6.9067	.43244	4.035**
BL	63	7.8023	0.62284	109	7.3733	.50248	4.934**
Left I_2							
MD	66	6.1011	0.41440	108	6.0760	.40579	0.393
BL	66	6.4188	0.38114	107	6.2900	.47402	1.866
Left I_1							
MD	65	5.4698	0.38368	110	5.4428	.39482	0.441
BL	66	6.0786	0.45438	109	5.7716	.47702	4.200**
Right I_1							
MD	66	5.4820	0.35968	109	5.4375	.40570	0.733
BL	66	6.0402	0.44705	108	5.8018	.46713	3.320**
Right I_2							
MD	67	6.0856	0.45629	106	6.0531	.41119	0.486
BL	66	6.4043	0.44207	105	6.1968	.44095	2.993**
Right C							
MD	66	7.1621	0.45844	110	6.8492	.44024	4.495**
BL	62	7.7546	0.58217	109	7.3451	.52357	4.720**
Right P_1							
MD	60	7.5201	0.56746	102	7.3562	.42706	2.082*
BL	59	8.4025	0.49157	103	8.0249	.50302	4.636**
Right P_2							
MD	63	7.5108	0.59646	108	7.3991	.47084	1.274
BL	64	8.8626	0.54904	107	8.5744	.46892	3.645**
Right M_1							
MD	63	11.6720	0.79216	97	11.2108	.76654	3.669**
BL	64	10.9922	0.69537	101	10.6494	.56034	3.483**
Right M_2							
MD	58	11.2636	0.78685	82	10.6827	.86655	4.057**
BL	62	10.8760	0.67729	96	10.5076	.56652	3.693**

* Significant at p-value < 0.05; ** significant at p-value < 0.01

In contrast, maxillary teeth (F8) were entered to the function; upper left second molar was the best contributor in buccolingual dimension. When these two groups were combined, posterior teeth group (F9), only mandibular teeth, mesiodistal variables of left first and second molars were selected respectively.

Canines or second molars were entered first in most functions (F1 and F3-F6 for canines and F2 and F7-F9 for second molars). The classification accuracy for each function is also presented in this Table. Classification accuracy was ranged from 62.9-73.1% in male and 57.7-69-1% in female. The highest accuracy rate was obtained from all teeth entered to the analysis (F1) followed by F2 and F3 (required maxillary and mandibular teeth respectively) that performed closely classification accuracy rate (69.1% and 69.2%). Comparing anterior and posterior teeth, the former gave better classification accuracy rate than the latter, particularly in function derived from mandibular posterior teeth which produced lowest classification accuracy. While focusing on each tooth group, anterior and posterior teeth, maxillary teeth obtained greater classification accuracy in both functions.

Table 4 depicts the coefficients (standardised and unstandardised), structure matrix, group centroids and sectioning points for the different functions. The structure matrix describes the magnitude of relation between the function and the variables entered while the group centroids indicate the average discriminant scores for each sex (Iscan and Kedici, 2003). Sectioning point is the average of male and female group centroids. To assess the sex, tooth dimensions are multiplied with the respective unstandardised coefficients and added to the constant. If the value obtained is less than the sectioning point given for the function, the individual is considered as female; if the value obtained is greater than the sectioning point, the individual is considered as male. Described below is a simulated case where all teeth have been recovered. In such a scenario, Function 1 is applied for sex assessment (see Table 4) which requires the BL measurements of lower right canine and MD of lower left second molar:

If BL of lower right canine = 7.60 mm; MD of lower left second molar = 10.94 mm. Multiplying these dimensions with the respective coefficients and adding the constant.

$$7.60 \times (3.17) + 10.94 \times (0.925) + (-20.362) = 0.1695.$$

Since 0.1695 is greater than the sectioning point 0.124 given for Function 1, the individual is classified as male.

4. Discussion

From univariate statistical analysis (Student's *t*-test), buccolingual (BL) dimension of upper left second molar exhibited greatest significant statistical difference ($p < 0.05$) between males' dentition and females'. In contrast, canines which traditionally showed highest degree of sexual dimorphism were as the second ordered variable among most highly significant difference. They usually performed as the most dimorphic teeth in various studies (Acharya and Mainali, 2007; Potter, et.al., 1981; Zorba, et al., 2011). Apart from canines, second molars also acted as the best sexual dimorphic variable. These teeth have been found as among the most sexual dimorphic teeth in some studies (Acharya and Mainali, 2007; Zorba, et al., 2011). Considering the dimensions measured, BL dimension performed greater statistical significant difference between sexes than MD dimension which were 27 out of statistical significant 45 variables. This finding was consistent with the results from other studies (Acharya and Mainali, 2007; Garn, et al., 1966). These studies were also suggested that BL dimension was more reliable in sexing than MD according to its great sexual dimorphism presence.

Refer to Garn et al. (1966) finding, their view point showed that BL dimension performed sexually difference between males and females' dentitions which males' were statistically significant larger than females'. This implied that males' tending toward more nearly square dimensions and females' showing greater size reduction buccolingually than mesiodistally (Garn, et al., 1966). Practically, Garn and colleagues also stated that BL dimension was recommended wider use similar to Iscan and Kedici (2003) who implied that this dimension was more reliable measurement than other variables. MD dimension was more difficult to measure than BL, considering the proximal contact that exists between teeth and crowding in anterior segment of the jaws. Also, excessive attrition and interproximal wear facets can undermine this dimension. On the other hand, there were a lot of information discussing about the usefulness of MD and BL dimensions. Acharya and Mainali (2007) indicated that MD dimension was better suited for discriminating sexes than BL in case that only MD or BL measurements could be selected. They discussed that greater sex discriminatory ability of MD could be related to the upper and lower arch dimensions that antero-posterior jaw measurements were statistically larger in males and that arch size influenced tooth size, implying that larger jaws in males affected comparably to larger MD dimension. On the other way, this study concluded that combining both MD and BL dimensions exhibited more discriminatory power than utilizing BL dimension solely. In addition, of the 56 variables measured males' teeth exceed females' ($p < 0.05$) in 45 which were 80% of all variables.

The level of sexual dimorphism in Thais from this study was relatively high and closed to sexual dimorphism's level (≈100%) in South Chinese (Ling and Wong, 2007). On the other hand, the study of Indian (Prabhu and Acharya, 2009) had only 37.5% of sexual dimorphism which was comparatively low and consistent with other studies in South Asian population (Acharya and Mainali, 2007). These characteristics re-confirmed that sexual dimorphism in tooth size was population-specific.

Table 3. Stepwise discriminant function analysis of buccolingual and mesiodistal dimensions[a]

Step and variables entered	Wilk's lambda statistic	Exact *F* statistic	d.f.1	d.f.2	Sig.	% accuracy
F1: All teeth[b]						
BL of lower right canine	0.792	10.478	1	40	0.002	70.0
MD of lower left second molar	0.700	8.350	2	39	0.001	
F2: Upper teeth						
BL of upper right second molar	0.817	19.518	1	87	0.000	69.1
MD of upper right canine	0.745	14.723	2	86	0.000	
F3: Lower teeth						
BL of lower right canine	0.818	14.239	1	64	0.000	69.2
MD of lower left second molar	0.749	10.532	2	63	0.000	
F4: Lower anterior teeth						
MD of lower right canine	0.885	19.003	1	146	0.000	65.7
MD of lower left lateral incisor	0.832	14.691	2	145	0.000	
F5: Upper anterior teeth						
BL of upper right canine	0.888	17.991	1	142	0.000	66.5
F6: Anterior teeth						
MD of upper right canine	0.869	18.868	1	125	0.000	68.1
MD of lower left lateral incisor	0.828	12.911	2	124	0.000	
MD of lower right canine	0.790	10.887	3	123	0.000	
F7: Lower posterior teeth						
MD of lower left second molar	0.807	18.162	1	76	0.000	64.7
F8: Upper posterior teeth						
BL upper left second molar	0.818	22.724	1	102	0.000	66.7
F9: Posterior teeth						
MD of lower left second molar	0.789	14.677	1	55	0.000	65.5
MD of lower left first molar	0.695	11.860	2	54	0.000	

F values are all significant at p-value < 0.01.

[a] At each step, the variable that minimizes the overall Wilks' Lambda is entered. Minimum partial F to enter is 3.84; maximum partial F to remove is 2.71.

[b] All 56 dental measurements were included in the analysis.

From discriminant analysis, F1 (all teeth variables) gave the highest classification accuracy (70%) among nine functions. The accuracy was relatively low compared to other studies (Acharya and Mainali, 2007; Iscan and Kedici, 2003). The low accuracy came from less precision in classifying female's dentition. This phenomenon was similar to discriminant analysis in Turks' population (Iscan and Kedici, 2003). It also performed quite low classification accuracy (77%) which affected from low accuracy in discriminating male's samples. Iscan and Kedici (2003) discussed that low classification accuracy indicated low level of sexual dimorphism. Consequently, this low sexual dimorphism was contributed by male subjects. It can also imply to this study, female subjects reduced the total classification accuracy. At this view point, a hypothesis arose that male and female's tooth size tended to be continuum rather than discrete (Iscan and Kedici, 2003). According to F6 (68.1%), analyzed anterior teeth expressed better classification accuracy than considering only posterior teeth (F9, 65.4%). The same results were also presented in Turks (Iscan and Kedici, 2003) and South African White (Kieser, et al., 1985).

Table 4. Stepwise discriminant function coefficients for tooth groups

Step and variables entered	Unstandardised coefficients[a]	Structure Matrix[b]	Standardised coefficients	Group centroids		Sectioning point
				male	female	
F1: All teeth						
BL L-R[c] canine	1.370	0.782	0.646	0.774	-0.527	0.124
MD L-L second molar	0.925	0.776	0.638			
(constant)	-20.362					
F2: Upper teeth						
BL U-R second molar	1.014	0.809	0.650	0.670	-0.499	0.086
MD U-R canine	1.311	0.779	0.608			
(constant)	-22.157					
F3: Lower teeth						
BL L-R canine	1.215	0.816	0.641	0.706	-0.459	0.124
MD L-L second molar	0.778	0.789	0.604			
(constant)	-17.606					
F4: Lower anterior teeth						
MD L-R canine	3.124	0.801	1.304	0.590	-0.339	0.126
MD L-L lateral incisor	-1.969	0.058	-0.781			
(constant)	-9.688					
F5: Upper anterior teeth						
BL U-R canine	2.123	1.000	1.000	0.443	-0.282	0.081
(constant)	-17.076					
F6: Anterior teeth						
MD U-R canine	1.479	0.754	0.651	0.667	-0.392	0.143
MD L-L lateral incisor	-2.114	0.038	-0.854			
MD L-R canine	1.824	0.691	0.783			
(constant)	-11.657					
F7: Lower posterior teeth						
MD L-L second molar	1.287	1.000	1.000	0.549	-0.424	0.063
(constant)	-14.096					
F8: Upper posterior teeth						
BL U-L second molar	1.615	1.000	1.000	0.546	-0.400	0.073
(constant)	-18.474					
F9: Posterior teeth						
MD L-L second molar	0.959	0.779	0.686	0.763	-0.555	0.104
MD L-L first molar	1.000	0.734	0.633			
(constant)	-21.700					

[a] Unstandardized discriminant functions evaluated at group means.

[b] Pooled within-groups correlations between discriminating variables and standardized discriminant functions.

[c] L-L: Lower left, L-R: Lower right, U-L:, Upper left, U-R: Upper right

These could be implied that the anterior teeth were able to discriminate the sexes more than the posterior ones (Iscan and Kedici, 2003). In addition, the functions for the mandibular (F3) and teeth of both jaws taken together (F1) predicted sex to similar scopes. The same tooth dimensions which were mandibular teeth (BL of lower right canine and MD of lower left second molar) entered both analyses. It indicated that mandibular teeth recovery alone sufficed for optimal sex assessment which also gave 70% classification accuracy. The strong discriminatory power of mandibular teeth was also found in Nepalese which gave 92.5% accuracy (Acharya and Mainali, 2007).

From the nine functions, nine variables from seven teeth: upper and lower right canines, upper left and right second molars, lower left first and second molars, and lower left lateral incisor were entered to the function. Canines and second molars entered to most functions, indicating these teeth were the best discriminatory variables in this study consistent with univariate analysis which canines and second molars showed greatest sexual dimorphism. On the opposite side, from 45 univariate sexual dimorphism variables, only nine were selected in the analyzed functions. More than third-fourth of variables and most BL measurements which presented great statistically significant difference were not entered to the functions. The results of univariate (Student's t-test) and multivariate (discriminant function) analysis found in previous studies (Acharya and Mainali, 2007; Potter, et al., 1981) showed that not all univariate statistical significant variables were useful in discriminant analysis. Potter stated that tooth measurements within an individual had correlation with each other. Comparing tooth one by one independently as in univariate analysis (Student's t-test) will not give an accurate difference between male and female (Potter, et al., 1981). Dentition should be treated as a unit, considering the correlation among all teeth, to determine the difference between sexes. Teeth must have a context of other measurements from the same individual with which to be evaluated. This implied that sex dimorphism is more correctly illustrated when the whole male dentition was compared to the whole female dentition (Acharya and Mainali, 2007). Discriminant analysis assessed the correlations among all tooth size variables and treated the entire dentition as a unit in each particular function. Acharya and Mainali (2007) recommended that multivariate approach is more suitable for sex evaluation while the large-scale univariate sex differences are not essential for sex assessment.

5. Conclusion

The present study has expressed sexual dimorphism in Thais using Student's t-test and discriminant analysis. It's also the first odontometric study for sex determination in this population. BL of upper left second molar displayed the most univariate sexual dimorphism. Also, there was high univariate sexual dimorphism in Thais that 80% of the entire dentition exhibited statistically larger male tooth dimension. Discriminant analysis assisted in assessing sexes using each function depend on situation that teeth are found. The highest classification accuracy (70%)

obtained from F1 (all teeth) requires BL of lower right canine and MD of lower left second molar. The sex identification accuracy is relatively moderate (70%), still relegating the dentition to being an adjunct rather than sole criteria for sex assessment.

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