

Association of Torus Palatinus with Palatal Arch Dimensions and Maxillary Arch Forms*

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Abstract :

The objectives of this study were to investigate the relationship between the occurrence of torus palatinus with palatal arch dimensions and maxillary arch forms in Thai subjects. The study included 366 Thais with equal number of men and women. Subjects who had no torus palatinus showed significantly deeper palates than subjects who had torus palatinus ($p < 0.001$). The palatal arch length and width did not differ in both groups. There were no association between the size of torus palatinus and palatal arch dimensions. Torus palatini were found more common on the maxillary arches with parallel (75.9%) and divergent ends (75.1%) than those with convergent ends (63.6%). However, these differences were not statistically significant. Our finding supported the previous study in that an association between the occurrence of torus palatinus and palatal arch height existed, but the relationship between the occurrence of torus palatinus and maxillary arch forms was not demonstrated.

Key words: arch dimensions; arch forms; torus palatinus

Introduction

Torus palatinus (TP) is a linear exostosis that may develop along a part of or all of palatine suture. TP has been reported more frequent in women than men and is age dependent⁽¹⁾. The occurrence of TP has been attributed to various conditions, especially genetic and environmental factors⁽²⁻³⁾. The variation of occurrence of TP has been associated with palatal arch height and maxillary arch forms in European samples⁽⁴⁾. The skulls with a height of palatal arch less than 12.4 mm. showed a significantly higher occurrence of tori (59.7%) in compare to subjects with a palatal height of more than 12.4 mm. (37.5%). The skulls with convergent end alveolar arch showed the highest occurrence of TP

(58.1%), whereas the other two forms (parallel and divergent ends) had a lower occurrence (48.4% and 45.9% respectively). Therefore, Vidic⁽⁴⁾ concluded that there was an association between the occurrence of TP and maxillary arch forms.

There was only one study in European subjects regarding the association of occurrence of TP and maxillary arch forms reported in the dental literature. The prevalence of TP and palatal arch dimensions were both influenced by genetic factors. Thus, an association of the occurrence of TP and maxillary arch forms in other population is worth studying.

The objectives of this study were to investigate the relationship between the occurrence of TP and palatal arch

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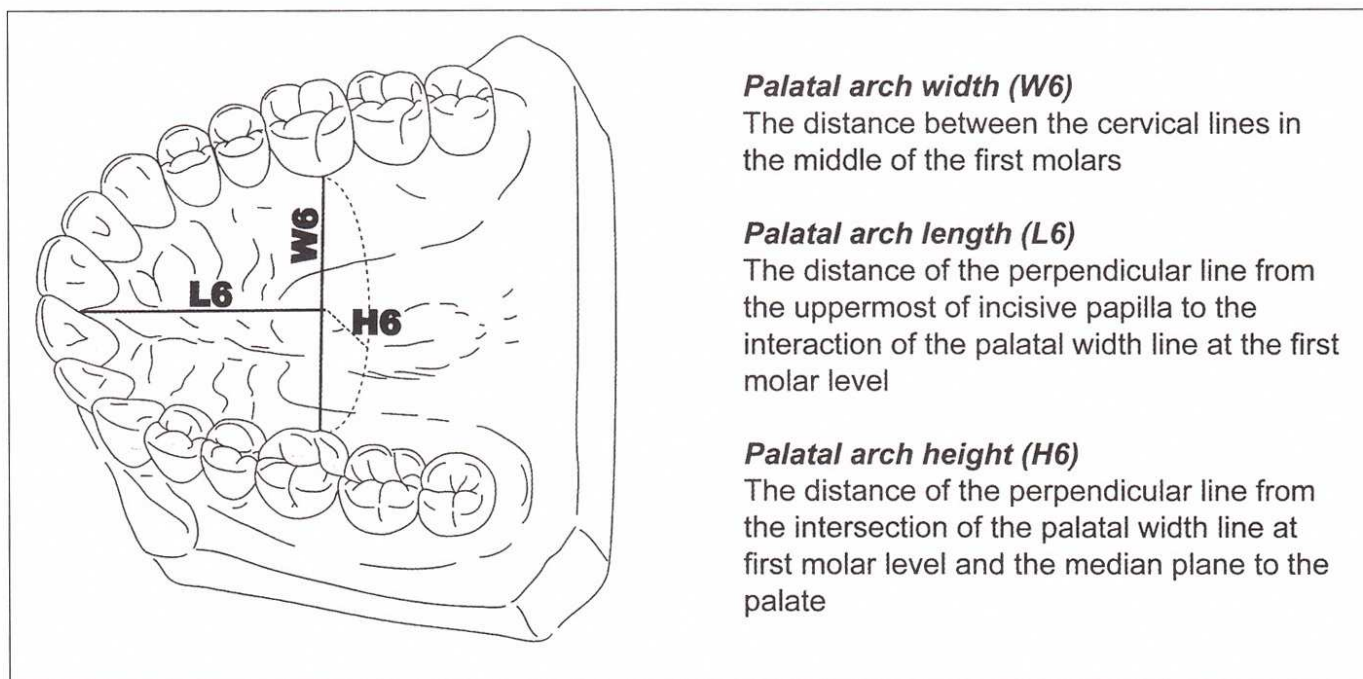


Fig. 1 Palatal arch dimensions (modified from Miyazaki et al., 1993)

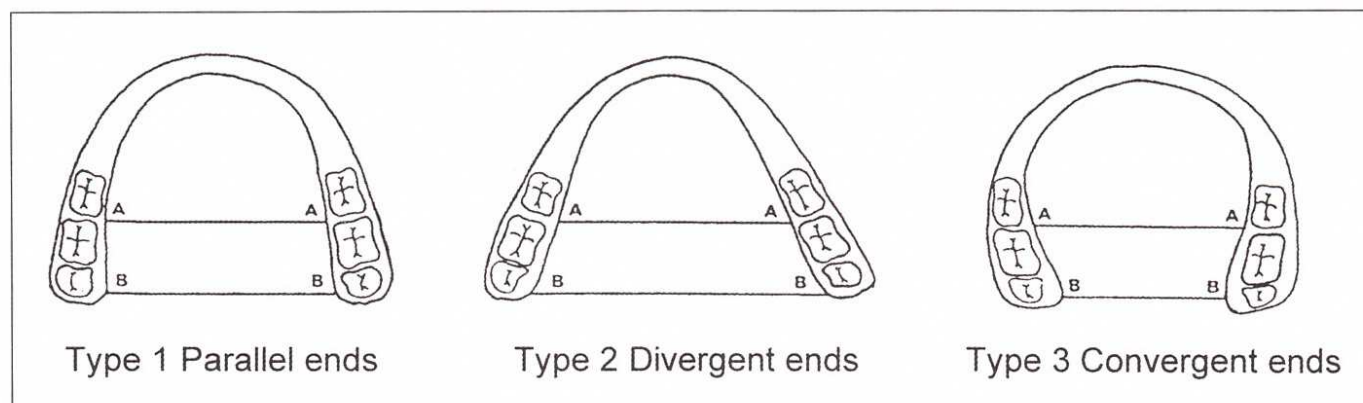


Fig. 2 Classification of maxillary arch forms (as described by Vidic, 1966)

dimensions as well as to investigate the relationship between the occurrence of TP and maxillary arch forms in Thai subjects.

Subjects and methods

Subjects

The study population comprised 366 Thais with equal number of men and women. The subjects were volunteer dental patients, dental students and dental school employees

aged 20 years and older. The average age of all subjects was 37.2 ± 13.4 years, with the range of 20-69 years.

Methods

The presence or absence of TP was assessed by clinical inspection and palpation. Questionable tori were regarded as not present. Alginate impressions of maxillary arches were taken and plaster models were made and used in measurement. A sliding caliper was used in measuring the elevation of TP and the palatal arch dimensions. The size of

Table 1 Relationship between the palatal arch dimensions and sex

Arch dimensions	Men (n = 183)	Women (n = 183)	Total (n = 366)	P value
Arch height	13.41±2.26	12.89±2.06	13.15±2.17	0.002
Arch length	29.08±2.20	28.26±2.16	28.67±2.23	< 0.001
Arch width	39.65±2.66	37.23±2.36	38.44±2.79	< 0.001

Data were expressed as mean ± SD (mm.) ; independent t-test

Table 2 Relationship between the palatal arch dimensions and the occurrence of torus palatinus

Arch dimensions	Subjects TP (n = 274)	Subjects without TP (n = 92)	P value
Arch height	12.80±2.09	14.20±2.11	< 0.001
Arch length	29.15±2.33	28.51±2.16	0.017
Arch width	38.45±2.70	38.38±3.04	0.833

Data were expressed as mean ± SD (mm.) ; independent t-test

TP was classified into 3 grades according to the elevation of TP measured at the highest point as small (<3 mm.), medium (3-6 mm.) and large (>6 mm.)⁽⁵⁾.

The measurement of arch dimensions was modified from Miyazaki et al⁽⁶⁾ and was defined (Fig. 1) as follows : the palatal arch width (W6) was established by measuring the distance between the cervical lines in the middle of first molars; the palatal arch length (L6) was established by measuring the perpendicular line from the uppermost of incisive papilla to the intersection of the palatal width line at first molar level; the palatal arch height (H6) was the length of the perpendicular line from the intersection of the palatal width line at first molar level and the median plane to the palate. In case of TP presence, the measurement point was modified to the closet point of the ideal point next into the TP free area. Arches that had unreliable measurement points because of lost, migrated and malposed first molars were excluded from the study. Each dimension was measured three times but at different time interval by one author (WA). The average measurement of each dimension was used in analysis.

Maxillary arches were classified into three morphological arch forms (Fig. 2) depending on the relation between the posterior and the most posterior width of the arch as

Table 3 Relationship between the palatal arch height and the occurrence of torus palatinus

Arch height	Subjects with TP (n = 274) n(%)	Subjects without TP (n = 92) n(%)
< 13.15 mm	154 (82.8)	32 (17.2)
> 13.15 mm	120 (66.7)	60 (33.3)

Palatal arch height vs. occurrence of TP; chi square test, $p < 0.001$

Table 4 Relationship between the palatal arch dimensions and torus size among subjects with TP

Arch dimensions	Small (n = 140)	Medium (n = 119)	Large (n = 15)	P value
Arch height	12.96±2.20	12.63±1.97	12.73±1.92	0.446
Arch length	28.40±2.19	28.74±2.20	27.67±2.85	0.133
Arch width	38.56±2.94	38.26±2.45	39.08±2.24	0.445

Data were expressed as mean ± SD (mm.) ; analysis of variance

previously described by Vidic⁽⁴⁾. The posterior width was measured at the level of the anterior limit of the second molar teeth and between the medial borders of the alveolar process. The most posterior width was measured at the level of the most posterior points on the medial borders of the alveolar process. Type 1 maxillary arch with parallel ends: The posterior width was equal to the most posterior width of the arch. Type 2 maxillary arch with divergent ends: the posterior width was less than the most posterior width of the arch. Type 3 maxillary arch with convergent ends: the posterior width was greater than the most posterior width of the arch.

The data were analyzed using the SPSS program (Release 9.0). Comparison of the differences between groups was tested by the chi-square, independent t-test and the analysis of variance, Significance of the differences was set at $p < 0.01$.

Results

The sample comprised 183 men and 183 women. The average age for men was 37.6 ± 13.1 years, women was 36.7 ± 13.4 years ($p = 0.223$). Two hundred and seventy four (74.9%) subjects had TP. Small TP were noted in 140 (38.3%) subjects, medium TP were noted in 119 (32.5%) subjects and

Table 5 Distribution of maxillary arch forms in relation to sex and the occurrence of torus palatinus

Maxillary arch forms	Subjects with TP		Subjects without TP		Total (n = 366)
	Men (n = 122)	Women (n = 152)	Men (n = 61)	Women (n = 31)	
Type 1 (Parallel ends)	22 (18.0)	19 (12.5)	6 (9.8)	7 (22.6)	54 (14.8)
Type 2 (Divergent ends)	98 (80.4)	128 (84.2)	52 (85.3)	23 (74.2)	301 (82.2)
Type 3 (Convergent ends)	2 (1.6)	5 (3.3)	3 (4.9)	1 (3.2)	11 (3.0)

Maxillary arch form vs. sex ; chi square test, $p = 0.919$

Maxillary arch form vs. occurrence of TP ; chi square test, $p = 0.678$

large TP were noted in 15 (4.1%) subjects.

Palatal arch dimensions

Table 1 showed the relationship between the palatal arch dimensions and sex. Men showed significantly higher number of palatal arch height (13.41 ± 2.26 vs. 12.89 ± 2.06 ; $p = 0.022$), arch length (29.08 ± 2.20 vs. 28.26 ± 2.16 ; $p < 0.001$), and arch width (39.65 ± 2.66 vs. 37.23 ± 2.36 ; $p < 0.001$) than women.

Table 2 showed the relationship between the palatal arch dimensions and the occurrence of TP. Subjects who had TP exhibited significantly shallower palates than those who had no TP (12.80 ± 2.09 vs. 14.20 ± 2.1 ; $p < 0.001$). The two groups showed no differences in palatal arch length (29.15 ± 2.33 vs. 28.51 ± 2.16 ; $p = 0.017$) and arch width (38.45 ± 2.70 vs. 38.38 ± 3.04 ; $p = 0.833$).

Table 3 showed the relationship between the occurrence of TP and palatal arch height. Subjects who had arch height shallower than the average arch height of the total subjects (13.15 mm.) showed higher occurrence of TP (82.8%) than subjects who had arch height deeper than the average arch height of the total subjects (66.7%). This difference was highly significant ($p < 0.001$).

Table 4 showed the relationship between the palatal arch dimensions and TP size among 274 subjects with TP. There were no relationship between size of TP and arch height ($p = 0.446$), arch length ($p = 0.133$) and arch width ($p = 0.445$).

Maxillary arch forms

Table 5 showed the distribution of maxillary arch forms in subjects of this study. Among 366 subjects, arch type 2, the most common, was found in 301 (82.2%) subjects. Arch type 1 was found in 54 (14.8%) subjects and arch type 3 was found in 11 (3%) subjects. There were no differences in maxillary arch forms between men and women ($p = 0.919$). Regarding the occurrence of TP and maxillary arch forms, TP

were found more common in arch type 1 (75.9%) and arch type 2 (75.1%) than arch type 3 (63.6%). However, there were no significant differences in maxillary arch forms between the subjects who had TP and those who had no TP ($p = 0.678$).

Discussion

Our study included subjects of 20 years and older because subjects of these age had complete growth and development of palatal arches. In this study, men showed deeper, longer and wider palates than women. Individuals who had no TP showed significant deeper palate than those who had TP. In addition, subjects who had shallower palates than the average palatal arch height of subjects in this sample (13.15 mm.) showed higher occurrence of TP than subjects who had deeper palates. This finding was consistent with Vidic⁽⁴⁾; the subjects who had shallower palates than the average palatal arch height of the group (12.4 mm.) showed higher occurrence of TP than subjects who had deeper palates. Our results showed that women had shallower palates than men and TP were found more common in individuals who had shallow palates. Thus, these features explain the evidence of finding TP more common in women than men.

Regarding the association between the occurrence of TP and maxillary arch forms, TP were found more common on the palates with parallel and divergent ends than the palates with convergent ends. However, these differences were not statistically significant. Our finding is contradictory to Vidic⁽⁴⁾ who reported the highest occurrence of TP on palates with convergent ends. Vidic stated that in cases where the most posterior width was less than the posterior width (convergent ends), the posterior part of the palate was less free that made the percentage of tori higher. Owing to Vidic's statement, we proposed in the opposite way. In cases of maxillary arches with parallel and divergent ends, the posterior part of the palates were more free, these types of palates might offer more space for the growth and develop-

ment of tori. Thus this hypothesis may explain the higher percentage of tori found on the palates with parallel and divergent ends in our study.

In conclusions, our finding support the previous study in that an association between the occurrence of TP and palatal arch height existed. However, it did not demonstrate the relationship between the occurrence of TP and forms of maxillary arch.

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บทวิทยากร

ความสัมพันธ์ระหว่างกระดูกทอรัสกลางเพดานปากกับขนาดของเพดานปากและรูปร่างของโค้งแม็กซิลลารี*

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บทคัดย่อ

การศึกษานี้มีจุดมุ่งหมายเพื่อจะหาความสัมพันธ์ระหว่างการเกิดกระดูกทอรัสกลางเพดานปากกับขนาดของเพดานปากและรูปร่างของโค้งแม็กซิลลารีในคนไทย การศึกษาทำในคนไทย ๓๖๖ คน โดยมีจำนวนของชายและหญิงเท่ากัน พบว่าผู้ที่ไม่มีกระดูกทอรัสกลางเพดานปากจะมีความลึกของเพดานปากมากกว่าผู้ที่มีกระดูกทอรัสกลางเพดานปากอย่างมีนัยสำคัญ ($p < 0.001$) แต่ความกว้างและความยาวของเพดานปากไม่แตกต่างกันไม่ว่าผู้ที่มีกระดูกทอรัสกลางเพดานปากหรือไม่ ไม่พบความสัมพันธ์ของขนาดกระดูกทอรัสกลางเพดานปากกับขนาดของเพดานปาก นอกจากนี้พบกระดูกทอรัสกลางเพดานปากส่วนใหญ่ในผู้ที่มีรูปร่างของโค้งแม็กซิลลารีแบบที่มีปลายขนาน (๗๕.๙%) และแบบที่มีปลายบานออก (๗๕.๑%) มากกว่าแบบที่มีปลายสอบเข้า (๖๓.๖%) แต่ความแตกต่างนี้ไม่มีนัยสำคัญทางสถิติ ผลการศึกษานี้สนับสนุนการศึกษาที่ผ่านมาถึงความสัมพันธ์ของการเกิดกระดูกทอรัสกลางเพดานปากกับความลึกของเพดานปาก แต่ไม่แสดงความสัมพันธ์ของการเกิดกระดูกทอรัสกลางเพดานปากกับรูปร่างของโค้งแม็กซิลลารี

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