Original Article

Comparison of CVM Stages and Maxillary Canine Calcification Stages for Determination of Skeletal Maturity

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ABSTRACT

Objective: To determine correlation between maturation of cervical vertebrae (CVM) stages and maxillary canine mineralization phases in determining the skeletal maturity.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Orthodontic Department, de'Montmorency College of dentistry, Lahore, from March 2021 to October 2022.

Materials and Methods: The study was conceived at orthodontic centre of public sector institute where lateral cephalograms and OPG radiographs of orthodontic subjects were used using established selection criteria.

Results: Descriptive statistics of CVM stages and Maxillary Canine calcification (DI) stages were calculated. Results of Spearman Coefficient of Correlation showed a very strong positive linear relationship between CVM stages and maxillary canine calcification stages.

Conclusion: There was very strong positive linear relation between CVM phases and maxillary canine calcification stages.

Key Words: There was very strong positive linear relation between CVM phases and maxillary canine calcification stages.

INTRODUCTION

The importance of determining the exact timing of skeletal maturity is important in orthodontics and cranio-facial jaw orthopedics to find the best treatment plan. The best effects of growth modification appliances such twin block and headgear can be best achieved if inserted while the time of peak puberty, and this can be determined using various invasive and non-invasive methods.[1]

There are various factors that can affect the onset of peak puberty such as hormonal factors, nutritional factors, race, age, gender and multiple other factors.

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The timing is importance not only for growth modification therapy but also for interceptive treatments, head gear traction treatment, non-extraction and extractions based fixed appliance therapy, overbite treatment e.g. deep bite malocclusion, Orthognathic surgery, and decision of retention regimes.[2-5]

There are multiple radiographic methods to determine the skeletal maturity such as hand-wrist x-rays, lateral cephalograms, panoramic x-rays and periapical x-rays. There are also multiple non-radiographic methods to determine the skeletal maturity such as IGF-1 levels, insulin levels, and various other biological indicators.[6-9]

The CVM method of cephalograms consists of analysing the changes in the lower border and shape of 2nd to 4th cervical vertebrae (C2-C4) on lateral cephalograms as described by Baccetti et al. 2005 and various other authors.[7-13]

The rationale of this study was that there may be a strong relationship between CVM and upper cuspid mineralization stages to find out the skeletal maturity in orthodontic subjects.

The objective of this study was to determine correlation between maturation of cervical vertebrae (CVM) stages and maxillary canine mineralization phases in determining the skeletal maturity.

MATERIALS AND METHODS

This Cross sectional study was conducted at orthodontic department of de'Montmorency College of dentistry, Lahore, from March 2021 to October 2022. A sample size of 100 is calculated at $\alpha = 0.05$, $\beta = 0.100$ and $\gamma = 0.854.13$.

All orthodontic patients around peak puberty having clear OPG and lateral cephalograms were included. Following patients were excluded: Patients having significant medical history, patients with previous history of dental trauma, and patients with deformities like clefts, hemiatrophy and hypertrophy.

CVM stages were assessed according to method by Hassel and Farman and Maxillary Canine Calcification stages were assessed from the panoramic radiograph according to Demirjian Index.

Frequency and percentage were calculated for stages of calcification on DI and CVMI. Spearsman coefficient of correlation was calculated to determine correlation between CVM and upper cuspid Demirjian stages (DI).

RESULTS

Results of Spearman Coefficient of Correlation showed a very strong positive linear relationship between CVM stages and maxillary canine calcification stages.

Results of Spearman Coefficient of Correlation were shown in Table 1. In the present study the Stage 1 of Skeletal Maturity (CVMI) stage as 12%, Stage 2 was 23%, Stage 3 was 29%, Stage 4 was 12%, Stage 5 was 13% and Stage 6 was 11%. Frequency of Maxillary Canine calcification (DI) stage as D was 5%, E was 19%, F was 30%, G was 24% and H was 22%. Spearman Coefficient of Correlation between Skeletal Maturity (CVMI) stage and Maxillary Canine calcification (DI) stage was 0.88 that showed a very strong positive linear relationship between them (Table 2).

Table No.1: Spearman Coefficient of Correlation (CC) between Skeletal Maturity (CVMI) stage and Maxillary Canine calcification (DI) stage

			CVM stage	DI
Spearman's rho	CVM stage	CC	1.000	0.882[**]
		Sig. (2-tailed)	.	0.000
		N	100	100
	DI	CC	0.882[**]	1.000
		Sig. (2-tailed)	0.000	.
		N	100	100

[**]. Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

The objective of the present study was to determine the correlation between maturation of cervical vertebrae (CVM) stages and maxillary canine mineralization phases in determining the skeletal maturity.

Therefore, one hundred patients were included by using non-probability consecutive sampling and obtained OPG x-rays and lateral cephalometric x-rays of all included patients.

In the present study the Stage 1 of Skeletal Maturity (CVMI) stage as 12%, Stage 2 was 23%, Stage 3 was 29%, Stage 4 was 12%, Stage 5 was 13% and Stage 6 was 11%. Frequency of Maxillary Canine calcification (DI) stage as D was 5%, E was 19%, F was 30%, G was 24% and H was 22%. Spearman Coefficient of Correlation between Skeletal Maturity (CVMI) stage and Maxillary Canine calcification (DI) stage was 0.88 that showed a very strong positive linear relationship between them.

To date, indicators of skeletal maturity such as secondary sexual features related to gender, ossification of certain bones such as cervical vertebras, and dental root status and eruption status have been used with varied results of accuracy. [5] However, there has been various studies over the reproducibility, reliability, validity and qualitative nature of various skeletal maturity indicator methods as compared with cervical maturation methods.

Several studies[14,15] have shown that all the CVM stages usually starts earlier in females as compared to males. The findings of the study by Krailassiri et al.[16] and Uysal et al.[17] also concluded that all the dental stages usually starts earlier in females as compared to males in relation to skeletal maturity stages.

There are certain limitations of the present study such as small sample size, its nature of being cross-sectional, and lack of randomization. However, within the limitations, the results showed that there is a very strong positive linear relationship between CVM stages and maxillary canine calcification stages.

CONCLUSION

This present showed a very strong positive linear relationship between CVM stages and maxillary canine calcification stages.

Author's Contribution:

Concept & Design of Study:	Nayha Enver
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Data Analysis:	Muhammad Azeem, Asad Ur Rehman
Revisiting Critically:	Nayha Enver, Waheed Ul Hamid
Final Approval of version:	Nayha Enver

Conflict of Interest: The study has no conflict of interest to declare by any author.

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