ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 3, Issue – 5, September - 2020, Page No. : 442 - 447

Sella Turcica – A Mirror of Endocrine Diseases

[1]Dr. Anuradha Chennupati, MDS, Asst Prof, Dept of OMR, GDC&H,Vijayawada

[2]Dr. X Augustin Prabha, MDS, Corresponding Author

[3]Dr. Raja V Naga Ranjith K, MDS

[4]Dr. P. Mallika Mahalakshmi, MDS, Reader, Dept of OMR, Mamata Dental College, Khammam

[5]Dr. A. Dasarathi, MDS, Asst Prof, Dept of Oral Pathology, GDC&H, Rims, Kadapa

[6]Dr. Marisetty Charitha, MDS

Corresponding Author: Dr. Anuradha Chennupati, MDS, Asst. Prof, Dept of Oral Medicine& Radiology, Govt Dental College & Hospital,Vijayawada.

Citation of this Article: Dr. Anuradha Chennupati, Dr. X Augustin Prabha, Dr. Raja V Naga Ranjith K, Dr. P. Mallika Mahalakshmi, Dr. A. Dasarathi, Dr. Marisetty Charitha, "Sella Turcica – A Mirror of Endocrine Diseases", IJDSIR- September - 2020, Vol. – 3, Issue - 5, P. No. 442 – 447.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: The aim of this study was to use quantitative methods to measure the size of the sella turcica and thus establish normative reference standards that could assist in a more objective evaluation of the sella turcica in the hypothyroid and diabetic patients compared with age and sex matched controls.

Materials and Methods: Healthy subjects without any history of systemic diseases and subjects who were diagnosed with diabetes mellitus and hypothyroid of age group of 25-65 years were included. Standardized lateral cephalograms were taken and conventional measurements included the length, depth and antero-posterior diameter were measured using Kodak software and analysed.

Results: Mean length, height and antero-posterior diameter of diabetes, hypothyroid & control showed significant difference, but not much difference was found in between diabetes and control group.

Keywords: Lateral Cephalogram, Sella Turcica, Diabetes, Hypothyroidism

Introduction

The sella turcica is an important anatomic structure in the midcranial region that houses the pituitary gland which is a reliable source of additional diagnostic information related to pathology of the hypophysis, or too many syndromes that alter the craniofacial region**.** [1] It was named according to its similar shape to Turkish saddles for the first time in Blancard's Physical Dictionary (1693). The morphology of sella turcica is similar before and after birth, but dimensions increase during growth and become persistent around 15 years of age. Normal morphological

variations of sella turcica vary greatly from individual to individual. [2]

Pituitary gland is referred to as 'master gland' of the body, so any disturbance in this gland may lead to different endocrine and craniofacial pathologies. The radiologic image of sella turcica on lateral cephalograms serves as a landmark to determine sella, the geometric center of this cavity, which is crucial for the cephalometric evaluations before, during and after orthodontic therapy. [3] Lateral cephalograms are used to evaluate craniofacial anomalies, but they should also be serve as a tool that provides beneficial knowledge concerning cranial structures that can reflect signs of a genetic, congenital, or systemic disorder.[3,5] Clinicians should be thorough with the normal radiographic anatomy and morphologic variability of sella turcica, to recognize and investigate deviations that may reflect pathological situations, even before these become clinically apparent. [2, 3, 4]

As there is a chance of morphological alteration in sella turcica which houses pituitary and because of its anatomical location, lateral cephalograms can be used to screen the morphological alterations in suspected subjects. Some chronic diseases are associated with variations in the morphology of sella turcica, diabetes and thyroid are the most common chronic diseases.

The aim of this study was to use quantitative methods to measure the size of the sella turcica and thus establish normative reference standards that could assist in a more objective evaluation of the sella turcica in the hypothyroidism and diabetic patients compared with age and sex matched controls.

Materials and Methods

This radiographic study was conducted for a period of 7 months, from May 2016 to November 2016. The study included a total of 90 digital lateral cephalometric radiographs of 43 males and 47 females between 25 and 65 years of age who had attended the Department of Oral Medicine and Radiology and were grouped into three categories.

Inclusion criteria

a. Healthy patients without any history of other systemic diseases

b. Patients in the age range of 25-65 years

c. Patients who are diagnosed of diabetes mellitus and hypothyroidism above 2 years were included.

Exclusion criteria

a. Individuals with congenital defects like clefts and malformations in the craniofacial region

b. History of fractures involving craniofacial region

c.Patients suffering from bone disorders, nutritional deficiencies and endocrinal disturbances.

Methods

Digital lateral cephalometric radiographs were taken by using Kodak 8000c machine with a tube voltage of 82 kVp, tube current of 10 mA and exposure time of 0.5s. The distances were measured using Kodak Programs software.

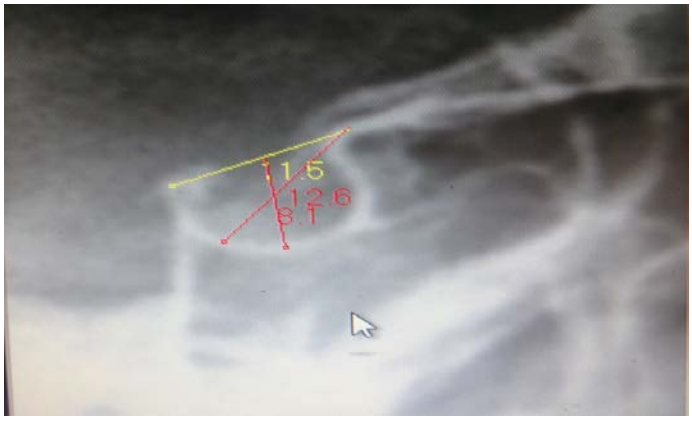


Figure 1: The dimensions of the sella turcica

The dimensions of sella turcica - length, diameter, and height **[Figure 1]** were measured according to the definitions of Silverman. [5] The length was measured as the linear distance from the superior most point on the tuberculum sella to the tip of the dorsum sella. The depth

was measured as a line perpendicular from the line joining tuberculum sella and dorsum sella to the inferior most point on the floor. The anteroposterior diameter of sella turcica is measured from the superior most point on tuberculum sella to the furthest point on the postero-inferior aspect of the hypophyseal fossa**. [Figure 2]**

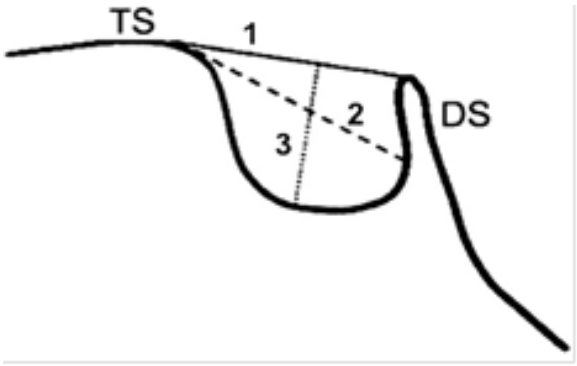


Figure 2: 1) Length, 2) Height 3) A-P dimension of Sella Turcica

TS-Tuberculum Sella, DS- Dorsum Sella

Statistical analysis: In this study the following methods were used for statistical analysis. Data were entered in Microsoft excel and analyzed using SPSS (Statistical Package for Social Science, Ver.10.0.5) software. Anova test was used to calculate the mean differences of linear measurements of sella turcica between diabetes, hypothyroidism and controls.

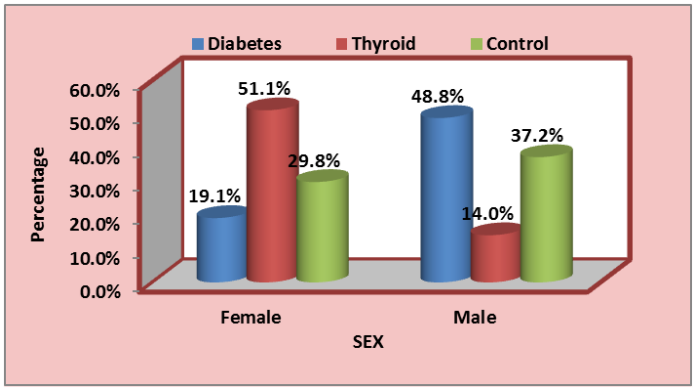
Results

The minimum age was 25 years and maximum age was 65 years. The patients were grouped into three different groups diabetes, hypothyroidism and age and sex matched controls. The distribution of males and females in three different groups are given in the **Table 1,Graph1.**

Table 1: Sex Distribution between three groups

Sex	Groups			Total
	Diabetes	Thyroid	Control	
Female	9	24	14	47
	19.1%	51.1%	29.8%	100.0%
Male	21	6	16	43
	48.8%	14.0%	37.2%	100.0%
Total	30	30	30	90
	33.3%	33.3%	33.3%	100.0%
P-value <0.01 HS				

Graph 1: Sex Distribution between three groups

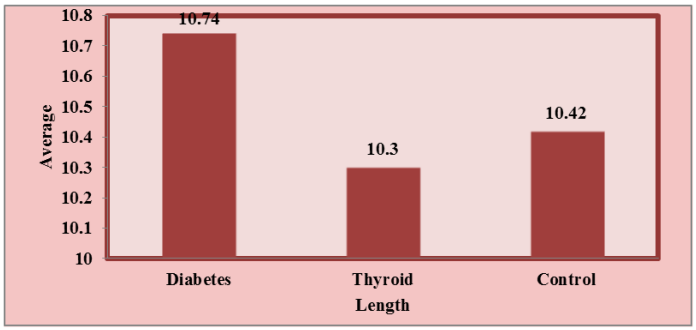


There was no statistically significant difference in the dimensions of sella turcica between the diabetic patients (diameter, 12.20, 6, 1.49 mm; length, 10.49, 6, 1.55 mm; height, 8.07, 6, 1.25 mm) and the controls (diameter, 12.45, 6, 1.43 mm; length, 10.90, 6, 1.73mm; height, 8.29, 6, 1.66 mm). [**Table -2, Table -3, Table -4]**

In this study the mean length of diabetes, hypothyroid & control shows 10.74, 10.30,10.42 which revealed that not statistically significant difference. **[Table 2, Graph2]**

Table 2: Length of the sella turcica between three groups

Parameters	Groups	Mean	SD	P-value
Length	Diabetes	10.74	1.97	0.35
	Thyroid	10.30	1.94	
	Control	10.42	2.45	

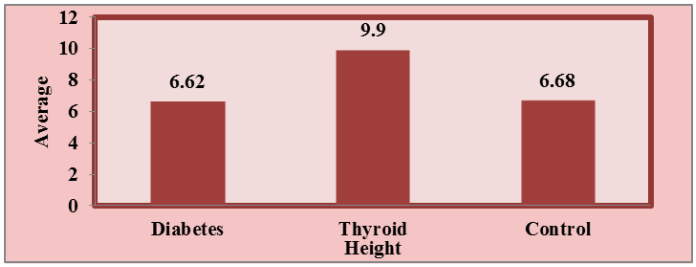


Graph 2 : Length of the sella turcica between three groups

The mean height of diabetes, hypothyroid & control shows 6.62, 9.90 &6.68 which revealed that statistically significant difference. [Table 3, Graph 3]

Parameters	Groups	Mean	SD	P-value
Height	Diabetes	6.62	0.86	<0.01
	Thyroid	9.90	1.83	
	Control	6.68	1.69	

Table 3: Height of the sella turcica

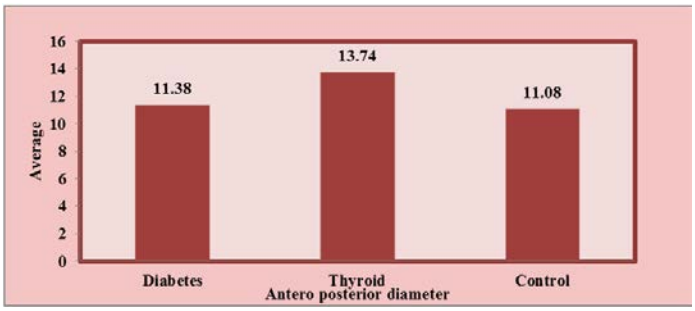


Graph 3: Height of the sella turcica

The Mean anteroposterior diameter of diabetes, hypothyroid &control shows 11.38, 13.74 & 11.08 which revealed significant difference. [Table 4, Graph 4]

Parameters	Groups	Mean	SD	P-value
antero posterior diameter	Diabetes	11.38	1.72	<0.01
	Thyroid	13.74	1.35	
	Control	11.08	1.57	

Table 4: Anteroposterior diameter of the sella turcica



Graph 4: Anteroposterior diameter of the sella turcica

Discussion

Sella turcica is the most vital anatomic structure which has special significance due to the presence of pituitary gland in the hypophyseal fossa. The exact dimensions of sella turcica are mandatory in the diagnosis, prognosis and treatment of diseases related to pituitary gland and brain. [11] A possible functional connection between the size of sella turcica and plasma TSH concentrations was described. [12]

Normative data on the size of the sella turcica has been investigated in the literature and typically range from 4 to 12 mm for the vertical and 5 to 16 mm for the antero-posterior dimension (Camp,1924 ; Silverman, 1957; Chilton *et al.*,1983 ; Choi *et al.* , 2001 ; Axelsson *et al.* , 2004a ; Jones *et al* ,2005).[5,6,7,8,9] Canigur Bavbek and Dincer (2014) reported neural crest cells which are crucial for the formation of anterior wall of sella turcica, develop longevity and proliferation of beta cells and thus the secretion of insulin.[10]

Silverman (1957) revealed the dimension of the sella turcica such as Vertical dimension 4-12 mm, Antero posterior dimension 5 to 16 mm.[5] Quakinine & Hardy(1987) were analysed a study on 250 cadavers the anteroposterior dimension, Length, Height was 12, 8, 6 mm.[11]

The present study showed that in normal healthy control the Length, Height, anteroposterior dimension was 10.42mm, 6.68mm, 11.08mm suggestive of positively

correlating with the height and anteroposterior dimension and length was found to be varied.

In the present study revealed that the mean length of diabetes, hypothyroid & control shows 10.74, 10.30 &10.42 which was no significant difference. Axelsson et al., (2004) found that length was almost constant throughout the observation period whereas the depth and diameter will increase**.** [4]

In the present study mean height of diabetes, hypothyroid & control shows 6.62, 9.90 &6.68 which revealed that statistically significant difference. The Mean antero-posterior diameter of diabetes, hypothyroid & control were 11.38, 13.74 & 11.08 which was significant difference. But, the mean height & anteroposterior diameter of hypothyroid is higher when compared to controls and diabetes.

Yamada *et al.(1976)* evaluated that in hypothyroid the size of an increase sella turcica inversely related with a decline in serum T4 and T3 concentrations as well as the magnitude of an enlargement of sella turcica correlated well with an increase of circulating TSH**.**[12] Prolonged hypothyroidism leads to pituitary hyperplasia due to loss of negative feedback from lack of circulating thyroxine (T4) and triiodothyronine (T3), leading to excessive thyrotropin releasing hormone (TRH) secretion from the hypothalamus. Both radiographic imaging and biochemical testing results were needed before proceeding with surgical intervention. Patients with hypothyroidism, who had pituitary enlargement incidentally found on brain imaging, should be treated with thyroid hormone replacement and close follow-up and with repeat imaging**.** [13]

Since there was no study regarding interaction between diabetes and size of the sella turcica. The present study reveals there is no difference between diabetes and control which found almost similar height and anteroposterior dimensions.

Further studies are needed to assess the sensitivity and specificity of cephalograms for detection of pituitary pathology. Further studies are needed for evaluation of size of the sella turcica in hyperthyroid and hypothyroid patients. Further studies are needed to assess increase sample size. The present study concluded that, with the help of lateral cephalometric radiographs it is possible to anticipate the endocrine disorders, especially thyroid abnormalities.

Conclusion

Lateral cephalogram can be an non invasive dignostic method for early detection of hypothyroidism, which indirectly reflects an increase in pituitary size and TSH-secreting capacity, possibly due to hypertrophy and hyperplasia of TSH cells in hypothyroid patients.

References

1. Sathyanarayana HP, Kailasam V, Chitharanjan AB. Sella turcica-Its importance in orthodontics and craniofacial morphology. *Dent Res J (Isfahan)*. 2013 Sep;10(5):571-5. PMID: 24348611; PMCID: PMC3858728.
2. Alkofide EA. The shape and size of the sella turcica in skeletal Class I, Class II, and Class III Saudi subjects. *Eur J Orthod. 2007;**29(5):457–63.***
3. M. Andredaki, A. Koumantanou, D. Dorotheou and D. J. Halazonetis. A cephalometric morphometric study of the sella turcica. The European Journal of Orthodontics, 29(5): 449-456, 2007.
4. Axelsson S, Storhaug K, Kjaer I. Post-natal size and morphology of the sella turcica. Longitudinal cephalometric standards for Norwegians between 6 and 21 years of age. Eur J Orthod 2004;26:597-604

5. Silverman F N 1957 Roentgen standards for size of the pituitary fossa from infancy through adolescence. American Journal of Roentgenology 78 : 451 – 460
6. Camp J 1924 Normal and pathological anatomy of the sella turcica as revealed by roentgenograms . American Journal of Roentgenology 12 : 143 – 155
7. Chilton L A , Dorst J P , Garn S M 1983 The volume of the sella turcica in children: new standards. American Journal of Roentgenology 140 : 797 – 801
8. Choi W J , Hwang E H , Lee S E 2001 The study of shape and size of normal sella turcica in cephalometric radiographs . Korean Journal of Oral and Maxillofacial Radiology 31 : 43 – 49.
9. Jones R M , Faqir A , Millett D T , Moos K F , McHugh S 2005 Bridging and dimensions of sella turcica in subjects treated by surgical-orthodontic means or orthodontics only . Angle Orthodontist 75 : 714 – 718
10. Nehir Canigur Bavbeka and Mufide Dincerb Dimensions and morphologic variations of sella turcica in type 1 diabetic patients
11. Quakinine G E , Hardy J 1987 Microsurgical anatomy of the pituitary gland and the sellar region: the pituitary gland . The American Surgeon 53 : 285 – 290
12. T. Yamada, T. Tsukui, K. Ikejiri, Y. Yukimura, and M. Kotani, “Volume of sella turcica in normal subjects and in patients with primary hypothyroidism and hyperthyroidism,” Te Journal of Clinical Endocrinology & Metabolism, vol. 42, no. 5, pp. 817–822, 1976.
13. Prateek Shukla, Ketan R. Bulsara, and Pooja Luthra, “Pituitary Hyperplasia in Severe Primary Hypothyroidism: A Case Report and Review of the Literature,” Case Reports in Endocrinology, vol. 2019, Article ID 2012546, 7 pages, 2019.