The Scientific Journal of University of Benghazi

http://journals.uob.edu.ly/sjuob

A Study of the Morphological Variation in the Shape and Size of Sella Turcica in the Population of Benghazi

Fatimah Alhadi Mohammed[1], Seraj Alzentani[2], Iman Ayad[1], Mahmoud Mohammed Werfalli[3]

[1] *Anatomy department, Faculty of Medicine, University of Benghazi, Benghazi, Libya*

[2] *Neurosurgery department, Faculty of Medicine, University of Benghazi, Benghazi, Libya*

[3] *Family & Community Medicine Department, Faculty of Medicine, University of Benghazi, Benghazi, Libya*

Received; 25/08/2021, Accepted; 27/09/2021

الملخص

السرج التركي يعرف شكلاً مقعداً عميقاً ويقع في الحفرة القحفية الوسطى على السطح العلوي للعظم الوتدي ويستفاد من دراسته في تقويم نتائج العلاج والتغيرات التطورية المتأخرة وأيضًا في تقويم تطور الجمجمة. تهدف هذه الدراسة إلى تقدير التباين الطبيعي في شكل السرج التركي وحجمه بين الجنسين والفئات العمرية المختلفة. أجريت هذه الدراسة على عدد 100 من المرضى البالغين في مركز الهوارى للأشعة بمدينة بنغازي من الفترة 1 أبريل 2018 إلى 31 مارس 2019. وأُدخِلَت البيانات إلى الإصدار 23 من برنامج التحليل الإحصائيSPSS و قد استخدم اختبار t للعينة المستقلة لفحص الفروق بين مجموعتين مستقلتين وكذلك استخدم تحليل مربع كاي لفحص العلاقة بين متغيرين فئويين مستقلين أيضا استخدمت ANOVA للمقارنة بين أكثر من وسيلتين .أوضحت النتائج أن الشكل الاعتيادي للسرج التركي وجد في 36.3٪ من الذكور و31.3٪ من الإناث، وشكل الجدار الأمامي المائل للسرج ظهر في 36.3٪ من الذكور و15٪ من الإناث، كما سجل وجود جسر في 6.1٪ من الذكور و12٪ من الإناث، كما لوحظ وجود ثقب في الجدار الخلفي للسرج في 1.2٪ من الذكور و31.3٪ للإناث وسُجِّل الشكل الهرمي للجدار الخلفي في 6.1٪ للذكور و10.4٪ للإناث. لا يوجد هناك فرق في الأبعاد الخطية للسرج عند المقارنة بين الفئات العمرية، ولكن كان هناك اختلاف في العمق بين الفئات العمرية .(P = 0.001) أوضحت النتائج أن تشريح السرج التركي والمناطق المحيطة يعد أمرًا مهماً لأطباء جراحة الأعصاب للتقويم السريري كما يمكن استخدام النتائج المذكورة في الدراسة الحالية معايير مرجعية لمزيد من الأبحاث المتعلقة في نفس المنطقة للمرضى الليبيين.

كلمات مفتاحية: السرج التركي، سكان، شكل، جنس.

Abstract

Sella Turcica is a saddle-shaped depression, located in the middle cranial fossa on the upper surface of the sphenoid bone. The morphology of Sella Turcica is significant for evaluating treatment outcomes and late developmental changes and especially in assessing the cranial morphology. This study aims to estimate the normal variation in the shape and measurement of Sella Turcica (length, depth, antero-posterior diameter) as well as the differences between genders and age groups. This research is a descriptive cross-sectional study and included adult patients (N=100) in Al-Howary Radiology Centre, Benghazi in the period between the 1st of April 2018 and the 31st of March 2019. Participants in the sample were purposively selected. Data was then collected and transferred to SPSS Software Version 23 and the analysis was completed. An independent sample t-test was used to examine the differences between two independent groups and the relationships between two independent categorical variables was examined through chi-square analysis. ANOVA was used to compare more than two means. The morphology of the Sella Turcica appeared to be normal in shape in 36.3% of males and 31.3% of females. The oblique anterior wall was noted in 36.3% of males and 15% of females, the Sella Turcica bridge was recorded in 6.1% of males and 12% of females, the notching posterior wall of Sella was present in 1.2% of males and 31.3% of females and the pyramidal shape of dorsum Sella was recorded in 6.1% in males and 10.4% of females. There was no difference in the linear dimensions of Sella Turcica when the various age groups were compared, however, there was a difference in depth between age groups which was statistically significant (P= 0.001). The anatomy of the Sella Turcica and its surroundings is significant for neurologists and neurosurgeons with regard to their clinical assessments. The Sella shapes and dimensions reported in the current study can be used as reference standards for further investigations involving the Sella Turcica in Libyan subjects.

Keywords: Sella Turcica, population, shape, gender;

1. INTRODUCTION

Sella Turcica is shaped as a saddle depression and is located in the middle cranial fossa on the upper surface of the sphenoid bone. It is bounded by the pituitary fossa in which the pituitary gland is lodged with tuberculum Sella at the front and dorsum Sella at the back. A protrusion on the pituitary fossa is formed by two anterior and two posterior clinoid processes which enclose the pituitary gland in the Sella Turcica [1].

The name was coined due to this formation's resemblance to a type of saddle with a broad seat, high pommel and cantle, once used by the Turks. According to this analogy, the Sella Turcica is comprised of three parts. The first is the tuberculum Sella (the pommel of the saddle), which is the slight anterior elevation on the body of the sphenoid bone. The second part is the hypophysial fossa (pituitary fossa), a saddle-like depression for the pituitary gland in the middle. The third part is the dorsum Sella (the cantle

*Correspondence:

Iman Ayad.
İman.ayad@uob.edu.ly

©2021 Unuiversity of Benghazi. All rights reserved. ISSN:Online 2790-1637, Print 2790-1629; National Library of Libya, Legal number : 154/2018

of the saddle), which is located posteriorly and is formed by a square plate of bone on the body of the sphenoid [2].

Studying the anatomy of the Sella Turcica and its surroundings is important for neurologists and neurosurgeons in their assessments of the presence of any pathological changes in this region. Indicating out the variations that may occur in the Sella Turcica area is also vital in preventing injuries of the structures that surround the Sella Turcica during surgery. When surgeons are oriented with these variations, they can detect them during the pre-operative preparation of cases and in reviewing the radiological profiles of cases. Oriented surgeons will be able to select the proper surgical technique, operative approach and surgical devices according to the anatomical variations of their operated cases [3]. Three linear measurements of the Sella Turcica were used; length, depth and anteroposterior diameter. Length; the distance between the tuberculum Sella to the tip of dorsum Sella. Depth; the line perpendicular to the line drawn above to the deepest point on the floor. Antero-posterior diameter; the line drawn from the tuberculum Sella to the most posterior point on the posterior inner wall of the fossa [4].

Axelsson et al give six types of the Sella Turcica shapes: Normal (a), Oblique anterior wall (b), Sella Turcica bridging (c), Double contour of the floor (d), Irregularity in the posterior part of dorsum Sella (notching) (e) and pyramidal shape of the dorsum (f) [5]. Akhare et al analysed the morphological shape and measured the linear dimensions of the Sella Turcica to determine any gender differences between members of the population of their study residing in central India. A statistical difference was found in the size of Sella Turcica. The length was more in males (P<0.002) when compared with females. Variation in morphological appearance was present in nearly one-third of the individuals [6]. Mostafa et al collected a total of 509 computed cephalograms of healthy Jordanians; 252 males and 257 females, aged 10 to 40 years old and divided these cephalograms according to age groups into adolescents and adults of both genders to discover the normal values of the Sella Turcica shape in the Jordanian population with reference to age and gender as well as variations of the shape. Their results showed that females exhibited a higher percentage of overall normal shape but lower relative percentages of oval and flat shapes, as compared with males. Similarly, females showed a decreasing trend of normal shape as their age advances. Notably, females and males changed in favour of the oval shape. In terms of variants, bridging and irregular dorsum clearly predominate as individual's progress in age. Moreover, there were statistically significant differences between the adult male group on one hand and the adolescent female group and adult female group on the other. Regarding age categories, Sella linear dimensions were significantly different between adolescent and adult age groups and within male and female groups. Although there was a significant increase of linear parameters of Sella Turcica across age groups, this growth did not affect the shape of Sella Turcica as the shape seems to be preserved across the studied age groups [7]. Magat et al studied the lateral cephalometric radiographs of 362 patients (145 males, 217 females), grouped by age and gender. Linear dimensions of Sella Turcica were measured and the shapes were evaluated. The normal morphology had the highest proportion (39.0%), followed by the pyramidal shape (15.5%), the double contour of the floor (14.6%), the oblique anterior wall (14.4%), the irregular dorsum Sella (8.6%), and the Sella Turcica bridge (8.0%). Moreover, there were significant differences between Sella Turcica shapes. Females had a greater diameter size of Sella Turcica than males ($p < 0.01$). Furthermore, larger Sella Turcica depths and diameters were observed among subjects aged 15–21 years compared to subjects aged 9–14 years ($p < 0.05$ and $p < 0.01$ respectively). Yet, no significant differences were found between age groups in terms of Sella Turcica lengths [8]. Chukwuani et al studied the computed tomography head images of 197 patients to observe the normal dimensions of Sella Turcica among the adult Nigerian population and assess the variations in dimensions of Sella Turcica among different age groups and gender. The Sella Turcica had a mean length of 9.8 mm, an AP diameter of 11.5 mm, and a depth of 8.6 mm. Additionally, the results showed that there were no differences between Sella Turcica dimensions, the gender of the patient and different age groups [9]. This study aimed to estimate the normal variation in shape and measurement of Sella Turcica (length, depth, antero-posterior diameter) as well as the difference among gender and age groups.

2. METHOD

This research is a descriptive cross-sectional study of adult patients (N=100) in Al-Howary Radiology Center in Benghazi between the 1st of April 2018 and the 31st of March 2019. Participants in the sample were purposively selected. Sinus CT scans with slice thickness of 1 mm of the 100 patients were used. The length, depth and antero-posterior diameter were calculated by the radiologist at the level of the mid-sagittal plane and at a maximum dimension of the Sella Turcica. The length of Sella Turcica was measured as the linear distance from the most superior point on the tuberculum Sella to the tip of the dorsum Sella and 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 antero-posterior diameter of Sella Turcica was measured from the superior most point on the tuberculum Sella to the furthest point on the posteroinferior aspect of the hypophyseal fossa.

Data was transferred to SPSS software version 23 and analysed. An independent sample t-test was used to examine the differences between two independent groups. The relationship between two independent categorical variables was examined by chi-square analysis. ANOVA was used to compare more than two means.

Ethics

The study was conducted according to the guidelines of both the Declaration of Helsinki and the Ministry of Health at Benghazi. The approval of the Director of the Center was sought and received before starting the collection of data. Additionally, all subjects gave verbal informed consent.

3. RESULTS

The mean age of males was 40.1±13.9 years and ranged between 18 – 76 years. The female mean age was 37.5±12.5years and ranged between 14-67 years. Figure (1) shows the distribution of cases by the shape of Sella Turcica.

©2021 Unuiversity of Benghazi. All rights reserved. ISSN:Online 2790-1637, Print 2790-1629; National Library of Libya, Legal number : 154/2018

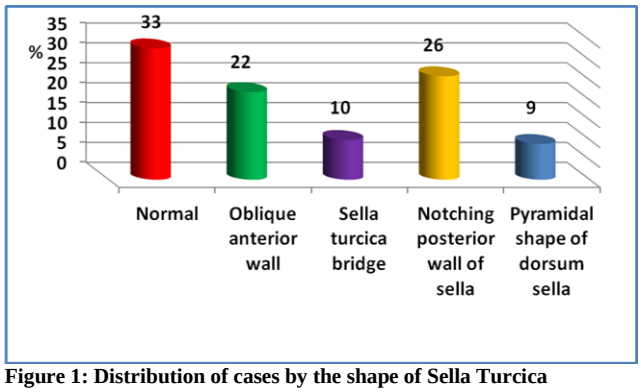


Figure 1: Distribution of cases by the shape of Sella Turcica

The Length of Sella was 4-12 mm in 81.8% of males and 89.6% of females and> 12mm was 18.2% in male and 13% of female Turcica. The length of Sella Turcica ranged between 4.5-14mm; the mean length in males was 10.5±1.5mm, and the mean length in females was 10.2 ± 1.6mm. The difference in means between males and females was not statistically significant p = 0.529 (Table 1).

Table 1: Sella Turcica linear dimensions for females and males (in millimetres)

Sella Turcica size	Gender	n	Mean± SD	Standard error of the mean	P-value
Length (in mm)	Males	33	10.46± 1.54	1.54	
	Females	67	10.16±1.58	1.59	0.529
Depth (in mm)	Males	33	7.89±1.33	0.23	
	Females	67	8.47± 1.38	0.17	0.164
Anterior – posterior diameter /mm (in mm)	Males	33	13.02±1.53	0.27	
	Females	67	12.76± 1.33	0.16	0.541

The depth of Sella Turcica ranged between 4.6 to 12mm, the mean depth of Sella Turcica for males was 7.89±1.33mm, and the mean depth for females was 8.47±1.37mm. This difference between males and females was not statistically significant; the p-value was 0.164. The depth of Sella Turcica of < 6.5mm was 15.2% in males and 6% in females. The depth of 6.5- 12.5mm was 84.8% in males and 94% in females. This distribution was not statistically significant p=0.131. When the effect of age on Sella Turcica size was studied, the linear dimensions of Sella Turcica compared between the age groups (length & anterior-posterior diameter in mm) were not found to be statistically significant, whereas comparing the depth in mm between age groups was statistically significant (p 0.0001) Table 2.

Table 2: Sella Turcica linear dimensions (in millimetres) by age group

Sella Turcica size	Age group (Year)	N	Mean± SD	Standard error of the mean	P-value For ANOVA
Length (in mm)	≤20	10	9.70 ±2.82	0.89	0.652
	21- 30	18	10.14 ±1.22	0.29	
	31 - 40	25	10.16 ±1.48	0.29	
	41 - 50	31	10.44 ±1.29	0.23	
	51 – 60	11	10.69 ± 1.50	1.50	
	>60	5	9.69 ±1.56	0.69	
Depth (in mm)	≤20	10	7.95 ±1.15	0.36	0.0001 *
	21- 30	18	7.56 ±1.33	0.37	
	31 - 40	25	8.29 ±1.33	0.27	
	41 - 50	31	8.66±1.42	0.25	
	51 – 60	11	10.69±1.50	0.45	
	>60	5	9.79±1.56	0.69	
Anterior – posterior diameter (in mm)	≤20	10	12.63 ± 2.59	0.80	0.901
	21- 30	18	12.54±1.56	0.37	
	31 - 40	25	12.83±1.15	0.23	
	41 - 50	31	12.97± 1.43	0.26	
	51 – 60	11	13.16±1.52	0.46	
	>60	5	12.92± 0.65	0.29	

*significant

4. DISCUSSION

This study describes the linear dimension and the morphological shape of Sella Turcica. The mean age of males was 40.1±13.9years and ranged between 18 – 76 years. The female mean age was 37.5±12.5years and ranged between 14-67 years

©2021 Unuiversity of Benghazi. All rights reserved. ISSN:Online 2790-1637, Print 2790-1629; National Library of Libya, Legal number : 154/2018

and the difference between the means of age was not statistically significant p = 0.305. The study population was 33 % males and 67% females. The morphology of the Sella Turcica appeared to be normal in shape in 36.3% of males and 31.3% of females, the oblique anterior wall was noted in 36.3% of males and 15% of females, the Sella Turcica bridge was recorded in 6.1% of males and 12% of females, the notching posterior wall of Sella was present in 1.2% of males and 31.3% of females and the pyramidal shape of dorsum Sella was recorded in 6.1% in males and 10.4% of females. These differences between males and females were not statistically significant p= 0.083. A similar study by A. Alkofide found that in the Saudi subjects of the study, the normal shape was found in 67%, the oblique anterior wall in 9.4%, the Sella Turcica bridge in 1.1%, the pyramidal shape in 2.8% and the irregular dorsum Sella in 11.1% [1]. Additionally, a study by Islam et al in Malaysia showed the percentages of the study population as follows: normal Sella (69.2%), oblique anterior wall (4.8%), double contour of Sella floor (6.6%), Sella Turcica bridge (0 %), irregularity (notching) in the posterior part of the dorsum Sella (16.2%) and pyramidal shape of dorsum Sella (3.0%) [10].

Kumar et al evaluated the correlation between the morphological variations of Sella Turcica with age and gender. The normal shape of Sella Turcica appeared to in 27.3% of the study population followed by combination (26.7%), irregular (15.8%), pyramidal (10.6%), bridge (10%), oblique anterior wall (5.5%), and double contour (4.2%). There were no statistically significant differences between males and females. Alternatively, there were statistically significant differences between depth and diameter when correlated with age. On comparison of the shape of Sella Turcica with linear measurements, the parameter length was statistically significant. (11). When the effect of age on Sella Turcica size was studied, the linear dimensions of Sella Turcica compared between the age groups (length & anterior –posterior depth in mm) were not found to be statistically significant ($p>0.05$), while comparing the depth in mm between age groups was statistically significant (p 0.0001). The same result was reported in another study when compared with age; there were significant differences between the older and the younger age groups ($P < 0.01$) [12].

The linear dimensions of Sella Turcica (length, depth and anterior-posterior depth) were compared according to gender and all three dimensions did not show any statistically significant difference ($p>0.05$) between males and females. Another study comparing linear dimensions of Sella Turcica between genders reported that no significant differences between females and males in terms of length, depth, or diameter size could be found, for all three linear dimensions. It was noted that Sella Turcica in the older group was consistently larger than that in the younger age group [12].

Consistent with other studies (2, 24), the participants of this research relied mostly on pharmacists to obtain information about drugs to self-medicate. On the contrary, only 8% of self-medicated students in a Pakistani study got the necessary information from pharmacists while the majority relied on media (7). In other studies, however, students mainly used their academic knowledge to self-medicate (5, 13) which in our study was listed as the second major source of information [12].

5. CONCLUSION

The anatomy of the Sella Turcica and its surroundings is important for neurologists and neurosurgeons in their clinical assessments. This study aimed to estimate the normal variation in the shape and measurement of Sella Turcica (length, depth, antero-posterior diameter) as well as the differences among gender and age groups. There was no difference in the linear dimensions of Sella Turcica when compared between the age groups, however, there was a difference in depth between age groups which was statistically significant.

6. REFERENCES

1. Devi SV, Baburao S. Age and sex related morphology and morphometry of sellar region of sphenoid in prenatal and postnatal human cadavers. International Journal Research and Development of Health. Int J Res Dev Health. 2013; 1 (3): 141 – 8
2. Tekiner H, Acer N, Kelestimur F. Sella turcica: an anatomical, endocrinological, and historical perspective. Pituitary.2015; 18:575–578
3. Turamanlar O, Öztürk K, Horata E, Beker Acay M. Morphometric assessment of sella turcica using CT scan. Anatomy 2017; 11(1):6–11.
4. Chaitanya B, Pai KM, Chhaparwal Y. Evaluation of the effect of age, gender, and skeletal class on the dimensions of sella turcica using lateral cephalogram. Contemp Clin Dent 2018; 9:195 9.
5. Axelsson S, Storhaug K, Kjær I, "Post-natal size and morphology of the sella turcica. Longitudinal cephalometric standards for Norwegians between 6 and 21 years of age," European Journal of Orthodontics.2004; 26 (6): 597–604
6. Akhare P, Wajekar P, Shenoy U, Banerjee S, Hazare A, Karia H. The shape and size of the sella turcica in skeletal class I, II & III patients of central India population. Journal of Applied Dental and Medical Sciences. 2018; 4(2):1-7
7. Mustafa A G, Abu Ghaida J H, Mistareehi A J, Allouh M Z, Mistarihi S M. Cephalometric morphometric study of age- and gender-dependent shape patterns of the sella turcica. IJAE.2018; 123(1): 32-45
8. Magat G, Sener S O. Morphometric analysis of the sella turcica in Turkish individuals with different dentofacial skeletal patterns. Folia Morphol. 2018; 77(3): 543–550
9. Ejike C A, Anthony U, Adimchukwunaka G A. Computed Tomography Evaluation of Sella Turcica Dimensions and Relevant Anthropometric Parameters in an African Population. International Journal of Neurosurgery. 2017; 1(1): 7-11
10. Islam M, Alam MK, Yusof A, Kato I, Honda Y, Kubo K, et al. 3D CT Study of Morphological Shape and Size of Sella Turcica in Bangladeshi Population. Journal of Hard Tissue Biology. 2017; 26 (1): 1- 6.
11. Kumar TS, Govindraju P. Relationship between the morphological variation of sella turcica with age and gender: A digital radiographic study. J Indian Acad Oral Med Radiol 2017; 29:164 9
12. 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: (457-463).

©2021 Unuiversity of Benghazi. All rights reserved. ISSN:Online 2790-1637, Print 2790-1629; National Library of Libya, Legal number : 154/2018