Acta Scientiarum
http://periodicos.uem.br/ojs
ISSN on-line: 1807-8648
https://doi.org/10.4025/actascihealthsci.v48i1.75058

Morphometric evaluation of the sella turcica relating to age, sex and facial skeletal pattern: a cross-sectional comparative study of cone beam computed tomography

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ABSTRACT. The aim of this study was to measure and evaluate the morphology of the sella turcica (ST) using CBCT and relate the data obtained with the facial skeletal pattern (Classes I, II and III), sex and age of the individuals. Measurements of length, depth, diameter, length of the anterior cranial base length and ST volume were collected. The ST bridge was evaluated according to the relationship between length and anteroposterior diameter, following the Leonardi standard as type 1 (no calcification), type 2 (partial calcification) and type 3 (complete calcification). The sample consisted of 180 individuals, divided according to age group, sex and facial skeletal pattern. The results showed that measurements of length, depth, diameter, volume and anterior cranial base are greater in males ($p<0.001$). Individuals under 40 years of age had larger ST length and anterior cranial base measurements ($p<0.038$ and $p<0.032$, respectively). Individuals with a class I facial skeletal pattern had a larger length and diameter than those in class II and a larger anterior cranial base than those in class III ($p<0.031$, $p<0.012$ and $p<0.014$, respectively). There was a statistically significant difference for variant ST formats (irregular and pyramidal) for females and individuals over 40 years old ($p = 0.003$ and $p<0.001$ respectively). ST morphology and morphometry can be influenced by factors such as sex, age and facial skeletal patterns.

Keywords: Anatomy; Cone beam computed tomography; Cephalometry; Sella turcica.

Received on December 20, 2024.
Accepted on July 14, 2025.

Introduction

The sella turcica (ST) is an anatomical structure composed of the anterior wall (tuberculum sellae), the pituitary fossa, and the posterior wall (dorsum sellae), responsible for housing the pituitary gland (Muhammed et al., 2020; Önal et al., 2023). Its development occurs over several stages of life, beginning during embryonic development from the sphenoid bone and continuing postnatally, influenced by pituitary gland expansion and cranial bone growth (Sathyanarayana et al., 2013). Recently, the ST has gained prominence due to its diagnostic and management implications in systemic conditions (Önal et al., 2023). Multidisciplinary studies on the ST have revealed its involvement in infections, pituitary pathologies, genetic syndromes, brain malformations, and occlusal changes, ranging from moderate to severe (Sathyanarayana et al., 2023).

In dentistry, the ST is particularly significant for cephalometric tracings, where its central landmark, the sella point (S), is crucial for evaluating craniofacial growth and intermaxillary relationships (Axelsson et al., 2004; Seifeldin et al., 2023). These evaluations have a direct impact on clinical interventions, such as orthognathic surgeries and orthodontic treatments (Al-Mohana et al., 2022). Furthermore, the morphology of the ST has been linked to pathological conditions or anatomical variations in the pituitary gland, enabling early diagnoses (Al-Mohana et al., 2022).

Morphological variations of the ST are widely reported in the literature and include differences in size and shape influenced by physiological aging and craniofacial growth disorders (Leonardi et al., 2006; Al-Mohana et al., 2022). One notable variation is the ST bridge, characterized by the fusion of the anterior and posterior clinoid processes and ossification of the interclinoid ligament, which occurs in 3% to 13% of individuals without associated anomalies, syndromes, or pathologies (Al-Mohana et al., 2022). Hereditary conditions, such as dental changes, skeletal class III(Al-Mohana et al., 2022), tooth agenesis (Chilton et al., 1983), and canine impaction (Mozlemzadeh et al., 2016; Gibelli et al., 2018; Chou et al., 2021), have also been associated with ST morphology, highlighting its importance for diagnosis and intervention (Ali et al., 2014).

Morphological changes, such as an ST bridge have been linked to agenesis of the lower second premolar (Alkofide, 2008), while variations in ST morphology, such as reduced dimensions and volumes, have been associated with cleft lip and palate (Omastova et al., 2023). These findings suggest a strong intrinsic connection between the ST and craniofacial development, though the biological mechanisms underlying these associations remain underexplored (Seifeldin et al., 2023).

In orthodontics and dentofacial orthopedics, understanding the relationship between ST dimensions and skeletal patterns has become increasingly relevant. However, the association between ST characteristics and the length of the anterior cranial base remains unclear, despite its potential to predict craniofacial growth trends (Korayem & Alkofide, 2015).

Historically, ST morphology was analyzed using two-dimensional (2D) cephalometry, which limited structural comprehension (Chou et al., 2021) due to superimposition. Advances in cone beam computed tomography (CBCT) now enable precise three-dimensional (3D) evaluations (Bavbek & Avan, 2021), offering higher resolution, reduced radiation doses, and more detailed visualization without superimposition (Jones et al., 2005), in comparison to helical tomography. These advances have improved the diagnosis of systemic pathologies and enhanced the understanding of craniofacial structures.

Notably, studies have indicated that nearly 50% of pediatric patients with malocclusions exhibit ST changes, suggesting a systemic etiological relationship with these discrepancies (Ortega-Balderas et al., 2022). Furthermore, CBCT studies have clarified some associations, including the link between ST variations and impaction of maxillary canines (Ali et al., 2014). However, data on the morphology and average dimensions of the ST in Brazilian individuals remain scarce.

Therefore, this study aims to measure and evaluate the morphology of ST using CBCT, to relate the findings to facial skeletal patterns (classes I, II and III), sex and age of the individuals, in addition to measuring the anterior cranial base, through the sella-nasion line (SN), in order to identify possible relationships between these factors. The null hypothesis is that there is no association between the measured structures and ST morphology and sex, age or facial skeletal patterns.

Materials and methods

Ethics committee and nature of the study

This is a retrospective study, approved by an Ethics Committee of a public university in Brazil. As this was a documentary study, the informed consent form (ICF) was waived for individuals who met the inclusion criteria. The work was conducted in accordance with the standards of the Declaration of Helsinki (1964).

CBCT scans

The CBCT scans were obtained using the i-CAT Next Generation equipment (Imaging Sciences International, Hatfield, PA, USA) with a300 μm isometric voxel size, FOV (Field of View) of 17 × 23 cm, 14-bit grayscale and0.5 mm focal spot. The following parameters were used for all patients: tube voltage 120 kVp, tube current adjustable between 3 and 8 mA.

CBCT analysis

The CBCT scans used in this study were obtained from anonymous Brazilian patients referred to a university dental clinic. This study included CBCT scans performed based on recommendations from professionals, from different areas of dentistry, to proceed with their respective dental treatments.

The size of the ST was determined by the following measurements obtained in the median sagittal plane: length from the tip of the dorsum sellae to the tip of the tuberculum sellae; depth of the ST formed by a line perpendicular to the first line to the deepest point of the ST and diameter formed by the greatest distance between the tuberculum sellae and the lowest posterior point of the fossa (Figure 1) (Silveira et al., 2020). The ST morphology was evaluated according to Axelsson et al. (2004), who established six types: normal sella turcica, oblique anterior wall, double contour of the floor, bridge of the sella turcica, irregularity in the posterior portion of the sella and pyramidal shape of the back of the sella (Axelsson et al., 2004; Poorsoleiman et al., 2024). The ST volume was obtained using the formula (in mm^3): V (volume) = (depth × length × diameter) × 0.5 (Ortega-Balderas et al., 2022). Theanterior cranial base, represented by the SN line, was also measured.

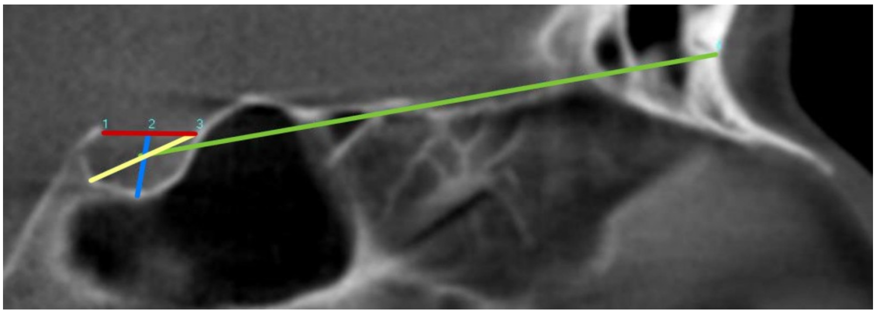

Figure 1. Linear dimensions in normal ST. ST length (red); ST depth (blue); ST diameter (yellow); Line of the anterior base of the skull (green).

From a total of 3475 tomography scans performed between 2014 and 2023, 180 patients were selected to be part of the sample (Chilton et al., 1983). The sample was divided according to sex and age into four groups: male and female individuals aged less than 40 years, and those aged over 40 years. Additionally, they were subdivided according to their facial skeletal classification into Class I (0º <ANB <4º), Class II (ANB ⩾ 4º) and Class III (ANB ⩽ 0º).

Thus, the sample totaled 180 patients, divided into 12 groups with 15 patients each (Lobo et al., 2019). Patients undergoing orthognathic surgery, those with pathologies and artifacts that compromise the analysis and patients under 18 years of age were excluded from the sample, as craniofacial maturation does not stabilize until early adulthood (Afrand et al., 2014).

The tomography scans were analyzed with the tomograph's proprietary software (Xoran version 3.1.62; Xoran Technologies, Ann Arbor, MI, USA) in a dark and quiet room. For calibration, 20 tomography scans were evaluated. All CBCT scans used for calibration came from the same database and were discarded from the total sample. Two independent examiners evaluated the sample.

The analysis of the CT scans used the work of Silveira et al. (2020) as reference. The morphology and reference lines used to measure the size of the ST were made in the patient's median sagittal plane (Silveira et al., 2020). The morphology of ST was classified as normal and variant. The variant category includes the following variations: bridge of the ST, double contour of the floor, irregular shape of the sella turcica, pyramidal shape of the dorsum sellae and oblique anterior wall (Figure 2), according to Axelsson et al. (2004) and Sathyanarayana et al. (2013).

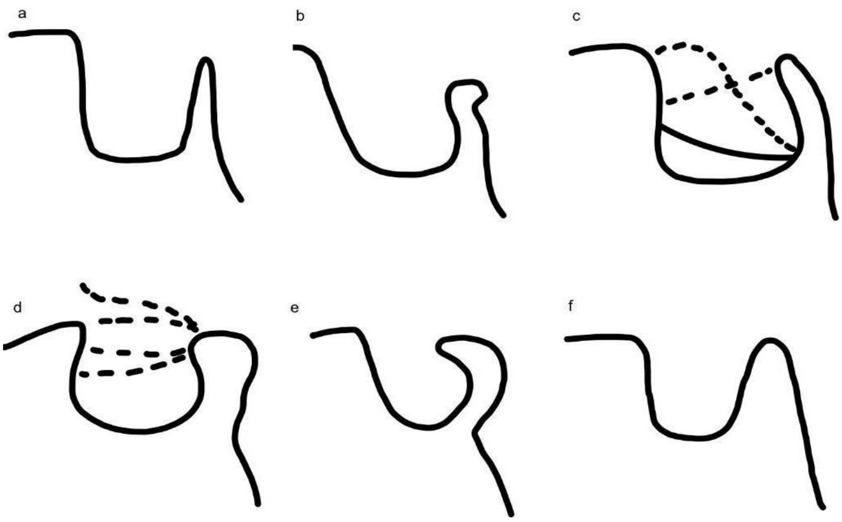

Figure 2. Variations in ST morphology. (a) Normal morphology; (b) ST Bridge; (c) Double contour of the floor; (d) Irregularity in the posterior portion; (e) Pyramidal shape of the back of the saddle; (f) Oblique anterior wall.

The ST bridge was evaluated depending on the relationship between the length and the anteroposterior (AP) diameter in line with the Leonardi standard (Leonardi et al., 2006) in:

- Type I (no calcification): ST length >75% of the AP diameter of the ST.
- Type II (partial calcification): ST length ⩽ 75% of the AP diameter of the ST. This appears as an extension without fusion of the anterior and posterior clinoid processes.
- Type III (complete calcification): fusion between the anterior and posterior processes, diaphragm sellaedetectable radiographically.

Statistical analysis

A database for qualitative and quantitative variables was organized enabling tabulation and statistical analysis. All statistical procedures were performed using the Bioestat 5.3 statistical program (Instituto Mamirauá, Pará, Brazil). Initially, a descriptive statistical analysis was carried out to obtain absolute and relative frequencies.

The Intraclass Correlation Coefficient (ICC) was used to evaluate inter-observer and intra-observer agreement. To evaluate the Gaussian distribution of the data, the Shapiro-Wilk test was performed. The T test was applied for independent variables, between sexes and ages, analysis of variance (ANOVA) for facial skeletal classes with Tukey's post-test and the chi-square or Fisher's exact test for comparing shape and form parameters. Type of ST bridge with sex, age and facial skeletal patterns.

Results

Sample characterization and correlation test

For this study, 180 patients were evaluated, 50% (n = 90) female and 50% (n = 90) male. The average age of the sample was 38.21 years (standard deviation ± 14.54); ranging from 18 to 91 years. Using the intraclass correlation coefficient (ICC), it was observed that the null hypothesis that inter-examiner agreement is purely random was rejected in all variables under study (p-value < 0.001), that is, agreement inter-examiner and intra-examiner were satisfied, noting that the coefficients varied from 0.89 to 0.98 indicating excellent reliability and reproducibility.

Analysis of the measurements studied

In Table 1, when comparing measurements between the sexes. A statistically significant difference was observed for all variables, with males exhibiting higher values than females, except for the depth measurement.

Table 1. Relationship of the measures studied between males and females presented with mean (±standard deviation) and application of the *t*-test.

Measurements	Sex	N	Mean	DP ±	P-value*
Length (mm)	M	90	10.107	1.936	<0.001*
	F	90	9.132	1.581	
Diameter (mm)	M	90	11.912	1.412	0.003*
	F	90	11.133	1.579	
Depth (mm)	M	90	7.628	1.036	0.270
	F	90	7.527	1.170	
Volume (mm³)	M	90	0.449	0.122	0.0007*
	F	90	0.391	0.118	
Base (mm)	M	90	69.386	3.656	<0.001*
	F	90	64.317	3.307	

Independent T-student Test; M (male), F (female), SD (standard deviation). *Statistically significant for p<0.05.

When comparing the measurements by age group, most values were higher in individuals under 40 years of age. However, with statistically significant results found for the measurements of length and anterior base of the skull (p = 0.038 and p = 0.032 respectively), these values being higher.

The correlation analysis between the measurements and chronological age showed no statistically significant associations, except for the anterior cranial base. When evaluating the correlations among the measurements themselves, a weak positive correlation was observed between variables.

Table 2 presents the comparison of measurements with facial skeletal classes, where it is possible to observe the existence of a statistically significant difference between length and diameter of the ST for Classes I and II (p = 0.031 and p = 0.012) and anterior base of the skull for Classes I and III (p = 0.014).

When compared, the shape and type of ST bridge with sex and age, the normal form was predominant. However, in females and in individuals over 40 years of age, a large number (n = 31) of the shape classified as variant (oblique anterior wall, double contour of the floor, bridge of the ST, irregularity in the posterior portion of the sella and pyramidal shape of the back of the sella), these being statistically significant (p = 0.008 for both) (Table 3).

Table 2. Comparison of the measurements studied across the facial skeletal patterns presented with mean (± SD) and application of the ANOVA test.

Measurements	Class I		Class II		Class III		P-value*
	Mean	SD	Mean	SD	Mean	SD	
Length (mm)	9.306A	1.795	10.069B	1.507	9.473AB	2.028	0.031*
Diameter (mm)	11.103A	1.847	11.930B	1.250	11.535AB	1.382	0.012*
Depth (mm)	7.791A	1.090	7.431A	0.949	7.511A	1.236	0.170
Volume (mm³)	0.403A	0.144	0.438A	0.094	0.418A	0.126	0.300
Base (mm)	67.396A	4.541	67.611A	3.165	65.549AB	4.466	0.014*

ANOVA test; SD (Standard Deviation). *Statistically significant. Tukey's test – Different letter indicates statistically significant difference between class for p < 0.05.

Table 3. Descriptive analysis with comparison of parameters of the shape and type of ST bridge with sex and age and application of Chi Square or Fisher's Exact Test.

Shape	Sex		Total n (%)	P-value*
	Male n (%)	Female n (%)		
Normal	74 (82.22)	59 (65.55)	133 (73.88)	0.008*
Variant	16 (17.77)	31 (34.44)	47 (26.12)	
P-value*	<0.001*	0.003*	180 (100)	
Shape	Age		Total n (%)	P-value*
	18-40	>40		
Normal	74 (82.22)	59 (65.55)	133 (73.88)	0.008*
Variant	16 (17.77)	31 (34.44)	47 (26.12)	
P-value*	<0.001*	0.003*	180 (100)	
Bridge	Sex		Total n (%)	P-value**
	Male n (%)	Female n (%)		
Type I	88 (97.67)	89 (98.88)	177 (98.33)	0.560
Types II e III	2 (2.22)	1 (1.12)	3 (1.66)	
P-value**	<0.001**	<0.001**	180 (100)	
Bridge	Age		Total n (%)	P-value**
	18-40	>40		
Type I	89 (98.88)	88 (97.67)	177 (98.33)	0.560
Types II e III	1 (1.12)	2 (2.22)	3 (1.66)	
P-value**	<0.001**	<0.001**	180 (100)	

*Chi-square; *statistically significant to p<0.05. **Fisher's exact test, ** statistically significant to p<0.05.

Type I was the most common classification of the ST bridge. However, no statistically significant differences were found between sexes (p = 0.560) or age groups (p = 0.560). Similarly, there were no significant associations between ST shape or type and facial skeletal classes (Table 4).

Table 4. Descriptive analysis with comparison of parameters of the shape and type of ST bridge with facial skeletal class and application of Chi Square or Fisher's Exact Test.

Shape	Class I n (%)	Class II n (%)	Class III n (%)	Total n (%)	P-value*
Normal	45 (75)	45 (75)	43 (71.66)	133 (73.88)	0.583
Variant	15 (25)	15 (25)	17 (28.33)	47 (26.12)	
P-value	<0.001*	<0.001*	<0.001*	180 (100)	
Bridge	Class I n (%)	Class II n (%)	Class III n (%)	Total n (%)	P-value**
Type I	59 (98.33)	59 (98.33)	59 (98.33)	177(98,33)	0.752
Types II e III	1 (1,66)	1 (1,66)	1 (1,66)	3 (1,66)	
P-value**	<0.001**	<0.001**	<0.001**	180 (100)	

*Chi-square; *statistically signifficant to p<0.05. **Fisher's exact test; **Statistically signifficant to p<0.05. Independent T-student Test; SD (standard deviation).

In Table 5, when checking whether there is any statistically significant difference between the measurements studied and the forms of ST, it is observed that ST classified as normal presents statistically significant depth and anterior cranial base measurements (p = 0.046 and p = 0.002) larger than forms classified as 'variant'.In contrast, when comparing these same measurements with the type of ST bridge, the only statistically significant measurement was for the diameter, which was larger for the ST bridge, classified as type I.

Table 5. Descriptive analysis with comparison between the measurements studied, the shape and the type of bridge and application of the Independent T Test.

Measurements	Shape	n (%)	Mean	SD ±	p-value*
Length (mm)	Normal	133 (73.88)	9.696	1.895	0.144
	Variant	47 (26.11)	9.394	1.571	
Diameter (mm)	Normal	133 (73.88)	11.628	1.508	0.060
	Variant	47 (26.11)	11.223	1.620	
Depth (mm)	Normal	133 (73.88)	7.660	1.113	0.046*
	Variant	47 (26.11)	7.344	1.050	
Volume (mm³)	Normal	133 (73.88)	0.429	0.124	0.058
	Variant	47 (26.11)	0.396	0.117	
Base (mm)	Normal	133 (73.88)	67.384	4.255	0.002*
	Variant	47 (26.11)	65.318	4.115	
Measurements	Bridge	n (%)	Mean	SD ±	p-value*
Length (mm)	I	177 (98.33)	9.635	1.823	0.133
	II e III	3 (1.66)	8.55	0.887	
Diameter (mm)	I	177 (98.33)	11.548	1.542	0.043*
	II e III	3 (1.66)	10.006	0.777	
Depth (mm)	I	177 (98.33)	7.571	1.111	0.276
	II e III	3 (1.66)	7.953	0.262	
Volume (mm³)	I	177 (98.33)	0.422	0.122	0.070
	II e III	3 (1.66)	0.316	0.187	
Base (mm)	I	177 (98.33)	66.823	4.304	0.249
	II e III	3 (1.66)	66.523	4.969	

Independent *t*-student Test; SD (standard deviation).*Statistically significant to p<0.05.

Discussion

In this study, the comparison of measurements between men and women showed significant differences in ST measurements between the sexes, except for depth, which were greater in men. Chou et al. (2021) also observed higher ST measurements in males. In which there, seen to be a relationship between hormonal and bone mass and bone mineral density (BMD). Although the exact relationship between sex hormones and BMD requires further investigation (Poorsoleiman et al., 2024), there is evidence of their link to the bioavailability of estradiol, testosterone, follicle-stimulating hormone, luteinizing hormone, and sex hormone-binding globulin (Poorsoleiman et al., 2024). However, some studies (Alkofide, 2001; Alkofide, 2007; Önal et al., 2023) do not reveal significant differences between the sexes. Thus, while some evidence points to a possible hormonal influence, the role of sex in determining ST dimensions remains inconclusive in the literature.

Most ST measurements were higher in individuals under 40 years old, being statistically significant for length (p = 0.038) and anterior cranial base (p = 0.032). Studies such as that by Surana et al. (2022) support this finding, reporting a decrease in ST with aging (Surana et al., 2022). Muhammed et al. (2020) and Sobuti et al. (2018) also noted a decrease in the diameter of the ST with advancing age, attributed to bone deterioration associated with aging.

Conversely, this study's results differ from those Chou et al. (2021) and Önal et al. (2023) who found no relationship between age and measurements of the sella turcica, while Yasa et al. (2017) showed that diameter, depth and length vary significantly with age, being greater in older individuals. These divergences can perhaps be explained due to differences in the age of the sample, ethnicity and methodology used, requiring further investigation.

Regarding morphological variations, Gibelli et al. (2018) reported a decrease in morphological variants with advancing age, differing from what was observed in this study, which may be due to specific characteristics of the population studied, as the structure of ST may vary between different ethnic groups (Magat & Sener, 2018). As demonstrated by Muhammed et al. (2020), who found differences in the linear dimensions of the length and diameter of the ST between Chinese and Nepalese. The ethnic diversity of Brazil suggests that ancestry can influence clinical results and the interpretation of radiographic exams, highlighting the need for new studies in different population groups.

The relationship between skeletal patterns and ST dimensions is still unclear in the current literature (Muhammed et al., 2020). When analyzing this relationship, statistically significant differences were found in the length and diameter of the ST between Classes I and II (p = 0.031 and p = 0.012) and in the anterior base of the skull between Classes I, II in relation to Class III (p = 0.014). Notably, Class II patients consistently exhibited larger dimensions across all three parameters. Thesefindings suggest that individuals with a greater length and diameter of the ST tend to present a more convex facial profile, while a reduced anterior cranial base length may be associated with a concave profile. However, these results contrast with previous studies (Sobuti et al., 2018; Magat & Sener, 2018; Chou et al., 2021) that found no significant difference between the dimensions of ST.

However, Valizadeh et al. (2015) reported that the length of the ST in class III patients was greater than in those in Class I and II, while the diameter and depth remained the same in all three groups. Alkofide (2007) and Sathyanarayana et al. (2013) reported a significant relationship in ST diameter between Class II or III skeletal patterns, with Class II patients showing smaller diameters. Moslemzadeh et al. (2016) reported a significant difference between Class I and Class III patients regarding the length of the ST, with the length being greater in Class III.

The shape of the ST was predominantly normal in this South Brazilian population, like some studies (Alkofide, 2007; Sathyanarayana et al., 2013) both for sex, age and facial skeletal classes. There was a statistically significant difference between the sexes, with a predominance of males (p = 0.008). The normal form presented significantly greater depth and anterior base of the skull compared to the forms classified as 'variant' (p = 0.046 and p = 0.002 respectively). Differing from Al-Mohana et al. (2022), who did not detect significant differences in ST morphology between genders, age groups or skeletal patterns[6].

These results are consistent with previous studies that did not find significant differences between the morphology of ST and age, facial skeletal patterns with a predominance of the normal shape (Alkofide, 2007; Surana et al., 2022). However, some authors state that the shape of the ST is associated with facial skeletal patterns and that the posterior clinoid process and bridges of the ST are related to the individual's vertical growth tendency. This may aid in the diagnosis and early interventions of dolichofacial patients (Yan et al., 2023).

The ST bridge is a common morphological variation and may be considered a developmental anomaly (Valizadeh et al., 2015). The prevalence, as a normal anatomical variation, varies from 5.5% to 22% (Kantor, & Norton, 1987; Jones et al., 2005). However, it is reported more frequently in patients with craniofacial problems (Becktor et al., 2000). In the present study, the prevalence was 1.66%, like Alkofide's work, which found a prevalence of 1.1% (Alkofide et al., 2007). The predominant type of ST bridge was type I (without calcification), with no statistical differences in relation to sex, age or facial skeletal class. The prevalence of ST bridging was considered lower (1.66%) in the present study compared to the studies by Valizadeh et al. (2015) and Sobuti et al. (2018). This difference may be due to the different ethnicities of the groups studied. However, the type I bridge had a larger anteroposterior diameter, which was statistically significant (p = 0.043).

In the present study, a relationship between the facial skeletal pattern and types II and III ST bridges was not detected. Al-Mohana et al. (2022) also found no statistically significant differences between the ST bridges and the facial skeletal pattern. Chou et al. (2021) found a higher prevalence of type III bridges in class III patients, although not statistically significant. Seifeldin et al. (2023) revealed in their work the absence of any correlation between ST bridging and malocclusion in the transverse plane, contradicting Deniz and Arslan (2021) who reported a higher incidence of ST bridging in patients with transverse maxillary deficiency.

All results suggest that ST morphology and dimensions can be related to factors such as sex, age and facial skeletal patterns. CBCT has proven to be a valuable tool for an accurate three-dimensional assessment of ST, allowing a better understanding of its morphological variations and their clinical implications. The detailed assessment of the morphology of the ST provides dental professionals with a valuable tool for more detailed diagnoses and planning, especially in orthodontics and orthognathic surgeries. Understanding the anatomical variations and growth patterns associated with the sella can aid in predicting craniofacial development, allowing for personalized treatment adjustments. Studies like this contribute to identifying anatomical factors that can influence dental alignment and facial growth, facilitating early diagnosis and more effective interventions. The study results also suggest potential associations between the analyzed variables and craniofacial development. Future research should consider longitudinal studies that address interindividual variations and the impact of growth factors. Additionally, the integration of artificial intelligence (AI) holds promising potential for future studies, both to refine the diagnosis and to assist in predicting craniofacial growth patterns.

Although this study has limitations, such as ethnic diversity, sample size, and the fact that the individuals included in this study were not from the general population but from a university dental clinic, there may be some inherent bias, it nonetheless contributes to a deeper understanding of ST and its clinical implications. Future studies with larger samples should explore the relationship of ST morphology with different ethnic and geographic populations to generalize these findings.Additionally,this study included only individuals over the age of 18, which limits the ability to assess ST morphology in children and adolescents. Longitudinal studies can provide a deeper understanding of the morphological changes in the studied structure over time and their implications for the planning and outcome of clinical interventions in orthodontics and other areas of medicine.

Conclusion

The measurements and evaluations conducted in this study reveal that men tend to exhibit higher ST measurements than women. Individuals under the age of 40 demonstrated greater ST length and anterior cranial base measurements.Significant variations were also observed among facial skeletal classes: Class I has a greater length and diameter of the ST compared to class II, and the anterior skull base is larger in class I than in class III. The normalmorphology of the ST was the most prevalent, especially among male and younger individuals, with type I bridge (non-calcified) being themost frequently observed variant. These findings suggest a relationship between these variables, requiring further studies to consolidate it.Moreover, the results underscore the relevance of ST in craniofacial and orthodontic assessments within dental practice, particularly in supporting early diagnosis of associated pathologies.

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