

The Sella Turcica: A Frontier in Dental Diagnosis

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Abstract

The Sella turcica is an important landmark in cephalometric that also serves as a diagnostic indicator in dentistry. Variations in its size and morphology are linked to disturbances in craniofacial development and are often associated with orofacial syndromes such as cleft lip and palate, Williams syndrome, and craniofacial dysostosis. Radiographic evaluation of the Sella region allows early recognition of these conditions. Thus, the Sella turcica represents a valuable frontier in dental diagnosis, bridging radiology with syndromic craniofacial assessment.



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Introduction

The Sella turcica is a saddle-shaped depression in the sphenoid bone that encloses the pituitary gland within the hypophyseal fossa¹ [Fig 1]. It serves as a crucial cephalometric landmark in orthodontics and craniofacial growth evaluation, easily identifiable on lateral cephalograms. Its morphology, size, and variations provide information about skeletal development, craniofacial anomalies, and pituitary pathologies.



Fig 1: Lateral cephalogram showing saddle shaped Sella turcica

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Methodology

A literature search was conducted in PubMed, Scopus, and Google Scholar using keywords such as “Sella turcica morphology,” “dental diagnosis,” “orthodontics,” and “craniofacial anomalies.” English-language human studies relevant to dental or orthodontic diagnosis were included. Titles and abstracts were screened, followed by full-text review, incorporated into the detailed analysis.

Embryological Significance

The Sella turcica region is crucial for the migration of neural crest cells, which move toward the frontonasal and maxillary developmental fields, thereby contributing to midfacial and craniofacial growth.² The Sella turcica develops in close coordination with the growth of the pituitary gland. Any disturbances in pituitary development may manifest as abnormalities in the Sella turcica morphology.³

Anatomical Features

Sella is located within the body of the sphenoid bone and is bounded anteriorly by the tuberculum sellae, posteriorly by the dorsum sellae, and inferiorly by the pituitary fossa. Its contents include the pituitary gland along with associated vascular and meningeal structures.⁴

Morphological Variations

The Sella turcica exhibits considerable variation in shape and has been classified according to its radiographic appearance. The commonly recognized forms include circular, oval, flat or shallow, J-shaped, and irregular types, such as notching, bridging, oblique anterior wall, double contour of the floor, and pyramidal dorsum sellae.¹

Clinical and Pathological Associations

The size and morphology of the Sella turcica hold significant clinical and pathological relevance, especially concerning the pituitary gland and craniofacial growth. As the pituitary gland resides within the Sella turcica, abnormalities of this gland often present as changes in its dimensions. An enlarged Sella turcica is often associated with conditions like pituitary adenomas, Rathke’s cleft cysts, and intracranial aneurysms, while a reduction in size may occur in hypopituitarism, growth hormone deficiency, or pituitary necrosis. In addition to

endocrine disorders, numerous studies have highlighted a strong association between abnormal Sella turcica morphology and a range of craniofacial syndromes and anomalies, such as Williams syndrome, Down syndrome, osteogenesis imperfecta, Cri-du-chat syndrome, trisomy 18, Fragile X syndrome, Axenfeld–Rieger syndrome and cleft lip and palate. These findings highlight the significance of radiographic evaluation of the Sella turcica as a diagnostic marker in paediatric patients with syndromic presentations. In addition, deviations in Sella turcica morphology have been linked with dental anomalies, particularly disturbances in tooth number, shape, and eruption pattern, further emphasizing its clinical importance in orthodontics and paediatric dentistry.⁵

Radiographic Importance in Orthodontics

Clearly visible on lateral cephalometric radiographs. Serves as a stable reference point (S-point) in cephalometric analyses.

Used in: Sella–Nasion plane (SN plane): essential in evaluating maxillary and mandibular position. Growth prediction studies. Assessment of skeletal and craniofacial anomalies.⁶

Significance of Sella Turcica

The Sella turcica serves as an important landmark in the fields Paediatric dentistry and orthodontics due to its role as a stable cranial base reference point for cephalometric analysis. Positioned at the centre of the cranial base, it provides a reliable landmark for assessing the anteroposterior and vertical relationships of the jaws. Its evaluation is crucial in determining the growth direction and magnitude of the maxilla and mandible, thereby aiding in treatment planning and growth prediction. Variations in the morphology of the Sella turcica have been shown to correlate with skeletal malocclusions as well as with several craniofacial syndromes, making it an important diagnostic marker.⁷ In paediatric and syndromic patients, where early detection of anomalies is essential for comprehensive management, the radiographic study of the Sella turcica serves as a valuable diagnostic tool, contributing significantly to both orthodontic evaluation and interdisciplinary care.⁸

Abnormal Morphologies of Sella Turcica and their Association with Craniofacial Syndromes

The Sella turcica morphology has been shown to exhibit distinct variations in both normal individuals and patients with craniofacial anomalies. Radiographic assessment of the Sella turcica not only provides information about skeletal and pituitary development but also assists in diagnosing certain craniofacial syndromes.

Several studies, including those by Axelsson *et al.* (2004), Kucia *et al.* (2010), and Sathyanarayana

et al. (2013), have highlighted a strong association between abnormal Sella turcica shapes and craniofacial syndromes. The following morphological deviations are of clinical significance.

Oblique Anterior Wall – Down Syndrome

Patients with Down syndrome often present with an obliquely angled anterior wall of the Sella turcica [Fig 2]. This morphological change is linked with midfacial hypoplasia and altered cranial base growth patterns commonly observed in these individuals.⁹

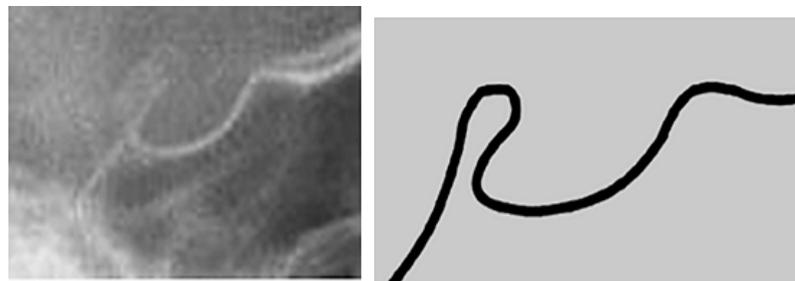


Fig 2: Image showing oblique anterior wall of Sella

Sella Turcica Bridge – Axenfeld-Rieger Syndrome

A Sella turcica bridge [Fig 3], results from ossification connecting the anterior and posterior clinoid

processes., is frequently associated with Axenfeld-Rieger syndrome. This syndrome affects ocular, dental, and craniofacial development.¹⁰

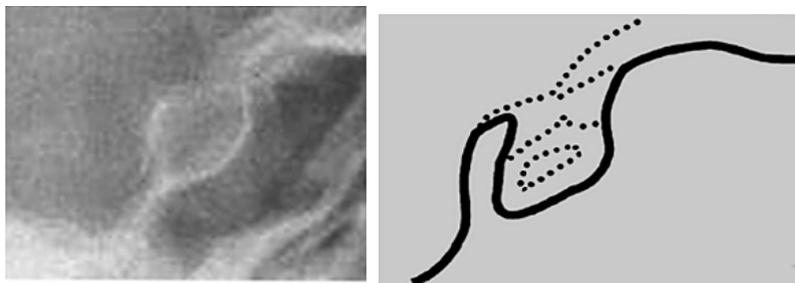


Fig 3: Image showing Sella Turcica Bridge

Irregular Posterior Wall – Apert Syndrome

Apert syndrome, characterized by craniosynostosis and midface hypoplasia, often exhibits an irregular posterior contour of the Sella turcica [Fig 4]. This reflects the disturbed cranial base remodelling process seen in syndromic craniosynostosis.¹¹

Pyramidal Shape – Crouzon Syndrome

A pyramidal configuration of the Sella turcica has been seen in individual with Crouzon syndrome, another craniosynostosis disorder [Fig 5]. This reflects abnormal growth at the Spheno-occipital synchondrosis and distorted cranial base architecture.¹¹

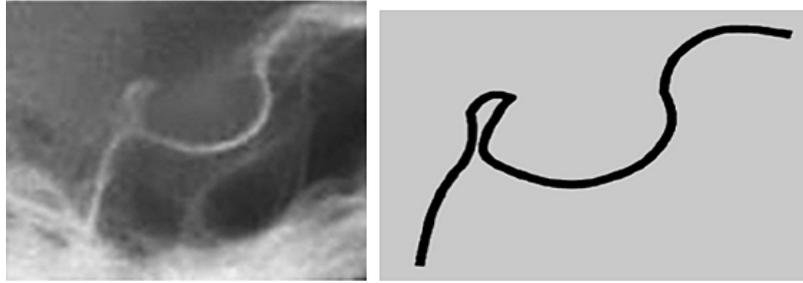


Fig 4: Image showing Irregular Posterior Wall of Sella

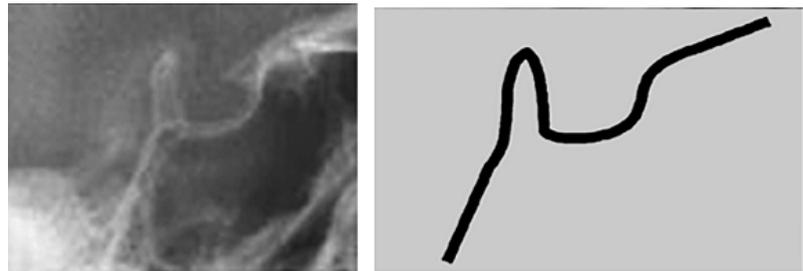


Fig 5: Image showing pyramidal shaped Sella

Hutchinson-Gilford Progeria Syndrome

In Hutchinson-Gilford syndrome/ Progeria, the Sella turcica may exhibit a J-shaped configuration [Fig 6],

likely reflect premature skeletal maturation and alter cranial base development.¹²

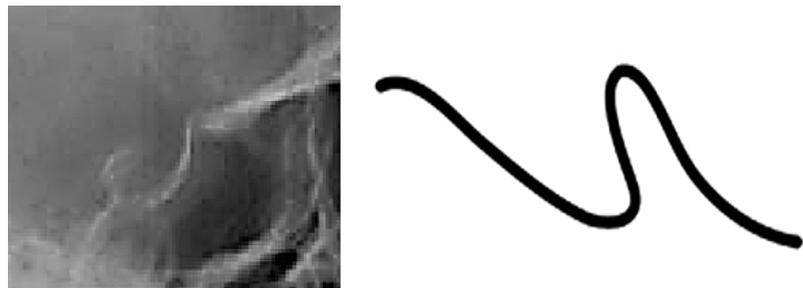


Fig 6 : Image showing J-shaped Sella

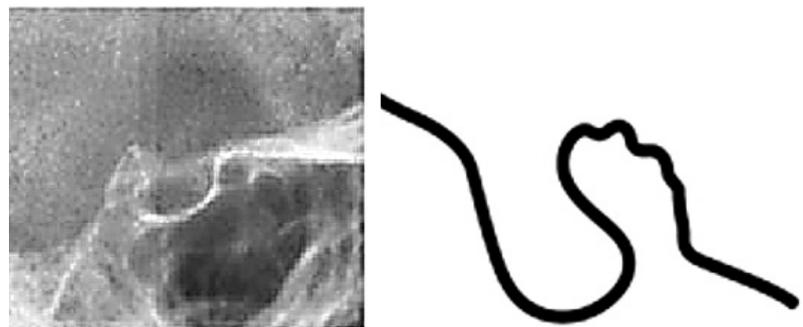


Fig 7: image showing uneven contour of clivus

Uneven Contour of Clivus – Cri-du-Chat Syndrome

Individuals with Cri-du-Chat syndrome have been observed to show an uneven contour of the clivus and Sella floor [Fig 7], consistent with generalized craniofacial dysmorphism.¹³

Clinical Implications

The identification of these abnormal Sella turcica morphologies on routine lateral cephalograms can aid orthodontists in the early recognition of underlying syndromes. Since many of these conditions have dental anomalies and growth disturbances, knowledge of these radiographic markers is vital for treatment planning and interdisciplinary care. Thus, Sella turcica serves not only as a cephalometric landmark but also as a diagnostic indicator of craniofacial syndromes.¹¹

Conclusion

The Sella turcica is not only a key anatomical structure but also a diagnostic window into pituitary health and craniofacial development. Its morphology offers insights into skeletal discrepancies, craniofacial syndromes, and pituitary pathologies. For orthodontists, it remains a fundamental cephalometric landmark for growth assessment, diagnosis, and treatment planning.

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This research did not involve human participants, animal subjects, or any material that requires ethical approval.

Informed Consent Statement

This study did not involve human participants, and therefore, informed consent was not required.

Clinical Trial Registration

This research does not involve any clinical trials.

Author Contributions

- **Nidhi Jayaprakash Shetty**: Conceptualization, methodology, writing – Original Draft.
- **Shri Kavya Anand**: Analysis, review & Editing.
- **Sandhya Prabha, Sanjana Aniyoor, Harshitha C Suresh**: Review & Editing.
- **Amitha H Anand**: Visualization, supervision and final approval of the manuscript.

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