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Bilateral shovel shaped maxillary central incisors in a non-syndromic adult: a distinct morphological presentation *

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Abstract

Shovel-shaped incisors represent a distinct morphological variation of permanent maxillary teeth characterized by prominent marginal ridges enclosing a deep lingual fossa. Although shovel shaped incisors are commonly observed as a population related morphological trait, particularly in Asian groups, their occurrence as a well-expressed (Type 3), bilateral form involving maxillary central incisors in a non-syndromic individual is less frequently documented in clinical literature. This report describes a case of bilateral shovel-shaped permanent maxillary central incisors in a 56-year-old medically healthy female who presented for routine dental examination. Clinical intraoral assessment revealed pronounced lingual marginal ridges and a deep lingual fossa in both maxillary central incisors. The morphological findings were confirmed using die stone cast models, traced diagrams, and intraoral periapical radiography, which demonstrated normal root morphology and periapical status. No additional dental anomalies or systemic associations were identified. Although typically asymptomatic, shovel-shaped incisors may predispose individuals to plaque accumulation, dental caries, occlusal disturbances, and esthetic concerns. Accurate recognition of this morphological trait is important for preventive and restorative dental care and holds significance in dental anthropology and forensic identification.

Keywords: tooth abnormalities; dental morphology; incisor; maxilla; forensic dentistry

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Introduction

Human dentition may exhibit several differences in morphological features. These variations may appear on the crown as anomalous cusps or other distinct anatomical forms and can affect a single tooth, multiple teeth, or the entire dentition (1,2). When present alongside other anomalies, such features are often associated with syndromes involving multisystemic variations and chromosomal aberrations (3).

Shovel-shaped incisors were first reported by Mühlreiter in 1870 (4). These teeth are characterized by a pronounced lingual fossa bordered by well-developed marginal ridges, resulting in a deep concavity on the palatal surface encased by a defined enamel boundary (5). While often considered a benign anatomical variant, such morphology may predispose individuals to several clinical challenges, including disturbed occlusion, plaque accumulation, dental caries, periodontitis, and even trauma to the tongue (6). In cases of pulpal involvement, endodontic therapy may be required. Sealing deep pits or invaginations is another important preventive consideration (7).

In certain cases, the pronounced morphology may also interfere with orthodontic correction, especially when increased overjet or altered crown shape is present. As a result, reshaping of marginal ridges or reconstructive procedures may be needed to restore function and aesthetics (6,7).

While shovel shaped incisors are widely recognized as a population associated morphological trait, they are also occasionally reported in association with certain syndromes when occurring alongside multiple dental anomalies. However, isolated, bilateral, and well expressed forms involving maxillary central incisors in otherwise healthy individuals remain less frequently emphasized in clinical reports.

The present case highlights such a presentation and aims to clarify its clinical relevance.

Case Presentation

A 56-year-old medically healthy female presented to a private dental clinic in Ahmedabad, Gujarat, India, for a routine dental check-up. Her medical and family histories were non-contributory, and no signs of systemic illness or syndromic features (e.g., Ellis-van Creveld syndrome, ectodermal dysplasia) were observed. The patient belonged to an Indian ethnic background, a population in which shovel shaped incisors have been reported with variable prevalence.

Intraoral examination revealed satisfactory oral hygiene and the presence of multiple crowns and fixed prostheses. Notably, both permanent maxillary central incisors exhibited prominent morphological features consistent with shoveling specifically, thick and well-defined marginal ridges encasing a deep lingual fossa. These features were clearly visualized using a custom fabricated intraoral mirror and documented with high resolution clinical photographs (Figure 1).

To confirm the morphological findings, a maxillary cast model was fabricated using die stone. (Figure 2).

Further radiographic evaluation with an intraoral periapical radiograph (IOPA) of the anterior maxilla showed normal root and periapical structures. Radiographic evidence supported the clinical observation, revealing thick marginal ridges and a relatively radiolucent lingual fossa, consistent with shovel-shaped incisor morphology (Figure 3).

There were no clinical signs of pulpal pathology, periodontal involvement, or associated anomalies. The patient reported no discomfort, sensitivity, or functional impairment. Based on clinical, radiographic, and model based assessments, and in the absence of systemic or syndromic associations, a diagnosis of bilateral shovel-shaped permanent maxillary central incisors in a non-syndromic adult female was established.

Considering the pronounced lingual morphology and potential for plaque accumulation, the patient was advised preventive measures including meticulous oral hygiene practices, with special emphasis on cleaning the palatal surfaces of the maxillary anterior teeth, along with periodic professional prophylaxis. As no carious lesions or structural defects were detected, no invasive preventive treatment such as sealant application or enameloplasty was performed. The patient was advised regular follow-up for monitoring.

Discussion

Shovel shaped incisors are considered an anatomical variation rather than a pathological anomaly. They are defined by pronounced marginal ridges encasing a deep lingual fossa, primarily affecting the maxillary central and lateral incisors (6). The term “shovel” reflects the spade-like shape formed by these features.

According to Hrdlička’s classification (9), shoveling can be graded into Type 0 (absent), Type 1 (trace), Type 2 (semi-shovel), and Type 3 (pronounced). The present case demonstrates a Type 3 expression, indicating a well developed

morphological form. This trait is more commonly observed in populations of Asian and Native American descent, while being less prevalent in African and European groups (6,8,10,11).
Several studies from the Indian subcontinent have reported a relatively high prevalence of shovel shaped incisors, although with variable expression. Nair et al. documented the presence of non metric dental traits, including shoveling, in Indian populations with regional variation (11). Despite this higher prevalence, shoveling is generally regarded as a normal morphological trait rather than a pathological or syndromic condition.
It is important to distinguish between the general prevalence of this trait and the specific features that make an individual case clinically noteworthy. While shoveling itself is relatively common in certain populations, the present case is distinguished by the combination of bilateral occurrence, involvement of maxillary central incisors (which are less commonly affected than lateral incisors), and a pronounced Type 3 expression in the absence of any associated dental anomalies or syndromic features.
Syndromic associations such as ectodermal dysplasia or Ellis–van Creveld syndrome are typically characterized by multiple dental and systemic abnormalities (2,3). The absence of such findings in the present case supports its classification as a non-syndromic morphological variation rather than a syndromic manifestation.
Ethnically, shovel shaped incisors are categorized as either “Sinodont” or “Sundadont,” terms used to describe northern and southern Asian population patterns, respectively (6,9). Studies have demonstrated a high prevalence of this trait in populations such as Eskimos, Chinese, and American Indians (7,10). Although maxillary lateral incisors are more frequently involved (6,14,15), central incisor involvement with pronounced expression, as seen in this case, is less frequently emphasized in clinical reports.
Clinically, this morphology may pose challenges, including esthetic concerns due to altered crown morphology and increased susceptibility to dental caries due to plaque accumulation in the deep lingual fossa (6,7). It may also complicate orthodontic treatment, particularly with respect to bracket placement and overjet correction (6). Preventive management strategies include meticulous oral hygiene, sealant application in deep fossae when indicated, and regular monitoring. In more complex cases, enameloplasty or restorative reconstruction may be required (6,9).
From a clinical perspective, the pronounced marginal ridges and deep lingual concavity may complicate oral hygiene, prosthodontic planning, and endodontic access. Accurate diagnosis and careful treatment planning are therefore essential.
Overall, awareness and early recognition of this morphological trait are essential for tailored preventive, restorative, and rehabilitative care. This case highlights that commonly recognized anthropological traits may present in clinically distinct patterns that warrant documentation, particularly when characterized by specific combinations of severity, tooth involvement, and absence of associated anomalies.

Conclusions

Shovel shaped incisors represent a well recognized dental morphological trait with established anthropological and forensic relevance, particularly in certain population groups. Although generally considered a benign and population associated variation, its presentation as a bilateral, well-expressed (Type 3) form involving maxillary central incisors in a non syndromic individual is less frequently emphasized in clinical literature.
The present case highlights the importance of distinguishing between the general prevalence of this trait and its specific clinical expression. Recognizing such variations is essential for accurate diagnosis, preventive care, and appropriate treatment planning, especially considering the potential for plaque retention, caries susceptibility, occlusal considerations, and endodontic challenges.
Furthermore, documenting such distinct morphological patterns contributes to a better understanding of dental diversity across populations and reinforces the role of detailed morphological assessment in both clinical practice and forensic identification.

Declarations of interest

None.

Author contributions

Conceptualization: R.M.; Clinical examination and diagnosis: R.M.; Data curation and interpretation: P.A.; Literature review: P.A.;

Writing – original draft: A.M., K.R., D.B.; Figure preparation: A.M., K.R., D.B.; Writing – review and editing: All authors; Final approval of manuscript: All authors.

Statement on the use of artificial intelligence
ChatGPT was used exclusively for language improvement and proofreading. No artificial intelligence tool was used for generating scientific content, data interpretation, or conclusions.

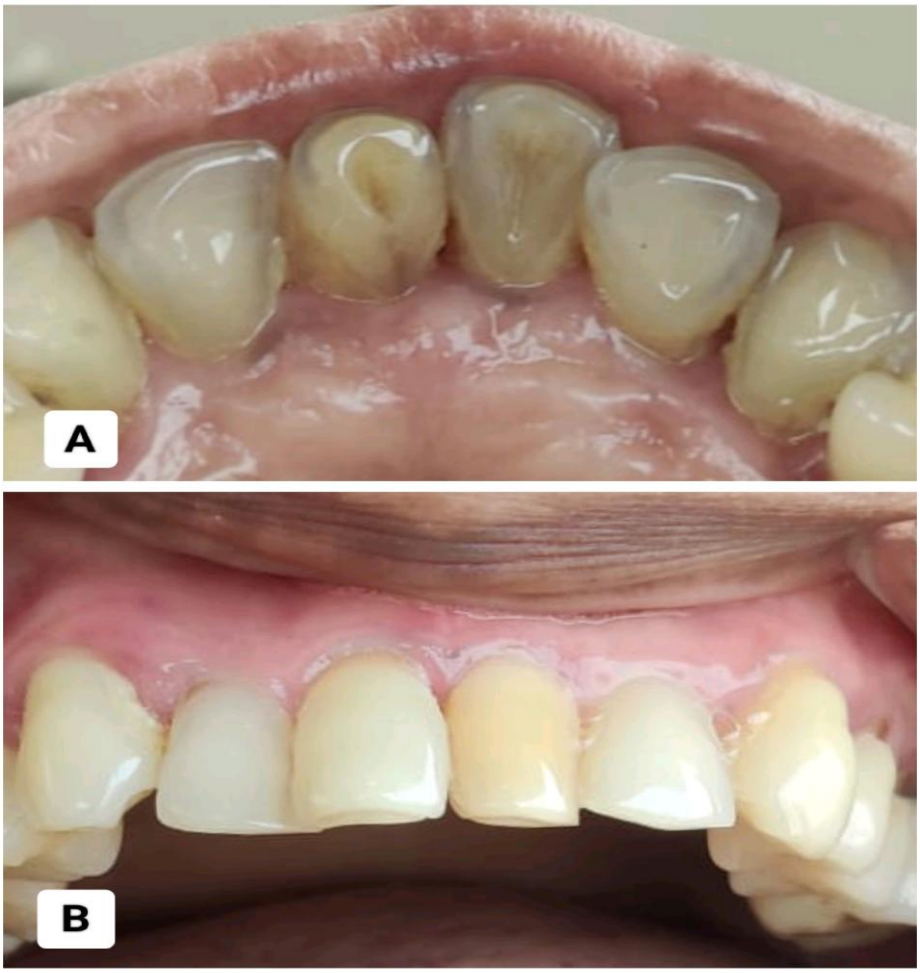

Figure 1. (A) Intraoral photograph of the lingual aspect showing prominent marginal ridges and a deep lingual fossa characteristic of shovel-shaped incisors. (B) Intraoral photograph of the labial aspect of permanent maxillary central incisors showing altered crown shape.

Figure 2. Cast model of the maxillary arch demonstrating shovel shaped central incisors.

Figure 3. Intraoral periapical radiograph of the maxillary anterior region revealing thickened marginal ridges and a darker radiolucent lingual fossa, consistent with shovel-shaped morphology.

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