TECHNICAL NOTE

https://doi.org/10.5125/jkaoms.2026.52.3.160
pISSN 2234-7550 · eISSN 2234-5930

V-shaped outward displacement: a proposed new subtype of isolated zygomatic arch fracture

Akash Ganguly[1], Md Kalim Ansari[2], Priyankar Singh[1], Anupriya Lakshmanan[2], Sachin Dev[3]

[1]Department of Oral and Maxillofacial Surgery, Post Graduate Institute of Dental Education and Research, Indira Gandhi Institute of Medical Sciences, Patna, [2]Department of Oral and Maxillofacial Surgery, Dr. Ziauddin Ahmad Dental College and Hospital, Aligarh Muslim University, Aligarh, [3]Department of Oral and Maxillofacial Surgery, PDM Dental College and Research Institute, PDM University, Bahadurgarh, India

Abstract (J Korean Assoc Oral Maxillofac Surg 2026;52:160-163)

Existing classification systems for isolated zygomatic arch fractures have substantially advanced clinical management of this injury pattern. However, atypical fracture configurations that do not conform to established subtypes are occasionally encountered in clinical practice. This technical note describes an unusual V-shaped outward displacement fracture of the zygomatic arch and proposes its recognition as a novel subtype within the recently described modified classification system for zygomatic arch fractures. A patient presenting following a motor vehicle accident exhibited an isolated zygomatic arch fracture with outward (lateral) displacement of arch fragments, forming a distinctive V-shaped configuration. Unlike conventional zygomatic arch fractures, which characteristically produce trismus through coronoid process impingement, this variant preserved mouth opening and manifested primarily as an aesthetic deformity. Management considerations for this pattern differ from standard approaches applied to conventional subtypes. The described fracture pattern is clinically and biomechanically distinct from the seven subtypes currently enumerated in the modified classification. Incorporation of this variant as a new subtype would enhance the comprehensiveness and clinical utility of the classification, enabling more accurate diagnosis and tailored surgical planning for atypical isolated zygomatic arch fractures.

Key words: Zygomatic fractures, Facial injuries, Wounds and injuries, Classification, Maxillofacial injuries

[paper submitted 2026. 5. 10 / accepted 2026. 5. 29]

I. Introduction

Fractures of the zygomatic arch are frequently encountered in maxillofacial trauma, accounting for a clinically significant proportion of midfacial injuries. Despite this, no universally adopted classification system for isolated zygomatic arch fractures has been established in standard textbooks. Multiple classification schemes have been proposed over the decades, each characterising fracture patterns according to the number of fracture lines, degree of displacement, and the resulting clinical consequences—most notably impingement of the coronoid process of the mandible, which precipitates trismus.

Jung et al.[1] recently undertook a systematic comparative analysis of existing classification systems and proposed a modified classification comprising seven distinct subtypes (Types I to VII). This classification provides a functional framework intended to facilitate both clinical decision-making and research in the field of maxillofacial traumatology. The authors acknowledged that further validation and refinement of the classification through broader clinical experience would be necessary.

During routine clinical activity in our Department of Oral and Maxillofacial Surgery, we encountered a patient with an isolated zygomatic arch fracture that did not conform to any of the seven subtypes described by Jung et al.[1]. The fracture demonstrated outward (lateral) displacement of arch fragments, producing a characteristic V-shaped configuration with the convexity directed laterally. This report describes the clinical and radiological features of this variant and proposes its formal addition to the existing classification as a new sub-

Akash Ganguly
Department of Oral and Maxillofacial Surgery, Post Graduate Institute of Dental Education and Research, Indira Gandhi Institute of Medical Sciences, Sheikhpura, Patna 800014, India
TEL: +91-8100040270
E-mail: akashganguly.dr@gmail.com
ORCID: https://orcid.org/0000-0002-8724-0175

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type.

II. Technical Note

A patient presented to our department following a motor vehicle accident with complaints of facial asymmetry and localised swelling over the right zygomatic region. Notably, the patient did not report restriction of mouth opening, and clinical examination confirmed full range of mandibular movement without pain or mechanical obstruction. Facial contour analysis revealed an outward convexity over the arch region rather than the inward collapse typically associated with isolated zygomatic arch fractures.

Axial computed tomography (CT) of the facial skeleton (Fig. 1. A) demonstrated a fracture of the zygomatic arch with outward (lateral) displacement of the intervening bony fragments. The displaced fragments formed a V-shaped configuration with the apex directed medially and the open end directed laterally—a geometry that is the geometric inverse of the typical isolated zygomatic arch fracture, which is characterised by medial (inward) buckling. The fracture lines flanked the displaced segment bilaterally, and no medial displacement was identified that would impinge on the temporal fossa or the coronoid process of the mandible.

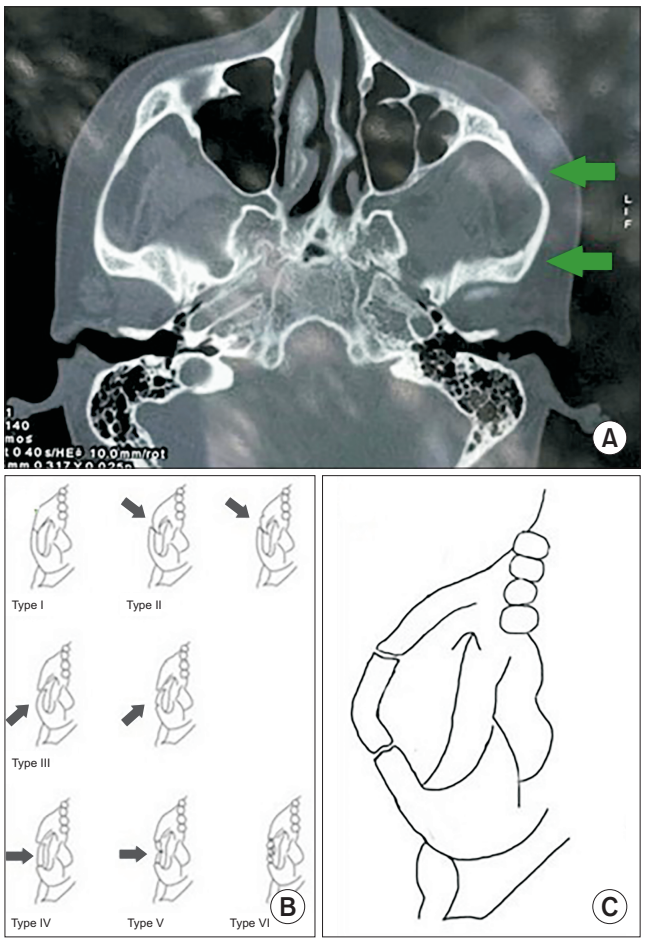


Fig. 1. A. Axial computed tomography section showing zygomatic arch fracture forming a V-shaped configuration with the convexity directed outward (arrows depicting the fracture lines). B. Nam and Jung Classification of isolated zygomatic arch fractures. Adapted from the article of Jung et al. (Arch Craniofac Surg 2022;23:111-8)[1]. C. Our proposed subclassification type VII to the existing Nam and Jung Classification.

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The existing modified classification (Fig. 1. B) described by Jung et al.[1] enumerates fracture patterns predominantly characterised by single or multiple fracture lines with varying degrees of inward displacement, impaction, or comminution. All seven established subtypes share a biomechanical common pathway whereby medial displacement of fragments may compress the coronoid process and restrict mandibular movement. The present fracture pattern (Fig. 1. C) deviates fundamentally from this pathway: outward fragment displacement does not encroach upon the infratemporal fossa, leaving coronoid process mobility unimpeded, and the predominant clinical consequence is a lateral contour deformity rather than functional trismus.

On the basis of these distinctive features—bilateral fracture lines flanking a laterally displaced V-shaped arch segment, preserved mouth opening, and aesthetic rather than functional primary presentation—we propose that this configuration be recognised as a discrete subtype within the modified classification (proposed addition as a new subtype following the existing seven types). The designation of the specific numeral should be determined in consultation with the original authors and the editorial committee to maintain classificatory consistency.

From a management standpoint, this fracture variant requires approaches that differ from those conventionally employed for inwardly displaced zygomatic arch fractures. Whereas standard techniques such as the Gillies temporal approach or the Keen intraoral approach are designed to reduce medially impacted fragments, restoration of the laterally displaced V-shaped segment may necessitate modified access strategies and fixation considerations to achieve satisfactory contour correction. The absence of trismus also alters the urgency and functional prioritisation of intervention, with aesthetic outcome assuming primary importance in the surgical planning process.

III. Discussion

Classification systems in maxillofacial traumatology serve two essential functions: they provide a shared language for clinical communication and they stratify fracture patterns in a manner that guides management decisions. The modified classification proposed by Jung et al.[1] represents a meaningful advance by consolidating prior systems and introducing a structured framework grounded in clinical and radiological criteria. However, as with any classification system, its utility is contingent upon its capacity to accommodate the full spectrum of fracture patterns encountered in clinical practice.

Outward displacement of zygomatic arch fragments, as observed in the present case, has received limited attention in the literature. The rarity of this pattern may partly reflect its underreporting or misclassification rather than a genuinely low incidence, as the absence of trismus may lead to delayed or incidental diagnosis on imaging performed for other indications. The V-shaped lateral convexity seen on axial CT is pathognomonic and should be recognisable to clinicians familiar with the radiological anatomy of the zygomatic arch.

The biomechanical basis for outward displacement is distinct from that of conventional zygomatic arch fractures. Whereas medial displacement typically results from a direct lateral impact force that buckles the arch inward, outward displacement may reflect an indirect transmission of forces through the zygomatic body or the temporal bone, resulting in a fulcrum-like mechanism that levers the arch laterally. Further biomechanical and finite-element studies would be of value in elucidating the injury mechanism underlying this variant.

Recognition of this variant within a formal classification also has implications for outcome assessment and research. Future comparative studies on management strategies, complication rates, and aesthetic outcomes in isolated zygomatic arch fractures would benefit from a classification that systematically distinguishes inwardly and outwardly displaced patterns. The incorporation of the proposed subtype would thus enhance not only clinical applicability but also the research utility of the classification—an objective explicitly articulated by Jung et al.[1] in their original publication.

We acknowledge the limitations inherent in a report based on a single case. Broader case series and multicentre data would be necessary to characterise the epidemiology, injury mechanisms, and optimal management of this fracture pattern. We encourage clinicians encountering similar presentations to report their findings, and we invite the original authors and the broader maxillofacial trauma community to consider incorporating this variant into the evolving classification framework.

We describe an isolated zygomatic arch fracture characterised by outward V-shaped displacement of the arch fragments—a pattern that is biomechanically and clinically distinct from the seven subtypes currently enumerated in the modified classification of Jung et al.[1]. This variant does not produce trismus and presents primarily as an aesthetic deformity, necessitating management strategies that differ from those conventionally applied to inwardly displaced fractures. Inclusion of this configuration as a new subtype within the existing classification would improve its comprehensiveness and clinical utility, enabling accurate diagnosis and tailored management of this uncommon but recognisable injury pattern.

ORCID

Akash Ganguly, *https://orcid.org/0000-0002-8724-0175*
Md Kalim Ansari, *https://orcid.org/0009-0000-8569-2912*
Priyankar Singh, *https://orcid.org/0000-0002-7020-5867*
Anupriya Lakshmanan, *https://orcid.org/0009-0007-4738-352X*
Sachin Dev, *https://orcid.org/0000-0002-2118-8335*

Authors' Contributions

A.G. participated in study conception and writing the original manuscript. M.K.A. participated in study conception and writing the original manuscript. P.S. participated in review and editing of the manuscript. A.L. participated in review and editing of the manuscript. S.D. participated in supervision of the study. All authors read and approved the final manuscript.

Funding

No funding to declare.

Ethics Approval and Consent to Participate

This technical note describes a clinical observation using established diagnostic and management principles without introducing any experimental intervention, novel technique, or deviation from standard patient care. Therefore, formal institutional review board approval was not required as per

institutional policy.

Consent for Publishing Photographs

Written informed consent was obtained from the patient for publication of this article and accompanying images.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Reference

1. Jung S, Yoon S, Nam SH. Proposal for a modified classification of isolated zygomatic arch fractures. Arch Craniofac Surg 2022;23:111-8. https://doi.org/10.7181/acfs.2022.00045

How to cite this article: Ganguly A, Ansari MK, Singh P, Lakshmanan A, Dev S. V-shaped outward displacement: a proposed new subtype of isolated zygomatic arch fracture. J Korean Assoc Oral Maxillofac Surg 2026;52:160-163. https://doi.org/10.5125/jkaoms.2026.52.3.160