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CHEVRON OSTEOTOMY FOR INTRA-ARTICULAR DISTAL HUMERUS FRACTURE: AN EVIDENCE-BASED CASE REPORT WITH SYSTEMATIC REVIEW

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ABSTRACT
Intra-articular distal humerus fractures are complex injuries that require anatomical reduction, stable internal fixation, and adequate surgical exposure to restore elbow function. Chevron osteotomy is widely used to improve visualization of the distal humeral articular surface during open reduction and internal fixation (ORIF). To present the management of an intercondylar distal humerus fracture using the chevron osteotomy approach and synthesize the available evidence regarding its clinical outcomes. An evidence-based case report with a systematic literature review was conducted following the PRISMA framework. A comprehensive search of PubMed, Cochrane Library, and ScienceDirect identified studies published between 2009 and 2025 using the keywords chevron osteotomy, distal humerus fracture, distal humeral fracture, intercondylar humerus fracture, trans-olecranon approach, open reduction internal fixation (ORIF), fixation, and surgical approach. Of 458 records identified, eight studies met the eligibility criteria and were included in the qualitative synthesis. Most included studies reported good-to-excellent functional outcomes, with mean Mayo Elbow Performance Score values generally exceeding 80 points, together with high rates of fracture union and osteotomy healing. Although implant-related irritation was the most frequently reported complication, osteotomy nonunion and fixation failure were uncommon. These findings were consistent with the presented case, in which chevron osteotomy facilitated anatomical reduction and stable fixation. Chevron osteotomy remains an effective surgical approach for complex intra-articular distal humerus fractures, providing excellent articular exposure, reliable union, and favorable functional outcomes when combined with accurate reduction and stable fixation.

Keywords: chevron osteotomy; distal humerus fracture; distal humeral fracture; intra-articular fracture

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INTRODUCTION

Distal humerus fractures represent relatively uncommon injuries, accounting for approximately 2–6% of all fractures and around 30% of elbow fractures in adults. These injuries often occur following high-energy trauma in younger individuals or low-energy falls in elderly patients with osteoporotic bone. Among the various fracture patterns, intra-articular distal humerus fractures, particularly AO type C fractures, present a significant surgical challenge because of the complexity of the articular anatomy and the need to restore joint congruency to achieve optimal functional outcomes (Fouché et al., 2024; Kong et al., 2025; Varecka & Myeroff, 2017).

Successful management of these fractures requires anatomical reduction of the articular surface, stable internal fixation, and early postoperative mobilization to prevent elbow stiffness. Open reduction and internal fixation (ORIF) remains the gold standard treatment for most displaced intra-articular distal humerus fractures. Modern fixation techniques typically involve dual plating constructs applied in orthogonal or parallel configurations, which provide sufficient stability to allow early range of motion (Holte et al., 2024; Stoddart et al., 2024; Stoffel et al., 2008). However,

achieving adequate visualization of the distal humeral articular surface during surgery remains one of the major challenges in these fractures.

Several posterior surgical approaches have been described to access the distal humerus, including triceps-splitting, triceps-reflecting, paratricipital (triceps-sparing), and Chevron osteotomy approaches. Each technique offers advantages and limitations regarding surgical exposure, soft tissue preservation, and postoperative complications. Among these approaches, Chevron osteotomy is widely considered the most extensile exposure, providing direct visualization of the distal humeral articular surface and facilitating accurate reduction of complex intra-articular fracture fragments (Aggarwal et al., 2021; Sharma et al., 2018; Wagener et al., 2015).

Within Chevron osteotomy techniques, the chevron osteotomy configuration has been widely favored due to its interlocking geometry and increased cancellous bone contact surface, which improve intrinsic stability and reduce the risk of osteotomy displacement or nonunion. Previous studies have demonstrated that this approach provides excellent visualization of the articular surface and facilitates precise fracture reduction, particularly in comminuted AO type C fractures. Nevertheless, the technique is also associated with potential complications, including hardware irritation, delayed union of the osteotomy site, and the need for secondary implant removal (Feinstein et al., 2023; Sharma et al., 2018; Wagener et al., 2015). Given these considerations, understanding the clinical outcomes and complication profiles associated with Chevron osteotomy is essential when selecting the most appropriate surgical exposure for complex distal humerus fractures. Therefore, this evidence-based case report aims to present a case of intercondylar distal humerus fracture treated using a chevron osteotomy approach, accompanied by a systematic review of the literature evaluating functional outcomes and complications associated with this surgical technique.

METHOD

Study Design

This evidence-based case report was conducted through a structured literature review aimed at identifying and synthesizing available evidence regarding the use of the Chevron osteotomy approach in the surgical management of intra-articular distal humerus fractures. The review process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to ensure transparency and reproducibility in the study selection process.

Literature Search Strategy

A comprehensive literature search was performed across three electronic databases: PubMed, Cochrane Library, and ScienceDirect. The search strategy employed combinations of keywords related to distal humerus fractures and Chevron osteotomy. The primary search terms included “distal humerus fracture,” “distal humeral fracture,” “intercondylar humerus fracture,” “Chevron osteotomy,” “trans-olecranon approach,” “open reduction internal fixation,” “ORIF,” “fixation,” and “surgical approach.” Boolean operators AND and OR were used to combine search terms in order to broaden and refine the search results.

Eligibility Criteria

Studies were considered eligible if they met the following criteria:

1) involved patients with distal humerus fractures, particularly intra-articular or AO type C fractures;
2) evaluated Chevron osteotomy as a surgical approach or fixation technique during open reduction and internal fixation;
3) reported clinical, radiological, or functional outcomes following surgical treatment; and
4) were published as original research articles, cohort studies, randomized trials, case series, or systematic reviews.

Studies were excluded if they involved non-human subjects, biomechanical studies without clinical outcomes, conference abstracts without full text, review articles without primary data, or studies unrelated to distal humerus fracture management.

Study Selection

All retrieved articles underwent a two-stage screening process. First, titles and abstracts were reviewed to identify potentially relevant studies. Articles that clearly did not meet the eligibility criteria were excluded at this stage. Following initial screening, full-text evaluation was performed to determine final eligibility. Studies published between 2009 and 2025 that fulfilled the predefined eligibility criteria were included in the qualitative synthesis. During the screening process, 448 studies were excluded based on title and abstract review. After duplicate removal and full-text assessment, eight studies published between 2009 and 2025 were ultimately included in the qualitative synthesis. The complete study selection process is summarized in the PRISMA flow diagram.

Data Extraction

Relevant data from each included study were extracted using a predefined data extraction form. The extracted variables included author name, year of publication, country of origin, study design, number of patients, fracture type or indication, surgical technique, comparator intervention when available, fixation method, duration of follow-up, functional outcome measures, key results, reported complications, and summary of findings. These extracted data were organized into a characteristics and results table to facilitate comparison across studies and to synthesize evidence regarding the clinical outcomes of Chevron osteotomy in distal humerus fracture surgery.

Risk of Bias Assessment

The methodological quality of the included studies was assessed descriptively based on study design, sample size, follow-up duration, and reporting of outcomes. Considering the predominance of observational studies and case series among the included literature, the overall risk of bias was considered moderate, primarily due to the absence of randomization in several studies and relatively small sample sizes in some cohorts.

RESULT

Case Illustration

A 26-year-old woman presented with complaints of pain in the left arm following a fall in the bathroom two days prior to admission. The patient reported pain localized to the left elbow that worsened with movement. She also complained of numbness in the left hand and swelling around the elbow, which caused difficulty in bending and straightening the arm. The pain increased when the arm was moved or used and was partially relieved with rest. The patient also experienced weakness in the left arm that interfered with daily activities such as lifting objects or supporting the body. She denied any open wound or bleeding at the site of injury. The patient had no previous history of similar trauma to the left elbow and reported no history of diabetes mellitus, hypertension, or allergies. On initial evaluation, the patient was conscious and cooperative with a Glasgow Coma Scale score of 15. Vital signs showed a blood pressure of 159/94 mmHg, pulse rate of 72 beats per minute, respiratory rate of 23 breaths per minute, temperature of 36.8°C, and oxygen saturation of 98%. Primary survey revealed a clear airway with normal neck appearance and no signs of obstruction. Chest examination showed symmetrical thoracic movement with vesicular breath sounds and no use of accessory respiratory muscles. Circulatory assessment demonstrated regular pulses with adequate strength and no evidence of active bleeding. Neurological evaluation revealed isochoric pupils with intact reflexes.

Local examination of the left elbow revealed swelling in the elbow region accompanied by mild deformity and hematoma without any open wound. Palpation revealed tenderness over the elbow joint with associated soft-tissue swelling. Crepitus was suspected during examination. Active range

of motion of the elbow was limited, particularly in flexion and extension, due to pain. Distal neurovascular examination showed intact sensory function including sharp, dull, tactile, thermal, and cold sensations. Peripheral circulation was preserved with palpable brachial, radial, and ulnar pulses and capillary refill time of less than two seconds.

Radiographic evaluation of the elbow demonstrated a complete fracture of the distal humerus involving the intercondylar region of the left side with poor alignment and apposition of the fracture fragments. No associated dislocation or subluxation was identified in the acromioclavicular, coracoclavicular, glenohumeral, or elbow joints. The patient reported severe pain around the elbow with a Visual Analog Scale (VAS) score of 8/10 at the time of presentation. A computed tomography (CT) scan was initially considered to further evaluate the fracture configuration; however, CT imaging could not be performed because the patient was not transportable at the time of evaluation, and the diagnosis was therefore established based on clinical assessment and plain radiographic findings.

Figure 1. Preoperative radiological evaluation result

Based on these clinical and radiological findings, the patient was diagnosed with an intercondylar fracture of the distal humerus of the left arm. Definitive surgical management was planned, and the patient subsequently underwent open reduction, internal fixation, and interfragmentary compression of the distal humerus fracture using a posterior approach with chevron osteotomy to facilitate adequate visualization of the articular surface.

Figure 2. Preoperative surgical site marking.

During the preoperative period, the patient was managed with immobilization of the affected limb using a splint and received intravenous medications consisting of cefotaxime 1 g every 12 hours, ketorolac every 8 hours for analgesia, and ranitidine every 12 hours. Serial daily evaluations showed gradual improvement of pain with minimal residual swelling, and no signs of infection were observed.

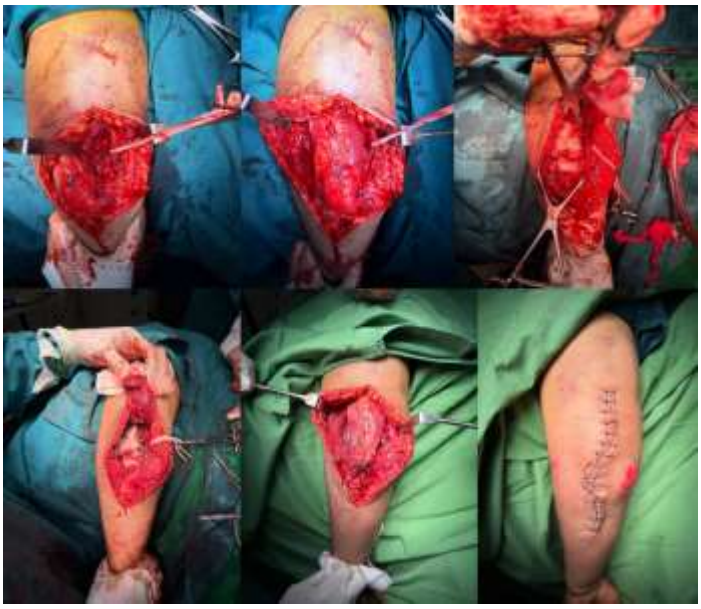

Figure 3. Intraoperative findings.

Definitive surgical treatment was performed on March 2, 2026. The patient was placed in a lateral decubitus position with the affected arm supported to facilitate a posterior approach to the elbow. A longitudinal posterior skin incision was made centered around the olecranon. The ulnar nerve was identified and carefully released through neurolysis to allow anterior transposition and prevent tension during surgical exposure. A chevron osteotomy was then performed in the non-articular bare area of the trochlear notch approximately 2–2.5 cm distal to the tip of the olecranon to allow improved visualization of the distal humeral articular surface. After adequate exposure was achieved, open reduction and internal fixation of the distal humerus fracture were performed using plate and screw fixation. The Chevron osteotomy was subsequently repaired using tension band wiring. Postoperative radiographic evaluation demonstrated internal fixation of the distal humerus with plate-screw constructs and tension band wiring of the olecranon with good implant position and adequate bone alignment.

Figure 4. Postoperative radiological evaluation.

Postoperatively, the patient was monitored with continued analgesic and antibiotic therapy. The surgical wound remained clean without signs of infection. Swelling was minimal and distal circulation remained intact. On the first postoperative day, the patient reported reduced pain and

was able to perform passive flexion and extension of the elbow. Subsequent clinical evaluations showed progressive improvement with preserved distal perfusion and stable postoperative condition.

Study Selection

The literature search identified 458 records from three electronic databases, including 74 records from PubMed, 9 from the Cochrane Library, and 375 from ScienceDirect. After screening titles and abstracts, 448 studies were excluded because they did not involve Chevron osteotomy or were unrelated to distal humerus fractures. Following duplicate removal and full-text assessment, eight studies published between 2009 and 2025 met the eligibility criteria and were included in the qualitative synthesis. These consisted of prospective cohort studies, comparative studies, randomized controlled trials, and systematic reviews. The study selection process is summarized in Figure 5.

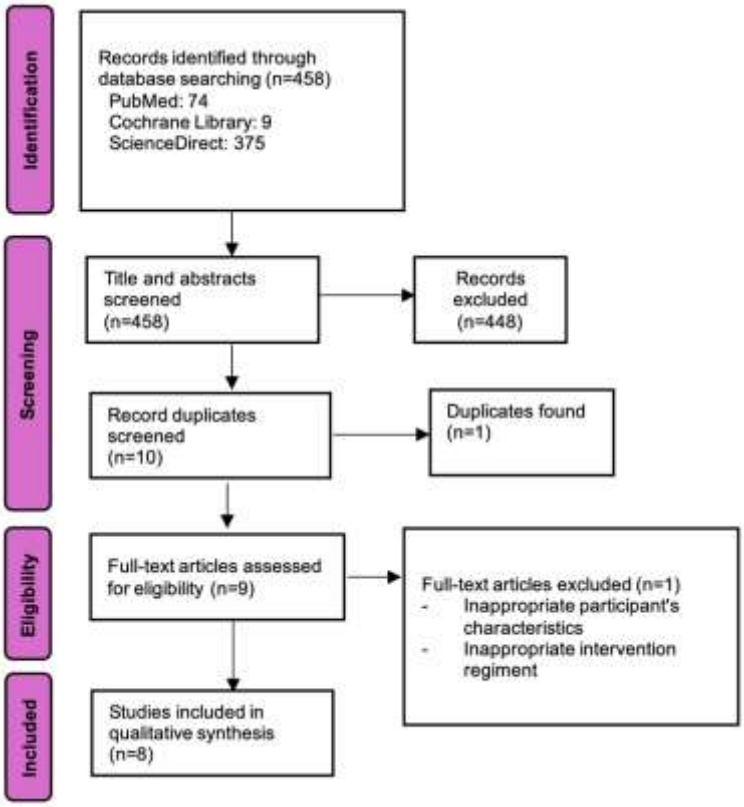

Figure 5. Diagram flow of literature search strategy for this systematic review.

Characteristics of Included Studies and Relevance to the Present Case

The eight included studies were published between 2009 and 2025 and involved patients with intra-articular distal humerus fractures, particularly AO type C fractures (Table 1). These fractures are known to be technically challenging because of the need for precise anatomical reduction of the articular surface. Across the studies, the Chevron osteotomy approach was consistently used to improve visualization of the distal humeral articular surface during open reduction and internal fixation (ORIF). Several studies specifically described the use of chevron-shaped osteotomy, which provides greater intrinsic stability and increased cancellous bone contact area compared with transverse osteotomy techniques. These characteristics are consistent with the clinical scenario in the present case, where a chevron osteotomy was performed to allow adequate exposure of the intercondylar fracture fragments of the distal humerus, facilitating anatomical reduction and internal fixation. Most studies also reported the use of dual plating constructs for distal humerus fixation, often applied in orthogonal or parallel configurations. This fixation strategy mirrors the operative technique performed in the reported patient.

Table 1.
Characteristics of Studies Evaluating Chevron Osteotomy for Intra-Articular Distal Humerus Fractures

First Author (Year)	Country	Study Design	Population (n)	Fracture Type / Indication	Surgical Technique	Comparator	Fixation Method	Follow-up Duration
Jeong (2022)	Korea	Systematic review and meta-analysis (5 comparative cohort studies)	243 patients (OO = 123, PT = 120)	Distal humerus intra-articular fracture (AO/OTA 13-C)	Chevron osteotomy approach	Paratricipital approach	ORIF with dual plating typically used for distal humerus fractures	13.2–46.4 months
Lu (2021)	China (studies included from China, Finland, Pakistan)	Systematic Review and Meta-analysis (4 RCTs + 5 observational studies)	537 patients	Distal humerus intercondylar fractures (AO type C1–C3)	Chevron osteotomy approach for exposure during ORIF	Triceps-sparing approach	Dual plating / distal humerus fixation systems (varied across included studies)	Not uniformly reported across studies
Refae (2024)	Egypt	Prospective interventional comparative study	20 patients	Supracondylar intercondylar humerus fracture (AO type C1–C3)	Chevron osteotomy (V-shaped / chevron osteotomy) for exposure during ORIF	Triceps-sparing approach	Dual plating fixation with orthogonal plates (lateral locking plate + medial reconstruction plate); osteotomy fixed with tension band wiring or 6.5-mm cancellous screw	6 months
Tak (2009)	India	Prospective case series	94 patients	Intra-articular distal humerus fractures (AO type C1–C3, majority complex intra-articular fractures)	Chevron osteotomy using trans-olecranon posterior approach for ORIF	None (single-arm study)	Osteotomy fixation with 4.5–6.5 mm cancellous screw reinforced with dorsal ulnar tension band wiring; fracture fixation with standard internal fixation constructs	6–48 months (mean 24 months)
Butala (2022)	India	Prospective randomized controlled study	30 patients	Intra-articular distal humerus fractures (AO/OTA type 13-B and 13-C)	Chevron osteotomy for exposure during ORIF	Chevron osteotomy using Gigli saw	Osteotomy fixation using K-wire with tension band wiring; fracture fixation with bicolumnar plating	Follow-up at 3 weeks, 1 month, 3 months, and 6 months
Shah (2025)	Pakistan	Retrospective comparative study	32 patients (Group A=16, Group B=16)	Intra-articular distal humerus fractures (AO type 13-C)	Open reduction and internal fixation of distal humerus	Intramedullary screw alone vs intramedullary screw +	Group A: 6.5 mm intramedullary cancellous screw with washer; Group B:	≈15–16 months

First Author (Year)	Country	Study Design	Population (n)	Fracture Type / Indication	Surgical Technique	Comparator	Fixation Method	Follow-up Duration
				requiring Chevron osteotomy for exposure	fractures via Chevron osteotomy	tension band wiring (TBW)	intramedullary cancellous screw + cerclage wire figure-of-eight TBW	
Feinstein (2023)	USA	Systematic Review	1,445 patients from 39 studies	Primarily distal humerus fractures requiring Chevron osteotomy exposure	Chevron osteotomy for surgical exposure of distal humerus fractures	Chevron vs transverse osteotomy; multiple fixation constructs	Tension band wiring (TBW), cancellous screw ± TBW, plate fixation, intramedullary nail	Mean ≈30.9 months
Singh (2021)	India	Prospective cohort study	32 patients	AO type C intra-articular distal humerus fractures	Chevron osteotomy for exposure during open reduction and internal fixation (ORIF)	None (single-arm study)	Dual plating in 90°–90° configuration with osteotomy fixation using tension band wiring	6 months

Functional Outcomes and Clinical Recovery

Functional outcomes reported across the included studies were generally favorable following surgical management using the Chevron osteotomy approach. The Mayo Elbow Performance Score (MEPS) was the most commonly used functional outcome measure. Several cohort studies demonstrated mean MEPS values in the good-to-excellent range, with reported scores around the mid-80s or higher at final follow-up. In addition, elbow range of motion outcomes were encouraging, with mean flexion values exceeding 120° and minimal extension deficits. These findings support the effectiveness of the surgical exposure obtained through Chevron osteotomy. In the present case, the ability to achieve clear visualization of the distal humerus articular surface through the chevron osteotomy approach likely contributed to accurate reduction and stable fixation, which are essential factors for achieving satisfactory postoperative elbow function. Comparative studies included in the review also indicated that Chevron osteotomy provides superior articular exposure compared with triceps-sparing approaches, although long-term functional outcomes may be comparable between techniques.

Osteotomy Healing and Fracture Union

The included studies consistently reported high rates of fracture union and osteotomy healing following Chevron osteotomy. Healing of the osteotomy site was typically observed within 8–16 weeks, with several studies reporting union in nearly all treated patients. The chevron configuration used in many of the included studies and in the present case is widely recognized for its interlocking geometry, which enhances stability and reduces the risk of osteotomy displacement. This structural advantage contributes to reliable healing of the osteotomy site. Radiographic union and satisfactory healing outcomes reported in the literature support the use of this technique in complex intra-articular distal humerus fractures such as the one presented in this case.

Postoperative Complications

Although the Chevron osteotomy approach provides excellent surgical exposure, several complications have been reported across the included studies. The most commonly described

complications include symptomatic hardware prominence, superficial infection, transient ulnar nerve irritation, and elbow stiffness.

Among these, implant-related irritation requiring secondary removal was the most frequently reported complication, particularly in cases where tension band wiring was used to repair the osteotomy. However, serious complications such as osteotomy nonunion or fixation failure were uncommon. Importantly, the overall complication rates reported in the included studies remain acceptable considering the complexity of distal humerus fractures. These findings suggest that the benefits of improved articular exposure with Chevron osteotomy often outweigh the potential risks when treating complex intra-articular fractures.

Evidence Supporting the Surgical Approach in the Present Case

Taken together, the evidence from the included studies demonstrates that Chevron osteotomy remains a reliable surgical approach for managing complex intra-articular distal humerus fractures. The technique provides excellent visualization of the articular surface, facilitates accurate fracture reduction, and allows stable internal fixation. In the present case, the use of a chevron osteotomy enabled direct visualization of the intercondylar fracture components and facilitated precise reduction of the distal humerus, consistent with the indications described in the literature. Therefore, the clinical decision to utilize this approach in the reported patient is supported by the available evidence, which shows that Chevron osteotomy is associated with good functional outcomes, high union rates, and acceptable complication profiles in the treatment of complex distal humerus fractures.

Table 2.
Functional Outcomes, Complications, and Main Findings of Studies on Chevron Osteotomy for Intra-Articular Distal Humerus Fractures

First Author (Year)	Key Results	Complications	Summary of Findings	Risk of bias
Jeong (2022)	Operation time longer in OO group (MD = 13.32 min; 95% CI 3.78–22.87; P = .006). No significant difference in elbow flexion (MD = 2.48; P = .14), extension (MD = 0.36; P = .78), arc of motion (MD = 0.40; P = .86), or MEPS (MD = −1.37; P = .42)	Higher infection in OO group (OR = 3.82; 95% CI 1.03–14.16; P = .04). No significant difference in heterotopic ossification (OR = 1.85; P = .35) or ulnar neuropathy (OR = 2.74; P = .19). Chevron osteotomy nonunion ≈2% and symptomatic hardware prominence ≈8%	Functional outcomes between Chevron osteotomy and paratricipital approaches were comparable, although osteotomy required longer operative time and had higher infection incidence	Low
Lu (2021)	No significant difference in excellent/good elbow function (OR 1.37; 95% CI 0.69–2.75). MEPS also not significantly different (WMD 0.17; 95% CI −2.56–2.89).	Complication rate not significantly different overall (OR 1.93; 95% CI 0.49–7.60). Sensitivity analysis suggested potential higher complications with Chevron osteotomy.	Chevron osteotomy provides excellent articular exposure but does not significantly improve functional outcomes compared with triceps-sparing approaches; may increase operative time, blood loss, and complication risk in some analyses.	Low
Refae (2024)	MEPS: TS group mean 82.5±10.34 vs OO group 79.5±13.63. Flexion-extension ROM: TS 97°±18.16 vs OO 89°±15.33. Operative time longer with OO (164.5 min vs 130.4 min). Blood loss higher with OO	Postoperative infection: 2 TS vs 1 OO. Radial neuritis: 1 TS. Ulnar neuritis: 1 TS vs 2 OO. Elbow stiffness: 5 TS vs 7 OO cases.	Chevron osteotomy provides superior visualization of articular surface and facilitates reduction in comminuted intra-articular fractures, but is associated with	Low

First Author (Year)	Key Results	Complications	Summary of Findings	Risk of bias
	(~260 ml vs ~161 ml).		longer operative time, greater blood loss, and potential osteotomy-related complications.	
Tak (2009)	All osteotomies united with mean healing time 11 weeks (range 8–20 weeks). Delayed union occurred in 4 patients (4.5%) but healed without intervention. 92% of patients achieved functional range of motion and 90% returned to pre-injury activity level.	Prominent olecranon implant in 23 patients (26%); symptomatic hardware in 17 patients (19%) requiring removal; superficial infection 8 patients (8.5%); ulnar nerve palsy 1 case; delayed union 4 cases (4.5%).	Chevron osteotomy provides excellent visualization for complex intra-articular distal humerus fractures and enables accurate reduction and fixation, although symptomatic hardware requiring secondary removal is relatively common.	Moderate
Butala (2022)	No significant difference between techniques. Mean difference in Oxford score = 0.60 and QuickDASH-11 = 1.67 (both within 95% CI). Both groups achieved good postoperative functional outcomes and range of motion.	No major complications reported during follow-up; minimal postoperative pain and transient sensory symptoms in a few patients.	Both Chevron osteotomy and Gigli saw Chevron osteotomy provide effective exposure for intra-articular distal humerus fractures with comparable functional outcomes. Technique choice may depend on surgeon preference and intraoperative ease.	Low
Shah (2025)	MEPS significantly higher in screw-alone group (92.3 ± 4.1 vs 78.1 ± 12.1, $P<0.05$); QuickDASH better in screw-alone group (24.5 ± 2.1 vs 56.2 ± 4.8, $P<0.05$); radiological union achieved in all patients	Superficial infection: 18.75% vs 43.75%; implant discomfort: 0% vs 56.25%; implant removal: 0% vs 43.75% (all higher in TBW group)	Intramedullary cancellous screw fixation alone produced equivalent union but significantly better functional outcomes and fewer implant-related complications compared with screw + TBW	Moderate
Feinstein (2023)	Chevron osteotomy showed lower complication rates than transverse osteotomy; delayed union 4.2%, nonunion 5.4%, implant failure 5.9%; TBW and screw constructs most commonly used	Implant removal 21.9% overall (highest in plate fixation 44.4%); infection 7%; higher delayed union and implant failure with transverse osteotomy	Chevron osteotomy provides better healing and lower complication rates compared with transverse osteotomy; TBW and cancellous screw constructs show acceptable complication rates but implant removal is relatively frequent	Low
Singh (2021)	Mean MEPS score 84 ± 8.4 at final follow-up; mean elbow flexion 121 ± 8.3°; mean extension deficit 10.3 ± 4.2°; radiological union achieved in all patients (mean union time ≈16 weeks)	One superficial wound infection treated with debridement; no reported osteotomy nonunion	Chevron osteotomy provided excellent visualization of the articular surface and allowed stable fixation with good functional outcomes and early mobilization in AO type C distal humerus fractures	Low

DISCUSSION

Interpretation of the Evidence in Relation to the Presented Case

The present evidence-based case report sought to evaluate the role of the Chevron osteotomy approach in the surgical management of intra-articular distal humerus fractures and to correlate the available literature with the operative strategy applied in the reported patient. The systematic review identified eight studies examining functional outcomes, fracture union, and complication profiles following distal humerus fracture fixation using this approach. Overall, the evidence consistently demonstrated that Chevron osteotomy provides excellent visualization of the distal humeral articular surface, facilitates anatomical fracture reduction, and results in favorable functional outcomes across multiple clinical settings.

These findings are particularly relevant to the clinical scenario presented in this report. The patient suffered an intercondylar distal humerus fracture, a pattern typically categorized as AO type C fracture, which is widely recognized as one of the most technically demanding elbow injuries to treat surgically. Such fractures frequently involve multiple articular fragments and disruption of the trochlear groove, requiring precise reconstruction to restore joint congruity and elbow kinematics (Fouché et al., 2024; Kong et al., 2025; Varecka & Myeroff, 2017). In the present case, the surgical team elected to perform a chevron osteotomy to improve visualization of the distal humerus articular surface, thereby allowing accurate reduction and stable fixation of the fracture fragments. The favorable outcomes reported across the included studies strongly support this surgical decision.

Surgical Exposure and the Importance of Articular Visualization

One of the central findings of the reviewed literature is the critical role of adequate surgical exposure in the management of intra-articular distal humerus fractures. Previous orthopedic studies have emphasized that incomplete visualization of the articular surface may compromise fracture reduction and lead to residual articular incongruity, which in turn increases the risk of post-traumatic arthritis and functional impairment (Holte et al., 2024; Stoddart et al., 2024; Stoffel et al., 2008). Among the available posterior elbow approaches, Chevron osteotomy has been consistently described as the most extensile exposure technique, allowing surgeons to directly visualize nearly the entire distal humeral articular surface (Aggarwal et al., 2021; Stoddart et al., 2024; Stoffel et al., 2008). This extensive exposure is particularly valuable when treating comminuted intercondylar fractures, where accurate reduction of the trochlea and capitellum is essential for restoring normal elbow mechanics. The systematic review findings demonstrate that most included studies utilized the Chevron osteotomy approach specifically for complex AO type C fractures, which closely mirrors the clinical situation encountered in the present case. By reflecting the triceps mechanism proximally, the osteotomy allowed direct access to the articular surface, enabling precise reduction and stable fixation of the fracture fragments.

Functional Outcomes Reported in the Literature

Functional recovery following distal humerus fracture surgery is strongly influenced by the quality of fracture reduction and the stability of fixation. Across the included studies, postoperative elbow function was primarily evaluated using the Mayo Elbow Performance Score (MEPS) and other validated outcome measures. Most studies reported mean MEPS scores within the good-to-excellent range, suggesting satisfactory restoration of elbow function following surgery. Similarly, elbow range of motion outcomes reported in the literature were generally favorable. Several studies documented mean elbow flexion exceeding 120° with minimal extension deficits, indicating that stable fixation combined with early rehabilitation can restore functional elbow movement. These outcomes highlight the importance of achieving adequate surgical exposure during fracture fixation. In the present case, the use of chevron osteotomy allowed the surgical team to achieve direct visualization of the articular surface and stable internal fixation, which are key factors contributing to satisfactory postoperative function. Therefore, the functional outcomes described in the literature provide supportive evidence for the surgical strategy employed in this patient.

Biomechanical Advantages of Chevron osteotomy

Another important finding emerging from the literature relates to the biomechanical advantages of the chevron osteotomy configuration, which was also used in the present case. Compared with transverse osteotomy techniques, the chevron configuration offers several structural benefits. The V-shaped osteotomy increases the contact surface area between bone fragments and creates an interlocking configuration that enhances intrinsic stability (Calisal & Uğur, 2023; Kia et al., 2018; Reising et al., 2014). These biomechanical properties help reduce the risk of osteotomy displacement and promote reliable healing of the osteotomy site. In addition, the configuration allows the osteotomy fragments to resist shear forces generated by triceps contraction during postoperative elbow motion. As a result, chevron osteotomy fixation is often associated with high union rates and stable fixation, enabling early rehabilitation without compromising osteotomy healing. The findings from the systematic review align with these biomechanical principles, as most studies reported high rates of fracture and osteotomy union, typically occurring within several weeks following surgery. This evidence reinforces the rationale for selecting the chevron osteotomy technique in the present case.

Complication Profiles and Clinical Considerations

Although the Chevron osteotomy approach provides excellent exposure of the distal humerus articular surface, it is also associated with potential complications. The systematic review identified several commonly reported complications, including hardware irritation, superficial infection, elbow stiffness, and transient ulnar nerve symptoms. Among these, implant-related irritation requiring secondary hardware removal was the most frequently reported complication. These complications are primarily related to the fixation method used for osteotomy repair, particularly when tension band wiring constructs are employed (Meldrum et al., 2021; Spierings et al., 2022). Despite these risks, the overall complication rates reported in the literature remain acceptable considering the complexity of the fractures being treated. Importantly, serious complications such as osteotomy nonunion or fixation failure were relatively uncommon across the reviewed studies. In the context of the present case, awareness of these potential complications is important when selecting fixation techniques and planning postoperative management. Nevertheless, the evidence indicates that the benefits of improved articular exposure provided by Chevron osteotomy generally outweigh the risks when managing complex intra-articular distal humerus fractures.

Clinical Implications for the Presented Case

The synthesis of the included studies highlights the continued relevance of Chevron osteotomy as a surgical approach for complex distal humerus fractures. The approach provides direct visualization of the articular surface, facilitates accurate fracture reduction, and allows stable fixation with dual plating constructs. These advantages are particularly important in AO type C fractures, where restoration of joint congruity is essential for preserving elbow function. The surgical strategy used in the present case aligns closely with the findings reported in the literature. The use of a chevron osteotomy enabled optimal exposure of the intercondylar fracture components, allowing precise reduction and stable fixation of the distal humerus. The favorable outcomes reported across the included studies therefore support the clinical rationale for the chosen surgical approach.

Limitations

Several limitations should be considered when interpreting the findings of this evidence-based case report. First, many of the included studies were observational in design, which may introduce potential bias and limit the strength of causal conclusions. Second, sample sizes varied considerably across studies, and some cohorts were relatively small. Third, variations in osteotomy fixation techniques and rehabilitation protocols may have influenced reported outcomes. Despite these limitations, the consistent findings across multiple studies strengthen the evidence supporting the use of Chevron osteotomy in complex distal humerus fracture management.

CONCLUSION

The present evidence-based case report demonstrates that the Chevron osteotomy approach, particularly the chevron configuration, remains a reliable surgical technique for the management of complex intra-articular distal humerus fractures. The systematic review of eight studies consistently showed that this approach provides excellent visualization of the distal humeral articular surface, facilitates anatomical reduction, and allows stable internal fixation, which are essential factors for achieving favorable functional outcomes. Although complications such as hardware irritation and implant removal may occur, the overall complication profile remains acceptable given the complexity of these injuries. In the presented patient with an intercondylar distal humerus fracture, the use of chevron osteotomy enabled optimal exposure of the fracture site and supported accurate reduction and stable fixation. Therefore, the findings from the literature and the clinical outcome of this case collectively support the continued use of Chevron osteotomy as an effective surgical approach for managing complex distal humerus fractures.

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