

Medial Epiphyseal–Epicondylar Alignment and Clinical Outcomes After Adding a Medial K-Wire to Lateral Two-Wire Fixation in Gartland II–III Pediatric Supracondylar Humerus Fractures: A Retrospective Cohort Study

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Abstract

Background

Closed reduction and percutaneous pinning is standard treatment for displaced pediatric supracondylar humeral fractures, but the optimal pin configuration remains debated. We compared clinical and radiographic outcomes between lateral two-pin and medial-pin–augmented (crossed) fixation, focusing on the medial epicondylar epiphyseal angle (MEEA) as a comparative outcome rarely used for this purpose.

Methods

We retrospectively analyzed 202 children aged 2 to 12 years with Gartland type II to III supracondylar humeral fractures treated surgically between 2016 and 2021. Group 1 (117 children) received two divergent lateral wires plus one medial wire via mini-open incision; Group 2 (85 children) received two lateral wires only. The decision to add a medial wire reflected a mix of surgeon routine and intraoperative judgment of construct stability, not a fixed protocol. Outcomes were the Flynn rating, loss of carrying angle and elbow motion, and the Baumann, humeroulnar, medial epicondylar epiphyseal, and diaphysiometaphyseal angles, measured at final follow-up against the uninjured side. The Benjamini–Hochberg procedure controlled for multiple comparisons.

Results

Mean follow-up was 28.4 months; groups were comparable at baseline. Operative time was longer in Group 1 (40.7 versus 24.2 minutes; $p < 0.001$). Group 1 showed less loss of elbow motion ($p = 0.008$) and higher humeroulnar ($p = 0.010$) and medial epicondylar epiphyseal angles ($p < 0.001$) — the largest difference measured, remaining significant after correction; loss of carrying angle was also lower ($p = 0.047$) but not significant after correction. The Baumann angle and Flynn rating did not differ. No iatrogenic ulnar nerve injury occurred.

Conclusions

Medial-pin augmentation was associated with better-preserved alignment and motion at final follow-up. MEEA may detect medial-column alignment differences not captured by the Baumann angle, making it the more sensitive comparative measure here, without increased nerve injury. Because allocation was non-randomized, these findings describe an association rather than proof of superior fixation strength, and support selective rather than routine use of the added medial wire.

Trial registration:

Not applicable. This is a retrospective observational cohort study of a previously performed surgical treatment, not a prospectively registered clinical trial.

Background

Pediatric supracondylar humeral fractures account for approximately 15% of all pediatric fractures and are the most common elbow fractures in children[1]. Closed reduction and percutaneous pinning (CRPP) is the gold-standard treatment for displaced (Gartland type II–III) fractures, aiming for anatomic reduction maintained by a construct that is mechanically sufficient yet biologically safe.

The optimal pin configuration remains debated. Lateral-only fixation avoids the medial side and the ulnar nerve, whereas adding a medial pin, or using a third lateral pin, has each been reported to improve construct stability in biomechanical and clinical studies[2–4]. Published comparisons between these approaches remain heterogeneous, reflecting persistent uncertainty about which construct best balances stability against nerve-injury risk[5].

We compared clinical and radiographic outcomes between a crossed construct (two lateral K-wires plus one medial K-wire via mini-open incision) and a lateral-only construct in children with Gartland type II–III supracondylar humeral fractures. Several randomized trials have already addressed this comparison; our 202-patient cohort instead adds two elements: systematic use of the medial epicondylar epiphyseal angle (MEEA) as a comparative radiographic endpoint, rather than solely a reduction-assessment tool, and a practical indication framework for when the added pin is warranted.

Methods

Ethics and Reporting

This retrospective cohort study was approved by the Başakşehir Çam and Sakura City Hospital Clinical Research Ethics Committee (approval no. 2021.10.248; reference KAEK/2021.10.248) and conducted in accordance with the Declaration of Helsinki. Written informed consent for surgery was obtained from a parent or legal guardian; because data were anonymized, separate consent for inclusion in this retrospective analysis was waived by the same committee. Reporting follows STROBE guidelines for observational studies[6]. In preparing this manuscript, the artificial intelligence tool QuillBot was used solely to correct grammar, improve fluency, and ensure correct punctuation; the authors are responsible for the scientific content and take full accountability for the manuscript.

Study Design and Patients

We reviewed all children treated for supracondylar humeral fractures at our department between February 2016 and February 2021. Of 238 surgically treated Gartland type II–III patients screened, 36 were excluded (12 late admission > 7 days, 8 open fractures, 6 preoperative neurovascular deficit

requiring exploration, 5 flexion-type fractures, 3 concomitant ipsilateral upper-limb injuries, 2 genetic/metabolic disorders), leaving 202 for analysis (Fig. 1).

Group Allocation

Group 1 (n = 117) received two divergent lateral K-wires plus one medial K-wire (crossed); Group 2 (n = 85) received two divergent lateral K-wires only, per the operative record. Configuration was not protocolized: three attending surgeons participated, some routinely using three pins for all type II–III fractures, others adding a medial pin only when intraoperative fluoroscopy after lateral pinning suggested residual instability or visible medial-column comminution — not a predefined radiographic or clinical threshold. This non-standardized indication is an important limitation, discussed below.

Fracture Classification

Fractures were classified by the modified Gartland system^[1] (type II: posterior cortex intact; IIIA: posteromedial displacement; IIIB: posterolateral displacement) on preoperative radiographs by two authors blinded to outcome, with disagreements resolved by consensus. Gartland subtype distribution, our available proxy for baseline fracture severity, did not differ significantly between groups (Table 2).

Surgical Technique

All procedures used general anesthesia and prophylactic intravenous cefazolin. After fluoroscopic-guided closed reduction, two divergent lateral K-wires were placed with confirmed bicortical purchase (Fig. 3). In Group 1, a medial K-wire was then added through a mini-open (≈ 1 cm) incision, with direct ulnar nerve visualization and protection before pin insertion (Fig. 2). K-wire diameter (1.2–2.0 mm) was selected by the surgeon according to patient size and bone quality rather than by protocol. A long-arm splint was applied with the elbow at 70–80° flexion.

Postoperative Management

Patients were reviewed clinically and radiographically at postoperative weeks 1, 3, 12, and 24. All K-wires in a given patient were removed together in the outpatient clinic at 3–4 weeks once early callus was visible radiographically, deferred up to 5 weeks if delayed. The splint was discontinued at K-wire removal, and supervised active motion began at that visit. Mean total follow-up was 28.4 months (range 18–46).

Outcome Measurements

Radiographs were measured on the institutional Picture Archiving and Communication System by two reviewers blinded to group allocation (mean of two measurements used): Baumann angle (BA), humeroulnar angle (HUA), MEEA, diaphysiometaphyseal angle (DMA), and anterior humeral line (AHL)

position, in both elbows, at final follow-up compared with the contralateral (uninjured) side (Table 1)[7, 8]. Carrying angle (CA) was measured clinically with a goniometer at the same visit. Loss of CA and loss of elbow range of motion (ROM) were defined as the absolute difference from the uninjured side; loss of reduction as a change of $\geq 10^\circ$ in BA or $\geq 5^\circ$ in the lateral humerocapitellar angle between the immediate postoperative and K-wire-removal radiographs, consistent with a recent large cohort study of alignment after K-wire fixation for this fracture population[9].

Table 1
Definitions and normal ranges of radiographic parameters used in this study

Parameter	Definition	Normal range	Reference
Baumann angle (BA)	Angle between the long axis of the humeral shaft and a line through the lateral condylar physis on AP view	64–81°	Calogero et al.[8]
Humeroulnar angle (HUA)	Angle between the long axis of the humeral shaft and the long axis of the ulna on AP view	8–18° valgus	—
Medial epicondylar epiphyseal angle (MEEA)	Angle between the medial epicondylar physeal line and the long axis of the humeral shaft on AP view	25–46° (mean $38.2^\circ \pm 4.2^\circ$)	Biyani et al. [7]
Diaphysiometaphyseal angle (DMA)	Angle between the diaphysis and the distal metaphysis of the humerus on AP view	84–94°	—
Anterior humeral line (AHL)	Line drawn along the anterior cortex of the humerus on lateral view; should intersect the middle third of the capitellum	Middle third of capitellum	Calogero et al.[8]
Carrying angle (CA)	Clinical angle between the long axes of the humerus and forearm with elbow extended and forearm supinated (goniometer)	5–15° valgus (varies with age and sex)	—
<i>MEEA normal range per Biyani et al. (1993): mean $38.2^\circ \pm 4.17^\circ$ SD, range 25–46° in 100 uninjured elbows. HUA, DMA, and CA are standard, widely used anatomical measurements presented here without a single attributable primary source.</i>			

Primary and Secondary Outcomes, and Statistical Analysis

The primary outcome was overall Flynn rating[10] at final follow-up. Secondary outcomes were loss of CA/ROM, complication rates, and the radiographic parameters above; MEEA was designated a priori as a key secondary outcome, consistent with this study’s stated aim (Background), not selected post hoc. Pin migration was defined as any visible change in wire position on follow-up radiographs, including back-out (proximal migration of the wire tip); no cases required unplanned early removal for this reason.

Normally distributed variables (kurtosis/skewness within ± 1.5) were compared with the independent-samples t-test; non-normal variables with the Mann–Whitney U-test; categorical variables with chi-square or Fisher exact test. Because multiple parameters were compared between the same two groups, the Benjamini–Hochberg procedure was applied to control the false-discovery rate ($q < 0.05$); results that lost significance after correction are identified consistently wherever reported. Analyses used IBM SPSS Statistics v22.0, two-sided, $\alpha = 0.05$.

Results

The study included 202 children: 117 (57.9%) in Group 1 and 85 (42.1%) in Group 2 (Fig. 1). Age (5.7 ± 2.1 vs 5.6 ± 2.3 years), sex, side, Gartland subtype distribution, and time from injury to surgery were comparable between groups (Table 2), supporting comparable baseline fracture severity between groups despite non-randomized allocation. Operative time was longer in Group 1 (40.7 ± 7.9 vs 24.2 ± 3.3 min; $p < 0.001$; $q < 0.001$).

Table 2
Demographic and clinical characteristics of the two groups

Parameter	Group 1 (lateral 2 + medial 1) n = 117	Group 2 (lateral 2 only) n = 85	Test statistic	p value
Age, years, mean $\pm$ SD	5.7 ± 2.1	5.6 ± 2.3	$t = 0.53$	0.599
Sex, male, n (%)	69 (59.0)	52 (61.2)	$\chi^2 = 0.10$	0.753
Side, left, n (%)	64 (54.7)	45 (52.9)	$\chi^2 = 0.06$	0.804
Gartland type II, n (%)	31 (26.5)	27 (31.8)	$\chi^2 = 0.83$	0.661
Gartland type IIIA, n (%)	49 (41.9)	35 (41.2)	—	—
Gartland type IIIB, n (%)	37 (31.6)	23 (27.1)	—	—
Time to surgery, hours, mean $\pm$ SD	13.0 ± 6.1	13.1 ± 6.6	$t = -0.16$	0.870
Operative time, minutes, mean $\pm$ SD	40.7 ± 7.9	24.2 ± 3.3	$t = 18.04$	$< 0.001^*$
Mean follow-up, months	28.7	28.0	—	—

* Significant after Benjamini–Hochberg correction ($q < 0.05$). SD: standard deviation.

At final follow-up, Group 1 showed less loss of CA ($3.1 \pm 2.4^\circ$ vs $3.9 \pm 3.1^\circ$; $p = 0.047$; $q = 0.078$, attenuated after correction) and less loss of elbow ROM ($4.6 \pm 3.8^\circ$ vs $6.2 \pm 4.5^\circ$; $p = 0.008$; $q = 0.024$) than Group 2 (Table 3). Overall Flynn rating did not differ significantly ($p = 0.331$).

Table 3
Clinical outcomes at final follow-up

Parameter	Group 1 n = 117	Group 2 n = 85	Test statistic	p value	q value (B–H)
Loss of carrying angle, °, mean ± SD	3.1 ± 2.4	3.9 ± 3.1	t = - 2.00	0.047	0.078
Loss of elbow ROM, °, mean ± SD	4.6 ± 3.8	6.2 ± 4.5	t = - 2.69	0.008	0.024*
Flynn rating: excellent, n (%)	75 (64.1)	48 (56.5)	$\chi^2 = 3.42$ (overall)	0.331	—
Flynn rating: good, n (%)	32 (27.4)	27 (31.8)	—	—	—
Flynn rating: fair, n (%)	7 (6.0)	7 (8.2)	—	—	—
Flynn rating: poor, n (%)	3 (2.5)	3 (3.5)	—	—	—
* Significant after Benjamini–Hochberg correction. ROM: range of motion; SD: standard deviation.					

Radiographically, Group 1 had a higher mean HUA ($12.3 \pm 3.1^\circ$ vs $11.1 \pm 3.4^\circ$; $p = 0.010$; $q = 0.027$) and higher median MEEA (39.0° [IQR 36.5–41.2°] vs 32.5° [29.8–35.4°]; $p < 0.001$; $q < 0.001$) – the largest between-group difference of any radiographic parameter measured (Table 4). Baumann angle, DMA, and the proportions with varus/valgus deformity did not differ significantly.

Table 4
Radiographic outcomes at final follow-up

Parameter	Group 1 n = 117	Group 2 n = 85	Test statistic	p value	q value (B–H)
Baumann angle, °, mean ± SD	74.2 ± 4.6	74.5 ± 4.8	t = - 0.56	0.575	—
Humeroulnar angle, °, mean ± SD	12.3 ± 3.1	11.1 ± 3.4	t = 2.61	0.010	0.027*
MEEA, °, median (IQR)	39.0 (36.5–41.2)	32.5 (29.8–35.4)	z = - 10.06	< 0.001	< 0.001*
Diaphysiometaphyseal angle, °, mean ± SD	88.7 ± 3.9	88.6 ± 4.1	t = 0.12	0.906	—
AHL within middle third of capitellum, n (%)	108 (92.3)	76 (89.4)	$\chi^2 = 2.12$	0.347	—
* Significant after Benjamini–Hochberg correction. AHL: anterior humeral line; MEEA: medial epicondylar epiphyseal angle; IQR: interquartile range.					

Complications were uncommon and similar between groups (Table 5): pin-tract infection (3.4% vs 3.5%; $p = 0.789$), asymptomatic pin migration including back-out (1.7% vs 2.4%; $p = 0.835$), loss of reduction (4.3% vs 8.2%; $p = 0.216$), and revision pinning (1.7% vs 3.5%; $p = 0.476$). No iatrogenic ulnar nerve injury,

vascular injury, or Volkmann ischemic contracture occurred in either group; the medial pin was placed via mini-open incision with direct nerve visualization in all 117 Group 1 cases.

Table 5
Complications

Complication	Group 1 n = 117, n (%)	Group 2 n = 85, n (%)	p value
Pin-tract infection (superficial)	4 (3.4)	3 (3.5)	0.789
Pin migration / back-out (asymptomatic)	2 (1.7)	2 (2.4)	0.835
Loss of reduction	5 (4.3)	7 (8.2)	0.216
Iatrogenic ulnar nerve injury	0 (0)	0 (0)	—
Vascular injury / Volkmann contracture	0 (0)	0 (0)	—
Revision surgery (any cause)	2 (1.7)	3 (3.5)	0.476
<i>Loss of reduction defined as $\geq 10^\circ$ change in Baumann angle or $\geq 5^\circ$ change in lateral humerocapitellar angle between immediate postoperative and K-wire-removal radiographs.</i>			

Discussion

In this cohort, medial-pin augmentation was associated with better-preserved elbow range of motion and more favorable radiographic alignment (MEEA, HUA) — differences surviving correction for multiple comparisons — without increased ulnar nerve injury; Flynn ratings did not differ, and the apparent difference in carrying angle did not remain significant after correction and is discussed only as an exploratory finding. Because allocation was non-randomized and the medial-pin indication was non-standardized, an important caveat applies: our primary endpoint was final-follow-up alignment and function, not immediate post-reduction stability, which could itself mask or mimic a true difference in fixation strength.

Our finding of better-preserved CA/ROM with crossed fixation agrees with meta-analyses reporting that crossed fixation lowers loss-of-reduction risk at the cost of higher ulnar-nerve-injury risk[2, 11, 18, 20, 21], though a 2026 non-inferiority randomized trial found no significant difference in reduction maintenance between constructs, reflecting the field's continuing shift toward lateral-entry fixation[5]. This heterogeneity likely reflects differences in fracture severity, surgeon experience, wire diameter, and lateral-pin divergence; carrying angle itself is a clinically meaningful parameter beyond cosmesis, given its documented association with valgus elbow alignment[19]. Notably, MEEA — introduced by Biyani et al. as a sensitive indicator of medial-column impaction (mean $38.2^\circ \pm 4.2^\circ$ in 100 uninjured elbows, range $25\text{--}46^\circ$)[7] — was the parameter that differed most strongly between our groups, exceeding the difference in Baumann angle, HUA, and DMA combined, consistent with the concept that medial-column impaction is a distinct risk of lateral-only fixation. Put differently, MEEA may detect medial-column

alignment differences that are not captured by the Baumann angle — a distinction that reframes our finding away from a blunt claim that the medial pin simply provides “more stable” fixation, and toward a more specific, testable hypothesis about which radiographic parameter is sensitive enough to detect a between-construct difference at all. To our knowledge, this is among the first comparative cohorts to use MEEA systematically as a between-group radiographic endpoint rather than solely a reduction-assessment tool; we suggest it offers a more discriminating perspective on medial-column integrity than the Baumann angle — itself recently re-characterized in an inter-observer reliability study[8] — and deserves wider routine use after CRPP for this fracture population.

A broader trend favors avoiding medial-entry pins altogether by adding a third lateral pin instead. In laboratory biomechanical models (cadaveric, synthetic-bone, finite-element), not clinical cohorts, a network meta-analysis of 12 such studies found that crossed or two-lateral-plus-medial constructs consistently rank highest for torsional and bending stability, with wire-augmented lateral constructs identified as a promising alternative and three-lateral-pin constructs approaching crossed-construct performance[3], a finding echoed in a 2026 finite-element analysis of medial-column comminution and K-wire configurations, which found the biomechanical penalty of avoiding the medial side is smallest in precisely the pattern where added stability is most sought[4]; these are mechanical, not clinical, findings. At the clinical level, a separate 2024 patient series of three-lateral-pin fixation (parallel or divergent) reported low rates of loss of reduction with no iatrogenic ulnar nerve injury[12, 13], though not directly compared with crossed fixation in one cohort. Although three lateral pins were not evaluated here, and the laboratory and clinical evidence above should not be weighted equally, this construct is a reasonable option when added stability is judged necessary but the surgeon prefers to avoid the medial side.

Regarding safety, no iatrogenic ulnar nerve injury occurred in either group; the medial pin was always placed via mini-open incision with direct nerve visualization, consistent with a large confirmatory series reporting a 0.43% injury rate with this technique — nearly ten-fold lower than pooled percutaneous (non-visualized) estimates — supporting direct visualization, rather than avoidance of the medial side per se, as the key safety factor[14]. Other recently described techniques for guided, non-rotational medial pin insertion report similarly low or absent iatrogenic ulnar nerve injury rates[16, 17], reinforcing that visualization and controlled insertion, not the medial entry point itself, are what determine nerve safety. We consider the mini-open technique an essential component of safe medial pinning whenever a medial pin is used.

Because this study cannot demonstrate superior mechanical strength, we do not conclude that a medial pin is required whenever lateral fixation alone is judged adequate: the added exposure, operative time, and residual ulnar-nerve risk are not justified once fluoroscopic stability is satisfactory. We suggest the medial pin, via mini-open incision, is most reasonably reserved for fractures in which fluoroscopy after lateral pinning shows residual instability or visible medial-column comminution, rather than applied routinely — the indication framework we propose for prospective testing.

Limitations

This study has several limitations. We did not systematically compare immediate postoperative and union radiographs, so we cannot claim the medial pin produces objectively “stronger” fixation — only that the crossed configuration was associated with better-preserved alignment and motion at final follow-up, with functional outcomes at least as good as, and on some measures better than, lateral-only fixation; these findings should therefore be regarded as hypothesis-generating rather than confirmatory, and this restriction to final-follow-up values — rather than the change from the immediate postoperative image — limits any claim about fixation strength specifically, as opposed to final alignment. Allocation was non-randomized with a non-standardized medial-pin indication, introducing selection bias in both directions: surgeons routinely using three pins may have treated fractures that would have done well with two (biasing toward equivalence), while those adding a pin selectively may have targeted more unstable fractures (biasing toward inferior Group 1 outcomes); the persistence of a Group 1 advantage despite this latter bias is reassuring but not conclusive. We did not perform formal propensity-score matching for this selection bias; the groups did not differ significantly on measured baseline characteristics, including Gartland subtype (Table 2), limiting gross confounding by these factors, though unmeasured intraoperative judgments of instability cannot be excluded, and a matched or adjusted analysis remains an important next step. K-wire diameter (1.2–2.0 mm) and medial-column comminution were not stratified in our analysis, though recent finite-element modeling confirms both variables meaningfully affect construct stiffness[15]; both are plausible confounders for a future study to address directly. We did not collect validated functional scores or systematically record time to radiographic union. Three attending surgeons participated, introducing possible technique variation, including in lateral-pin divergence. Finally, 28.4-month follow-up cannot detect later sequelae such as cubitus varus presenting during growth. A prospective, randomized, non-inferiority trial with standardized indications, immediate post-reduction radiographic comparison, and validated functional outcomes is needed before routine medial-pin augmentation can be recommended.

Conclusions

In this retrospective cohort, medial-pin augmentation via mini-open incision was associated with better-preserved elbow range of motion and more favorable radiographic alignment; the apparent carrying-angle difference did not survive correction for multiple comparisons and should be read as exploratory only. The clearest signal was radiographic: MEEA may detect medial-column alignment differences that are not captured by the Baumann angle, making it a more sensitive comparative measure of medial-column alignment than the Baumann angle in this setting, without increased iatrogenic ulnar nerve injury. Because allocation was non-randomized, these findings are hypothesis-generating: functional results with the crossed construct were as good as, and on several measures better than, lateral-only fixation, without demonstrating that lateral-only fixation is mechanically insufficient when judged adequate at surgery. We support selective rather than routine addition of the medial pin — reserved for intraoperatively apparent residual instability or medial comminution — pending a randomized trial with standardized indications and validated functional outcomes.

Abbreviations

AHL

Anterior humeral line

BA

Baumann angle

CA

Carrying angle

CRPP

Closed reduction and percutaneous pinning

DMA

Diaphysiometaphyseal angle

HUA

Humeroulnar angle

IQR

Interquartile range

MEEA

Medial epicondylar epiphyseal angle

ROM

Range of motion

SD

Standard deviation

STROBE

Strengthening the Reporting of Observational Studies in Epidemiology.

Declarations

Ethics approval and consent to participate

This study was approved by the Başakşehir Çam and Sakura City Hospital Clinical Research Ethics Committee (approval no. 2021.10.248; reference KAEK/2021.10.248) and was conducted in accordance with the Declaration of Helsinki. Written informed consent for surgery was obtained from a parent or legal guardian of all participants; because this analysis used anonymized retrospective data, the same committee waived the requirement for separate consent to the research use of these data.

Consent for publication

All radiographs included in this manuscript have been fully de-identified and contain no patient-identifying information. Not applicable beyond this, as no individual patient photographs, videos, or identifiable case-report details are included.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

YE and OA conceived and designed the study. YE, OA, and OC acquired the data. YE and OA analyzed and interpreted the data. YE, OA, and OC drafted the manuscript. YE, OA, OC, and CE critically revised the manuscript for important intellectual content. YE and OC provided technical and material support. YE, OA, OC, and CE supervised the work. All authors read and approved the final manuscript.

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Authors' information

YE, OA, OC, and CE are practicing orthopaedic and hand surgeons in Istanbul, Turkey, with clinical interests in pediatric upper-extremity trauma.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Figures

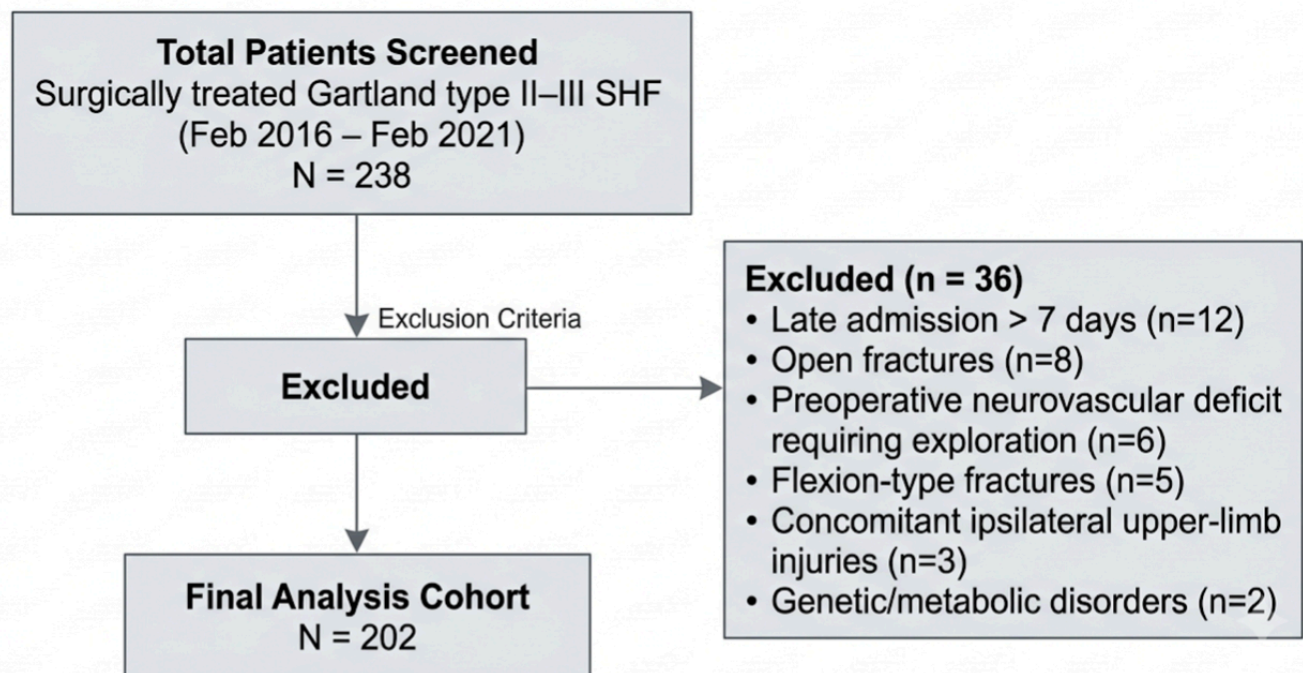


Figure 1

Figure 1

STROBE flow diagram of patient selection. Of 238 screened patients, 36 were excluded for the reasons listed, leaving 202 patients allocated to two groups by pin configuration.

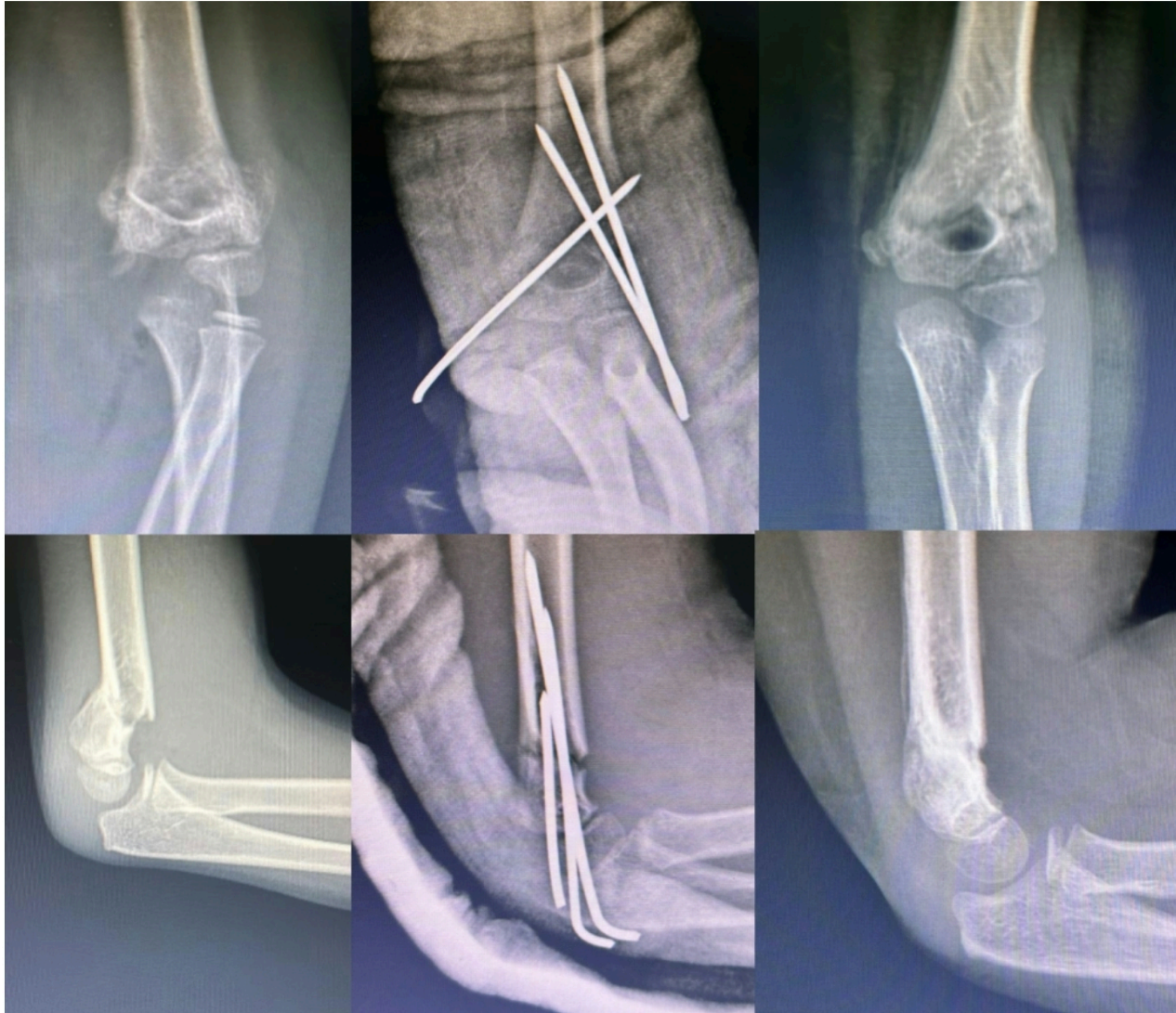


Figure 2

Representative radiographs of a patient treated with two divergent lateral K-wires plus one medial K-wire placed via a mini-open incision (Group 1). Top row: immediate postoperative radiographs (anteroposterior and lateral views) showing the crossed three-wire construct. Bottom row: radiographs at final follow-up after wire removal, showing maintained alignment with the crossed construct.

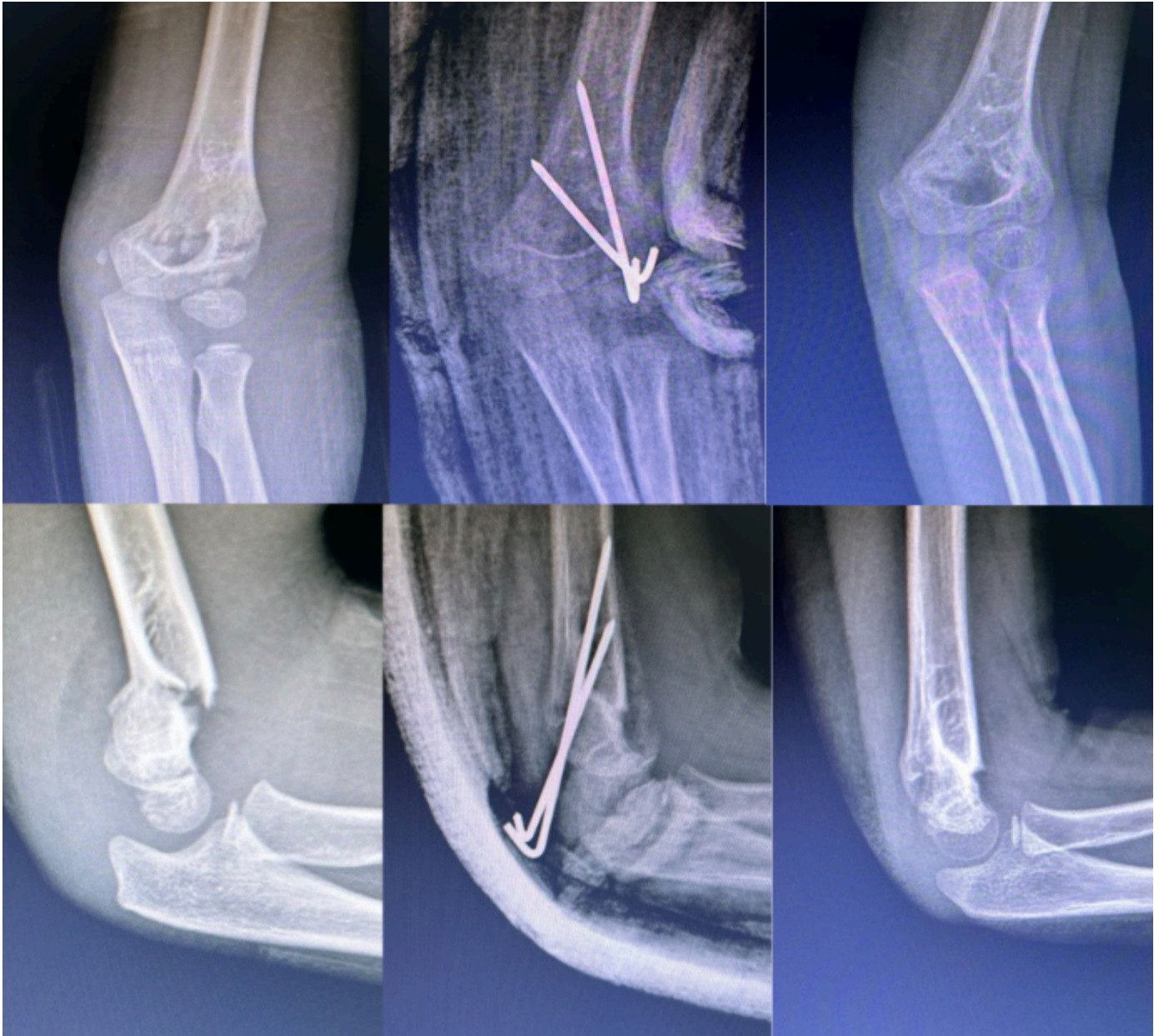


Figure 3

Representative radiographs of a patient treated with two divergent lateral K-wires only (Group 2). Top row: immediate postoperative radiographs (anteroposterior and lateral views) showing the two-wire lateral-entry construct. Bottom row: radiographs at final follow-up after wire removal, showing maintained alignment without a medial-entry wire.