JPOSP

Journal of Paediatric Orthopaedic Society of Pakistan

Quarterly

jposp2025@gmail.com

Vol. 1; Issue 1
June 2026

The Paediatric Orthopaedic Society of Pakistan

President
Prof. Atiq uz zaman

Vice President
Dr. Abbas Ali

General Secretary
Dr. Pervez Ali

Treasurer / JS
Dr. Muhammad Aslam Mengal

Executive Member
Dr. Muhammad Mubashir (Punjab)
Dr. Imran Khan (KPK)
Dr. Noman Parekh (Sindh)
Dr. Jamil Ahmed Zehri (Baluchistan)

The Past Presidents:
Prof. Javed Iqbal Anjum (2012-2017)
Prof. Anisuddin Bhatti (2018-2020)
Prof. Rana Dilawez Nadeem (2020-2021)
Prof. Sikander Hayat (2021-2023)
Prof. Muhammad Amin Chinoy (2023-2025)

JPOSP
Journal of Paediatric Orthopaedic Society of Pakistan
Official Publication of Paediatric Orthopaedic Society of Pakistan
Applied for registration: ISSN, HEC, PMDC, OJS, SECP

Correspondence Address for JPOSP:
Room # 301 (B), 3rd floor 106-c, Al-Murtaza Commercial Lane-1, Phase-8
Defence Housing Authority (DHA). Karachi. Pakistan
Email: contactus@jposp.org.pk, jposp2025@gmail.com

Guidelines for Authors

The journal of Paediatric Orthopaedic Society of Pakistan (JPOSP) requires manuscripts to follow ICMJE recommendations 2025, https://www.icmje.org/news-and-editorials/updated_recommendations_jan2025.html. Manuscript to be submitted on email id: jposp2025@gmail.com with a copy to managing editor JPOSP.

Key features for manuscript Formatting:
Fonts: Times New Roman. **Size**: title 14pt, body 12pt. **Alignment**: justified. **Line space**; 1.5. **Page:** all pages numbered to start from title page. **Not allowed**: bold fonts, capital letters, colour or underline
sentences. **Submissions:** in Microsoft Word file

- **Title Page:** Category of the manuscript (original article, case report, Review article, Metanalysis etc). Title of manuscript with full name of all authors. Each author's affiliations, contact numbers and emails. Corresponding author's name, address, email and cell number. Authors contribution to study as defined in ICMJE requirement. Conflict of interest. Mention total word count of the manuscript, and in abstract (excluding tables and references).

  - **Abstract page**: Structured in sequence of; Objectives, Methods, Results, Conclusion, Key words.
  - **Manuscript:** start on a new page after abstract. Structured in sequence of; Introduction, Methods, Statistical analysis, Results, Citation of tables and figures, Discussion, limitations, strength, Conclusion, References. Tables, and Figures to insert at the end of manuscript, each one on a separate page. Content of each section detailed as bellow:

    - **Introduction:** Two or three paragraphs with not more than 10 refences. Appropriate rationale for conducting the study must be written in the last paragraph. Data and conclusions from other studies must not be included.
    - **Methods:** Must clearly state the ethical review statement, study design, place of study, years of study, study duration, sampling technique, sample size calculation, data collection procedure, criteria for inclusion & exclusion, follow-up procedure with duration, identification of implants and pharmacy used, statistical methods.
    - **Results:** Results should be presented clearly and in accordance with study objective. Results mentioned in text should not be represented in tables or graphs or vice versa.
    - **Discussion:** Important findings of results should be interpreted/ analysed. It should be written in separate
      paragraphs and each important variable of the study must be discussed in a single paragraph.
    - **Strength and weakness** of the study and recommendations if any must be written in the last
      paragraph of discussion.
    - **Conclusion:** Conclusion should be relevant to the aim, objective of the study, not more than two paragraphs.

- **References:** Vancouver style, mostly published during last 5-7 years and 25% must be from native literature
- **Tables & Figures:** total not exceeding 5 in numbers

- **Ethical Compliance:** Consent of Parents / Caretaker / guardian consent must be declared for original study, case reports or series.
- **Supporting Documents:**
  - **Ethical Review Board (ERB) or Institutional Review Board (IRB) Certificate:** approval from the hospital and questionnaire/research proforma along with manuscript, otherwise manuscript will not be processed.
  - **Covering letter**: Signed by Corresponding author, citing importance of study and reasons for publication, mention core key features of study. Submit scanned (PDF).
  - **Authorship Certificate:** Criteria according to "ICMJE Authorship Criteria", signed by all authors in sequence of authorship stating their contribution to the study.
  - **Undertaking:** that study is original, never published before, not rejected by any other journal, and shall not be submitted to any other journal unless returned as not accepted with JPOSP
- The JPOSP does not issue acceptance letter for the manuscript, only manuscript is acknowledged once received.
- Once authorship certificate is submitted no further changes in the author's list is allowed.
- The editors have the right to do necessary changes in the manuscript during the final editing of the manuscript.
- RCT must have Trial number from DRAP or abroad

- **Publication Charges:**
  - **Original article:** Rs.20,000.00., **Review Article**: Rs.25,000.00., **Case Report** & Editorial: Rs.10,000.00. [POSP members & Paediatric Orthopaedic Fellowship Trainees, exempted from above charges]
  - **Submission fee:** Rs 5000.00 [Non-refundable]

- **Words Count:**

MANUSCRIPT	ABSTRACT	ABSTRACT WORD COUNT	TOTAL COUNT	REFERENCES	Tables & figures
Original article	Structured	250	3000	25	5+
Review article	Un-structured	150	4000	40	5
Case Report	Un-structured	150	1250	10	2
Editorial	Un-structured	--	1500	10	--

Journal of Paediatric Orthopaedic Society of Pakistan - JPOSP
JPOSP, Vol.1, No.1, June 2026

Table of Contents

Editorial

The Evolution of Paediatric Orthopaedics in Pakistan: Past, Present and Future.

Anisuddin Bhatti, Saddam Mazar Baloch

Over the years, Paediatric Orthopaedics has evolved beyond deformity correction, trauma management, bone and joint infections and metabolic diseases to embrace Social Orthopaedics. This addresses and tackles to: restore function, prevent disability, assist for optimal growth, provide psycho-socio-economic aid through various support societies and rehabilitation centres; all to prevent lifelong stigma on affected individual and alleviate psycho-social burden on patients, parents and communities. Mostly, these goals are achieved through early recognition and timely management of congenital, developmental, metabolic and post-traumatic sequelae and deformities, using the best evidence-based conservative protocols, mini-invasive surgeries, limb preservation and deformity correction-lengthening surgeries.

However, over the decades in our region, the Paediatric orthopaedics was essentially practiced by general orthopaedic surgeons and few paediatric surgeons. They mostly handled paediatric fractures with primitive techniques available then. That included conservative casting, tractions to open methods by use of Rush pins, K-wires in paediatric fractures. While congenital deformities; including congenital-Developmental Dysplastic hip (DDH,) Clubfoot (CFD), Vertical Talus (CVT), and Congenital Knee Dislocation (CKD) were mostly treated with extensive open reductions with significantly compromised results. While high majority of these cases including scoliosis were either left untreated or inadequately treated with significantly compromised outcomes at adolescence. These approaches of inadequate management, were also being related by folks, friends and fraternity of medical practitioners to various superstitious belief among community and ignorant health care caregivers, that: "surgery is a better option than cumbersome long duration conservative treatment in CFD, CVT, CKD and while other relates "surgery in these deformities is, better to be done once child is old enough" **[1,2].**

Breaking the Barrier of conceptually delayed commencement of treatment of congenital-developmental MSK deformities the **Pakistan Orthopaedic Association"** (POA) established "**Paediatric Orthopaedic Forum**" (POF) in 2006; that played a pivotal role to fosters a bridge between local realities with international benchmarks. The POF accomplished the target with a structured program of creating awareness among folks and medical fraternity; held series of public camps, media propagation sessions and hand on skill transformation workshop. That included Clubfoot Ponseti management, DDH, CKD, CVT bracing casting and early interventions as minimally required. That also included Paediatric trauma courses, mini-invasive surgical techniques and Cerebral Palsy Reconstruction Surgery workshops. These workshops were initially carried out by POF-POA faculty in collaboration with regional health facilities and later developed multidisciplinary collaboration with international Paediatric Orthopaedic community. To accomplish targets a structured 3-phase program of "**Pakistan Clubfoot Disability Prevention Program** (Pak-CFDP) was developed and implemented phase 1, successfully from 2006-2012 by sensitization of orthopaedic community, family physicians and folks with series of awareness programs, clubfoot camps and media programs. In the context the 1st Paediatric Orthopaedic Seminar and Ponseti workshop was held on 25-26 November 2006. followed by series of Ponseti workshops were held twice a year. During 2008 Pak-Orthocon the international experts Prof. DK Taneja and Dr. Yasir Elbatrawy were invited for Pre-conference Ponseti workshop and full day Paediatric Orthopaedic session. Subsequently series of Ponseti workshops, educational programs and

public medical camps were held during 2028-2012 with international participation by Dr. Zaid Al Abaudi, Marc Sinclare and other experts. An outstanding milestone was witnessed during Pak-Orthocon 2012, wherein Prof. Jose A Morcuende, Prof. Shafiq Pirani were invited to hold Ponseti CF workshop and deliberated their experience in Paediatric in Orthocon sessions. This great milestone paved way for robust creation of **"Paediatric Orthopaedic Society of Pakistan** (2012), **Ponseti International Pakistan** (2013) and creation of Pakistan Clubfoot registry hosted by ICR. These events opened venues for in-house mentorship opportunities at Ponseti International Association, IOWA-USA with Prof. Jose Morcuende and at Sao Paulo Brazil with Dr. Monica Nogueira). Following successful implementation of phase I Pak-CFDP (2006-2012), Phase II **"Mentorship Training Opportunities" (MTO**) sponsored by PIA-USAID leadership development was held for in-house residential hand on skill training for a two weeks continuous duration for POA members was conducted by native Ponseti faculty spread over to during 2014-2016. The Phase III scale-up (2016-to-date) was then adopted by mentors & mentees of MTO in their regions. Who thereafter established 160 dedicated clubfoot clinics all over Pakistan. The testimony of success of Pak-CFDP, its implementations and outcome has significantly endorsed in Clubfoot Disability: Model for Sustainable Health Systems Programs in Three Countries, published by Ponseti International Association from University of Iowa in 2015 **[7]** and barrage of publications on Ponseti methodology indicating significant decline in age of 1st consult for CFD from walking age to soon after birth and good bye to extensive surgeries like Turco's PMR etc and Kites conservative methodology **[3,4,5,6]**. The scale-up programs interestingly encouraged to hold live surgery workshops on other Paediatric deformities and trauma management with up-date techniques and multiple hand on training courses including DDH, CVT, CKD, Cerebral palsy reconstruction and mini-invasive technique workshops on Paediatric trauma. This scale-up multidisciplinary workshops, seminars and interactive courses encouraged the native POSP - POA community to **"Paediatric Orthopaedic Registry of Pakistan" PORP**, launched in September 2023 and got publish evidence-based research, aligned with contemporary global trends and playing another pivotal role to fosters a bridge between local realities with international benchmarks.

In the evolution of Paediatric Orthopaedics in Pakistan the remarkable milestone includes the POA and POSP scholarships for one-year durations and the most recent one eagerly awaited the second fellowship "**FCPS Paediatric Orthopaedics"**. CPSP has started this 2-years program with examination in January 2025 and till date accredited 15 dedicated Paediatric Orthopaedics units, all-over country, providing international benchmark facilities.

In an era where knowledge dissemination is on tips and trends of seconds, it is imperative for progress to bring a platform that shall address the pressing priority to document, disseminate, and publish the native research to elevate Paediatric Orthopaedic care in Pakistan in alignment with global trends. The establishment of JPOSP reflects our collective commitment to promoting research, improving clinical practice, and encouraging scholarly engagement among orthopaedic surgeons, trainees, and allied professionals. To advance these aims, JPOSP confidently invite you to contribute original articles, case reports and evidence-based literature reviews, highlighting truly unique disease patterns, ever encountered in the developed world, for the successive issue of JPOSP. This is our beginning, we shall move forward with the conviction that every child deserves expert, evidence-based orthopaedic care and that the knowledge fostered within these pages will help make that a reality.

References.

1. **Anisuddin Bhatti**, et al. Epidemiology of Developmental Dysplasia of Hip in Pakistan: Insights from the Paediatric Orthopaedic Registry Pakistan (PORP). Pak J Med Sci. 2025;41(3):668-675.doi: https://doi.org/10.12669/pjms.41.3.10922
2. **Burfat AM,** et al. Understanding the knowledge and perceptions about clubfoot in Karachi, Pakistan: a qualitative exploration. Iowa Orthop. 2013 33:149–152.

3. **Ghazanfar Ali Shah**, et al. Management of congenital talipes equinovarus in Sheikh Zayed Hospital: A prospective study of 53 cases. J Pak Orthop Assoc 1990;2:22-38.
4. **Riaz Ahmed Shail**, et al. Turco's one stage postromedial release in idiopathic CTEV. J Pakistan Orthop Assoc 1992; 2(5): 67-76.
5. **Anisuddin Bhatti**, et al. One stage correction of congenital dislocation of the hip in older children. (Original article). *J Col Phy Surg Pak,* 1997, 7 (3): 113-117.
6. **Javed Iqbal**. Management of clubfoot using Ponseti method. Pak Paed J. 2007:3(4):201-205.
7. **Jose A Morcuende, etal.** Clubfoot Disability: Model for Sustainable Health Systems Programs in Three Countries. Ponseti International Association. The University of Iowa. 2015.Feb.1-39

Original Article (Pre-Reviewed)

Outcomes of Closed Reduction and Percutaneous Pinning for Paediatric Epiphyseo-Metaphyseal Upper Limb Fractures: A Retrospective Cohort Study and Predictors of Failure.

Tehreem Mehmood [1] MBBS, **Saddam Mazar Baloch** [2] MS Orthopaedics, **Anisuddin Bhatti** [3] FCPS Orthopaedics.
Affiliation: Department of Orthopaedics & Paediatric Orthopaedics, Dr. Ziauddin University Hospital, Clifton Campus, Karachi.

Abstract:

Objectives: Minimally invasive, closed reduction and percutaneous pinning (CRPP) is widely practiced for displaced paediatric epiphyseo-metaphyseal upper limb fractures to achieve the best outcomes, without significant complications. However, native data is meagrely available. This study reports comparative outcomes and identifies predictors for failures of closed reduction commonly observed in our native practice.

Methods: This observational study included 40 children aged 1-18 years who underwent CRPP, at Dr. Ziauddin University Hospital Clifton, Karachi managed between January 2022 and June 2025. Demographics, fracture morphology, radiological parameters, clinical outcome as per Quick DASH scores or Flynn's criteria and Paediatric quality of life (PedsQL) were assessed at a mean follow-up of 6 months (minimum 6 months).

Results: Among cohort of the 40 children, male to female ratio was 2:1. Metaphyseal fractures were encountered in 20 (50%) patients, supracondylar humerus fractures (SCHF) in 17 (42.5%) while 3 (7.5%) were epiphyseal injuries. Overall, CRPP succeeded in 33 (82.5%), while 7 (17.5%) required Open reduction (OR) including 2 (5%) with planned OR. Among 17 SCHF, mean Baumann's angle achieved is 73.8 ± 9.1 degrees, radiological parameters were also within normal limits in other epiphyseo-metaphyseal fractures. Two of SCHF (11.8%) had transient elbow stiffness. No deep-seated infections, growth arrests, or permanent neurovascular deficits occurred among both groups. Overall, Quick DASH scores was excellent in 30 (75%) including 87% of SCHF. Whereas mild-to-moderate disability was observed in 10 (25%) of overall cases. As per PedsQL 86.8 ± 6.3 patients appreciated good overall quality of life.

Conclusion: CRPP is safe and effective method to manage Paediatric epiphyseo-metaphyseal fractures reporting early within 2 weeks of injury, whereas delayed presentation leads to compromised outcome. The teenage with high BMI, single-bone fracture in forearm, comminution, gross swelling and delayed were the significant predictor for the failed closed reduction.

Keywords: Paediatric fractures; Upper Extremity; Closed Fracture Reduction; Fracture Fixation; Complications; Supracondylar Distal Humerus Fractures; Wrist Fracture; Treatment Outcome; Outcomes Assessment

Corresponding Author:
Dr. Tehreem Mehmood PGT
FCPS Orthopaedic
Dr. Ziauddin University Hospital, Clifton, Karachi Email:
tehreem.mehmood10@zu.edu.pk

Introduction

Upper limb fractures are the most common injuries of paediatric population, the most common of them being distal forearm epiphyseo-metaphyseal 25% and 15-18% being supracondylar Humerus (SCH) fractures **[1, 2, 3]**. The majority of these can be managed conservatively, wherein some degree of left-over angulation is remodelled to in due course of time **[4]**. Whereas, grossly displaced unstable fractures like Gartland 3, 4 / AO 13-M/3.1 **(**III**) - (**IV**),** distal radio-ulnar overlapped and distal radius single bone displaced fractures, often require requires expertise to reduces and thereafter CRPP to achieve anatomical reduction, prevent ensuing deformities, functional disability and achieve optimum outcomes during subsequent growth **[1, 5]**. The MI-CRPP reduced surgery time, minimise soft tissue damage, scar as none, minimum risks of surgical site infection and almost none physeal growth disturbances at long term **[6, 7].** Nevertheless, beside expertise to develop, the surgeon's patience and adherence to follow principles, minimised complications that may arise during the procedure, like tethering of neurovascular bundle, tendon injury pin track infection and failure reductions **[8].** We are presenting outcome of cohort of 40 children with displaced upper limb supracondylar and epiphyseo-metaphyseal fractures managed with CRPP, including early to delayed presenting cases, findings compared to published literature and to define the predictors of failure of CRPP.

Hypothesis:

Earlier presentation, lower body mass, reduced swelling and less comminution of fractures are associated with better clinic-radiological outcomes.

Working Definitions:

Kapandji Technique A percutaneous reduction method in which a Kirschner wire is inserted into the fracture site, to leverage and lock the bone fragments into place, mostly at distal radius. [17]**.,** **Joystick Manoeuvre** A reduction method in which a percutaneously inserted K-wire or instrument is used as a lever to manipulate and align fracture fragments under imaging guidance. [16]**., Blount's Technique** A method of closed reduction for supracondylar humerus fractures involving traction followed by elbow hyperflexion to maintain fracture alignment, often relying on an intact posterior periosteum for stability. [12]., Mubarak and David's Technique A PP method for SCHF in which lateral entry K-wires are inserted in a divergent configuration to stabilize both the medial and lateral columns of the distal humerus, providing adequate fixation while avoiding the risk of ulnar nerve injury associated with medial pin placement.[15]**., Radial Epiphyseal Angle** the angle between the long axis of the radial head and the line perpendicular to the physis, to assess alignment at the growth plate region, in paediatric fractures involving the physis. [26] [27]**. Metaphyseo-Diaphyseal Angle** A radiographic angle formed between the metaphysis and diaphysis of a long bone, to evaluate alignment and detect angular deformities following fracture reduction. [26]**. Baumann's Angle** A radiographic measurement on anteroposterior elbow X-rays, between the

long-axis of the humeral shaft and the physeal line of the lateral condyle, to assess coronal alignment in SCHF. [26]

Methods

This observational study cohort included 40 children aged 1-18 years of either gender, who underwent CRPP and planned OR, for epiphyseo-metaphyseal upper limb fractures at Dr. Ziauddin University Hospital Clifton, Karachi from 1st January 2022 to 30th June 2025. The study followed STROBE guidelines and received institutional ethical approval (Reference: 11531125TMORT). Patient's data extracted from HIMS, using consecutive sampling technique to minimize selection bias. Inclusion criteria comprised of SCHF, metaphyseal, and epiphyseal fractures of upper limb treated CRPP, with or without conversion to open reduction. Patients presenting with open fractures, pathological fractures, metabolic bone disease, osteogenesis imperfecta or fractures older than 3 weeks were excluded. Techniques followed Arbeitsgemeinschaft für Osteosynthesefragen (AO) principles **[10-11].** The follow-up protocol adopted with clinical and radiological evaluation as per fracture, at 2, 4, 12 weeks, 6 months (minimum), and 12 months. Outcomes were assessed using QuickDASH and PedsQL questionnaires. Radiological parameters included Baumann's angle (SCHF), epiphyseal angle, and metaphyseo-diaphyseal angle.

Patients were prepared with standard general anaesthesia protocol and sterile attires. Epiphyseo-metaphyseal fractures were manipulated with "Closed reduction technique" as defined in AO surgery methods **[10-11]**. SCHF were manipulated using Blount's technique **[12].** Once stable position was achieved and confirmed under C-arm, fractures were fixed with CR-PCP pinning. SCHF were fixed with lateral-entry K-wires (typically two for stable fractures and three or more for unstable patterns), ensuring bi-cortical fixation and adequate pin spread **[13, 14].** Unstable fracture with medial comminution ~~is~~ were either stabilized with K-wires through medial epicondyle via a 1cm incision with safe mobilization of ulnar nerve or by Mubarak and David's technique **[15].** Other epiphyseo-metaphyseal fractures were fixed with crossed K-wires following adequate reduction under C-arm. Few cases however required joystick maneuver **[16]** or Kapandji technique for distal radius fractures **[17**]. Pins were bent, cut and left exposed under protected dressing and cast. Failed CR were managed with mini incision open reduction, along with few planned open reductions for stable reduction and fixation. Pins were mostly removed within three weeks, with dressing through window at 2 weeks, after pin removal, a skin-tight cast was applied for another 2-3 weeks as needed, with monitoring of progressive callus formation on radiographs.

The evaluation parameters included patient demographics, fracture generics, radiological parameters and complications, at average follow-up duration of 6 months. Clinically assessed with Quick DASH score and Paediatric Quality of Life Assessment. While radiologic evaluation made on individual criteria for each fracture region using epiphseo-metaphyseal, metaphyseo-diaphyseal angles, rotational profile and Baumann's angle in SCHF.

Data Analysis:
Data were analysed using SPSS version 23, Descriptive statistics are presented as mean ± SD for continuous variables and frequencies/percentages for categorical variables. Due to the small number of failures (n=7), formal comparative statistics for predictors were not

performed; associations are reported descriptively. $P < 0.05$ was considered significant where applicable. No adjustment for confounders was made given the descriptive design.

Results:

A total of 40 paediatric patients were included in the study. Of these 40 children 26 (65%) were male, females 14 (35%). Twenty of them were minor children (1-6 years), 16 in school age (7–12 years) while 4 children were teenage (13–18 years) were included. Similarly, male children experienced the higher number of injuries across most mechanisms, including high impact force injures in 23 male children, while 11 children were female **(Figure 1)**

Figure 1 Mechanism of Injury across age group and genders

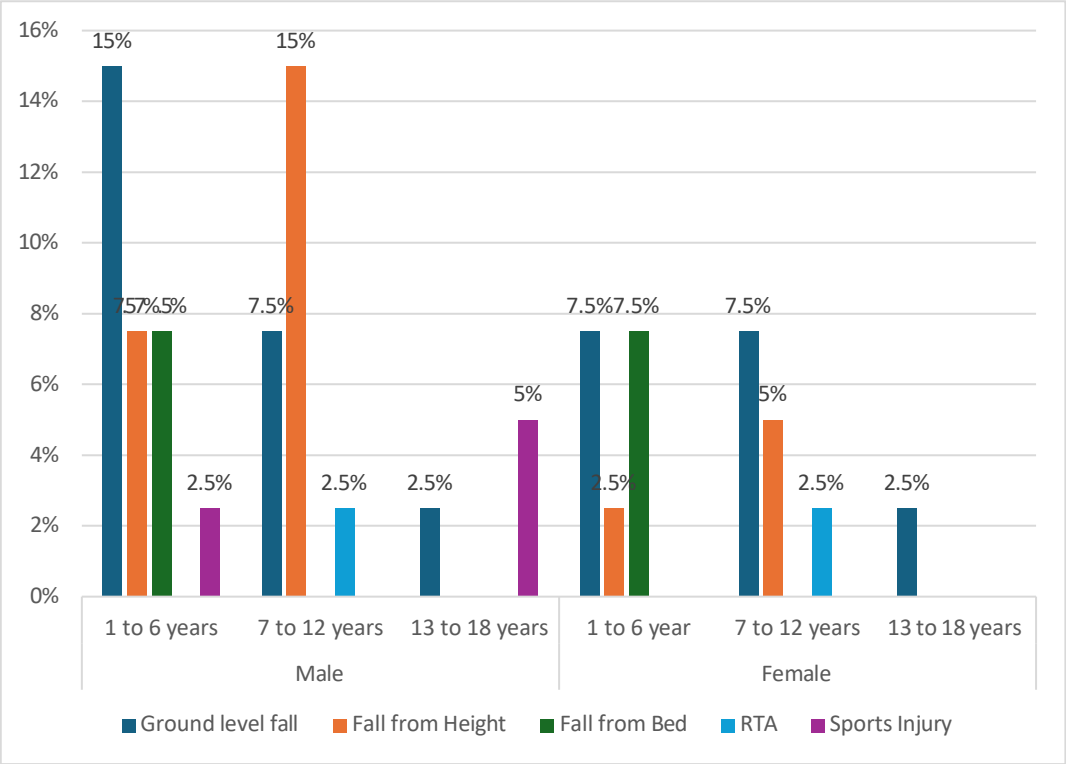


Table 1, revealed; the most common fracture (50%) were the metaphysis, followed by SCH (42.5%) and epiphyseal injuries in 3 (7.5%). The closed reduction was the most common procedure performed with total of 33 patients (82.5%) patients.

All cases were divided in 2 groups, Group 1 - 17 (42.5%) were SCH fractures and Group 2 – 23 (57.5%) were epiphyseo-metaphyseal fractures. In group 1, 3 (18%) patients with SCHF required open reduction (1 (6%) planed OR and 2 (12%) failed CR) while 14 (82%) were successfully treated with CRPP. Among epiphyseo-metaphyseal fractures 4 (18%) required open reduction (1 (4%) planed OR and 3 (14%) failed CR) while 19 (82%) were treated with CRPP.

In total, 7 (17.5%) cases, required open reduction. Two (5%) were planned OR and 5 (12.5%) converted to OR after failed CR. However, fracture classification or injury pattern did not influence the treatment modality.

Three months post-surgery Baumann's angle of SCH fractures treated with CR

and OR was within normal range of 73.8 ± 9.1. The mean metaphyseal-diaphyseal angle was within normal range, 2.8 ± 3° ulna, 3.5 ± 2.5° radius and humerus 8.3 ± 9.4°. The mean radial epiphyseal angle was 8.75 ± 4.7° for 2(66%) fractures treated with CR, however 1 (33%) required OR intra-operatively.

Functional outcomes in patients with supracondylar fracture were assessed using Flynn's criteria. All patients achieved satisfactory results, with most classified as excellent (70%) or good (17%) outcomes. A smaller proportion of patients fell into the fair category, accounting for 2 (13%) of cases, while no patients had poor outcomes.

Quick DASH score, evaluated in other epiphyseal-metaphyseal fractures, showed that majority of the patients 30 (75%) had a score between 0-25, depicting excellent recovery and very low disability. Ten patients (25%) had an average score between 25-50 showing mild to moderate disability, and no patient suffered from severe or extremely severe disability.

PedsQL assessment demonstrated favourable outcomes across all domains. The highest mean score was observed in physical functioning (89.2 ± 6.8), indicating excellent recovery of physical activity. Social functioning (87.6 ± 6.2) and emotional functioning (84.5 ± 7.4) were also high, reflecting good psychosocial well-being. School functioning showed comparatively lower but still satisfactory scores (81.3 ± 8.1). The PedsQL score was 86.8 ± 6.3, indicating good overall quality of life in the study population following treatment.

Table 1 Fracture with AO Classification [18] and the mode of treatment used

Site of fracture	Bone Involved	AO Classification		Treatment method			Radiological Evaluation		
Site & Frequency	Site & Frequency	Frequency		CR N-33	Planed OR N-2	Failed CR-OR N- 5	Mode of Evaluation	Mean Angle	P-Value
Supracondylar 17 (42.5%)	Distal Humerus SCHF only 17 (100%)	13-M/3.1 (III)	12 (70%)	9	1	1	Baumann's angle	73.8 ± 9.1	< 0.05
		13-M/3.1 (IV)	5 (30%)	4	0	1			
Epiphysis 3 (7.5%)	Proximal Radius 3 (100%)	21r-E/1.1 (II)	3 (100%)	2	0	1	Radial Epiphyseal angle	8.75 ± 4.7	0.034
Metaphysis 20 (50%)	Proximal Humerus 3 (15%)	11-M/3.1	3 (100%)	3	0	0	Metaphyseo-diaphyseal angle	8.3 ± 9.4	0.026
	Proximal Ulna 1 (5%)	21u-M/3.1	1 (50%)	1	0	0		2.8 ± 3	0.073
	Distal Ulna 1 (5%)	23u-M/3.1	1 (50%)	1	0	0			
	Distal Radius & Ulna 6 (30%)	23-M/3.1	6 (100%)	5	1	1			
	Proximal Radius 1 (5%)	21r-M/3.1 (II)	1 (11.1%)	1	0	0		3.5 ± 2.5	< 0.05
	Distal Radius 8 (40%)	23r-M/3.1	8 (88.9%)	7	0	1			
N=40				**33 (82.5%)**	**2 (5%)**	**5 (12.5%)**			
Abbreviations: CR – closed reduction, OR – open reduction; P values have been compared to normative values (one-sample t-test)									

Table 2 Flynn's criteria for supracondylar humerus fractures

Result	Rating	Cosmetic factor: Carrying angle	Functional factor: Motion Loss	Our Outcome
Satisfactory	**Excellent**	0-5	0-5	**12 (70%)**
	Good	>5-10	>5-10	**3 (17%)**
	Fair	>10-15	>10-15	**2 (13%)**
Unsatisfactory	**Poor**	>15	>15	**0**

Table 3 Functional Outcome Evaluation with Quick Dash Score

Score	Interpretation	Outcome
0-25	Excellent recovery, low disability	**30 (75%)**
25-50	Mild to moderate disability	**10 (25%)**
50-75	Severe disability	**0**
75-100	Extremely severe disability	**0**

Table 4 Paediatric quality of life outcome at 6 months follow-up

Domain	Mean ± SD	p-value
Physical Functioning	89.2 ± 6.8	<0.001
Emotional Functioning	84.5 ± 7.4	<0.001
Social Functioning	87.6 ± 6.2	<0.001
School Functioning	81.3 ± 8.1	0.003
Total Score	86.8 ± 6.3	<0.001

p-value derived using one-sample t-test comparing observed means to normative population value (mean=80)

Figure 2 shows Supracondylar humerus fracture (AO 13-M/3.1, Gartland III) in a 10-year-old male. Failed initial CR, subsequently treated with CRPP under GA using the Mubarak maneuver and three lateral-entry K-wires. At 6 months: full ROM (range of motion) and normal Baumann's angle.

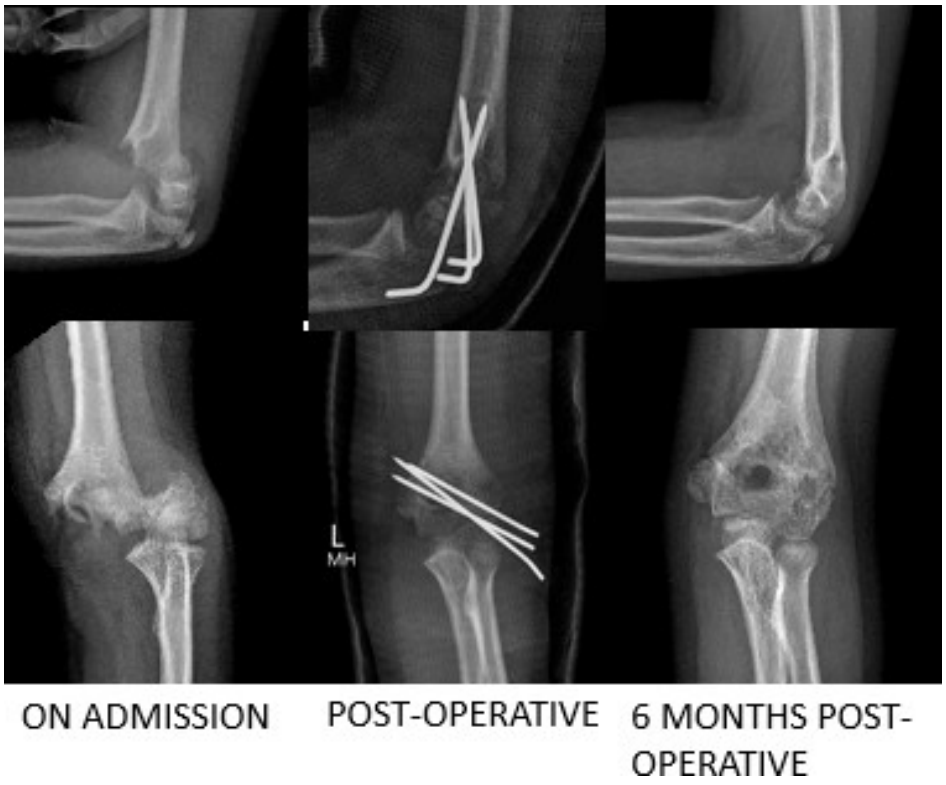


Figure 2 Proximal radial epiphyseal fracture (AO 21r-E/1.1, Judet II) in a 7-year-old female. Managed with CRPP using joystick technique and two K-wires. At 6 months: full elbow ROM and normal radial epiphyseal angle

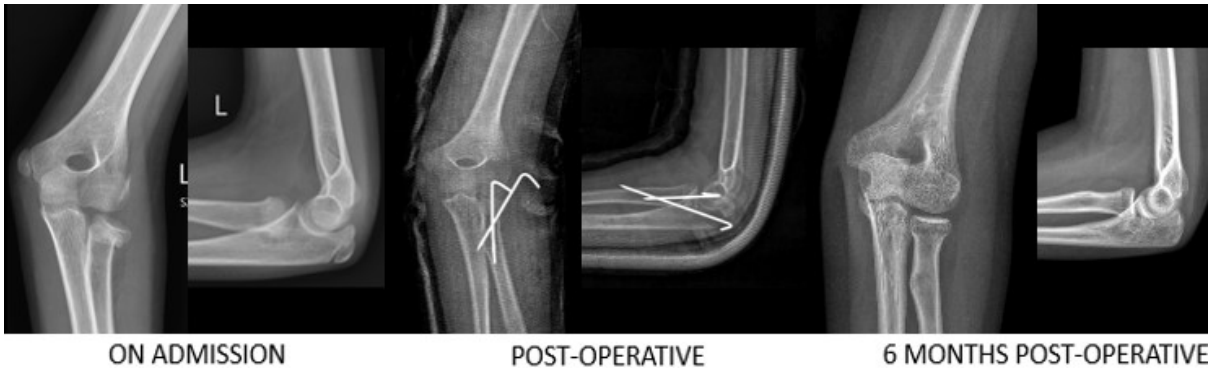
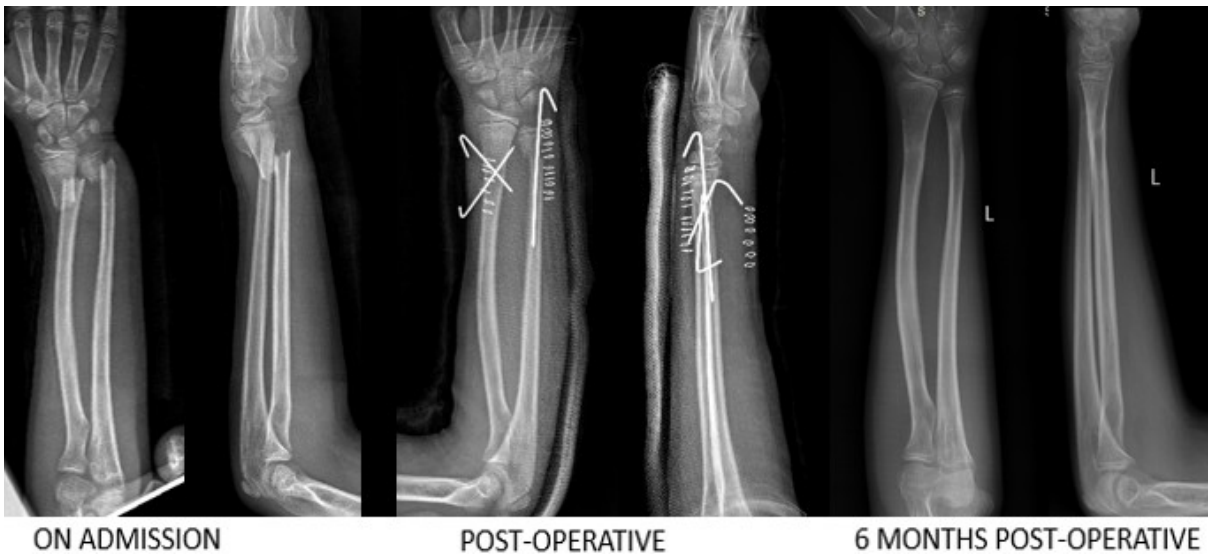


Figure 3 Distal radius and ulna metaphyseal fracture (AO 23-M/3.1) in an 8-year-old female presenting after 1 week. CR unsuccessful; treated with OR and K-wire fixation (radius ×2, ulna ×1). At 6 months: full ROM at wrist and elbow with normal metaphyseo-diaphyseal angle.



Ten patients (25%) who underwent percutaneous pinning for SCHF or epiphyseo-metaphyseal fractures reported mild to moderate disability with decreased range of motion of the operated limb and pain at surgical site after removing cast at 4 weeks. Two-patients (13%) who underwent percutaneous pinning for supracondylar humerus fractures reported decreased range of motion at the elbow. Regular physiotherapy was required to improve mobility and improving results were seen at follow-up. Apart from this, no cases of deep infection, growth arrest, or permanent neurovascular deficit were noted in our study. No growth disturbance observed at 6 months.

Discussion:

The majority of the population studied was male, with male to female ratio 2:1 which is in line with the existing literature showing higher incidence of fractures among males due to increased outdoors activities [1]. No patients were excluded after enrolment and no missing data were observed for primary outcomes, and all completed the required follow-up.

Closed reduction was successful with normal radiological parameters, good functional outcome and no major complications in the majority of cases (n=33, 82.5%). This proves the success of this minimally invasive technique, given proper expertise. Failed closed reductions, necessitating an open reduction were uncommon (n=7, 17.5%).

The 7 cases requiring open reduction, helped understanding factors contributing to closed reduction failure. In our study open reduction was required, particularly among supracondylar fractures, where 3 patients (7.5%) could not be managed with closed techniques. Of these, two had comminuted fracture patterns, while one had marked soft tissue swelling that made intraoperative manipulation difficult. Delayed presentation was another important factor. One patient with a distal

radius–ulna fracture presented after one week, and another with a radial neck fracture presented after two weeks; in both cases, early callus formation made closed reduction unsuccessful. In one distal radius–ulna fracture, a higher BMI of 23 (at risk of over-weight), made closed reduction technically challenging. Average BMI in our population was 19 (healthy). Additionally, a distal radius fracture with an intact ulna could not be adequately reduced due to bony overlap and mechanical restriction.

Taken together, these cases suggest that delayed presentation, fracture complexity, and soft tissue factors play a key role in the failure of closed reduction. Patients presenting more than 48 hours after injury often had increased swelling and bruising, which further complicated manipulation. Similarly, gross displacement, comminution, and complex fracture patterns were important predictors for the need for open reduction. These findings highlight the importance of early intervention and careful selection of cases for minimally invasive management as illustrated by Ulus et al. [19].

The mean Baumann's angle for supracondylar fractures was within normal limits, thus showing that proper coronal alignment has been achieved [20, 21], similar to the results reported by Hasan et al [13]., who emphasized that maintaining Baumann's angle is critical in preventing cubitus varus deformity. Clinically the patients were assessed via Flynn's criteria [21] and we achieved satisfactory results, with the majority classified as excellent or good. A smaller proportion, 2 (13%), demonstrated mild to moderate residual limitation in range of motion at the elbow with loss of >10-15° while no patients had worse outcomes. These patients subsequently underwent structured physiotherapy, which led to significant improvement in elbow mobility and overall function during follow-up. No additional interventions were required.

Patients with epiphyseo-metaphyseal fractures were assessed with Epiphyseo-metaphyseal and Metaphyseo-diaphyseal angles. All radiological parameters were within normal range. Quick DASH scoring was done to evaluate functional outcome of all cases involved [22]. It showed a promising outcome with majority of the patient having excellent functional recovery with a few patients suffering from mild to moderate disability. Overall, the findings indicate favourable functional recovery in most patients, minimal residual deformity, and good restoration of limb function following treatment, supporting the effectiveness of closed reduction percutaneous pinning over other treatment modalities for epiphyseo-metaphyseal fractures [21].

The high PedsQL scores observed in this study indicate favourable physical and psychosocial recovery, supporting the effectiveness of minimally invasive surgical management in improving overall quality of life in paediatric patients [23]. These findings correlate with the excellent and good functional outcomes assessed by Flynn's criteria, as well as with mild to moderate disability observed with quick DASH score thus suggesting that restoration of anatomical alignment and function translates into improved patient-reported outcomes.

A smaller proportion, 10 (25%), demonstrated mild to moderate residual

limitation restricted range of motion of the arm and pain at surgical site after removal of cast at 4 weeks. These patients subsequently underwent structured physiotherapy, which led to significant decreased pain and improvement in mobility, and overall function during follow-up. No additional interventions were required.

The results highlight that these treatment modalities not only have comparable post-operative radiological parameters but also have better patient satisfaction with the least complications, reduced blood loss, exposure, infection rate and heterotopic calcification in open surgeries. It gives valuable insight into the current practices and outcomes, thereby emphasizing the importance of minimally invasive fixation as the treatment of choice for paediatric upper limb fractures as demonstrated by recent meta-analysis, that closed reduction and percutaneous pinning provides outcomes comparable to open reduction for paediatric supracondylar fractures, with lower soft-tissue complications and improved cosmetic results [24].

The present study did not perform a direct comparison between closed and open reduction techniques because the choice of fixation method was primarily determined by fracture pattern, anatomical location, skin condition and stability, rather than surgeon preference. Similar methodological approaches have been reported in previous paediatric fracture studies, where outcomes of minimally invasive fixation techniques were evaluated descriptively without direct comparison due to heterogeneity of fracture types and treatment indications. Several retrospective series evaluating CRPP for supracondylar fractures have reported outcomes independently rather than comparatively, emphasizing safety, union rates, and complication profiles within each modality [25]. Furthermore, retrospective observational studies with limited sample sizes are often not powered for subgroup comparison, and performing statistical comparisons may introduce bias. The aim of the present study was therefore to evaluate overall clinical and radiological outcomes of minimally invasive fixation strategies in paediatric upper limb fractures rather than establish superiority of one technique over another. Future prospective comparative studies with homogeneous fracture patterns are required to allow meaningful comparison between treatment modalities.

Limitations: Retrospective design. with a potential selection and information bias, short minimum 6 month follow up, precludes assessment of late growth disturbances or remodelling; single-centre study with modest sample size.

Recommendation: CRPP should remain the first-line treatment modality in patients with epiphyseo-metaphyseal fractures of upper limb in paediatric age. Prospective studies with longer follow-up are needed to confirm long-term outcomes.

Conclusion

Closed reduction and percutaneous fixation in paediatric epiphyseo-metaphyseal fractures of upper limb showed satisfactory outcomes, both clinically and radiologically, with minor complications and highlighting the factors that lead to failure of closed reduction. The findings also demonstrated favourable paediatric quality of life outcomes, with

high PedsQL scores indicating good physical and psychosocial recovery following treatment.

Acknowledgements

The authors thank the Department of Orthopaedics & Trauma, and HMS at Dr. Ziauddin Hospital for data access.

Conflict of Interest

None Declared

Funding

This study received no external funding.

References

1. Qiu X, Deng H, Zhao Z, Zeng S, Zeng Y, Wang X, et al. Upper limb pediatric fractures in 22 tertiary children's hospitals, China: a multicenter epidemiological investigation and economic factor analysis of 32,832 hospitalized children. J Orthop Surg Res. 2022;17(1):300. doi:10.1186/s13018-022-03159-5.
2. Südow, H., Navarro, C.M. The incidence of distal radius fractures in a Swedish pediatric population - an observational cohort study of 90 970 individual fractures. BMC Musculoskelet Disord 22, 564 (2021). https://doi.org/10.1186/s12891-021-04410-6
3. Badkoobehi H, Choi PD, Skaggs DL. Supracondylar humerus fractures. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024 Available from: https://www.ncbi.nlm.nih.gov/books/NBK560933/.
4. Naik P. Remodelling in children's fractures and limits of acceptability. Indian J Orthop. 2021;55(3):549-59. doi:10.1007/s43465-020-00320-2.
5. Givens RR, Kunes JA, Sevensky R, Lu K, Herbert M, Rosenwasser K, et al. Recommended treatment for pediatric upper extremity fractures varies among orthopaedic surgeons and trainees. JPOSNA. 2025;12:100247. doi:10.1016/j.jposna.2025.100247.
6. Alagesan S, Mohideen S, Pradeep E, Kumar KVA, Ashwin VY, Ajay BSR. Functional outcome of pediatric supracondylar humerus fractures treated with closed reduction and percutaneous pinning. J Orthop Case Rep. 2025;15(6):282-6. doi:10.13107/jocr.2025.v15.i06.5738.
7. Bartolotta RJ, Daniels SP, Verret CI, Fufa DT. Current fixation options for elbow, forearm, wrist, and hand fractures. Semin Musculoskelet Radiol. 2019;23(2):109-25. doi:10.1055/s-0039-1677699.
8. Hahn SG, Schuller A, Pichler L, Hohensteiner A, Sator T, Bamer O, et al. Complications and outcomes of surgically treated pediatric supracondylar humerus fractures. Children (Basel). 2024;11(7):791. doi:10.3390/children11070791.
9. Alberghina F, Andreacchio A, Pavone V, Mansour M, Dimeglio A, Canavese F. Pediatric functional outcome measures in upper extremity fractures. J Pediatr Orthop B. 2022;31(3):260-9. doi:10.1097/BPB.0000000000000909.
10. AO Surgery Reference. Closed reduction K-wire fixation – distal forearm [Internet]. Available from: https://surgeryreference.aofoundation.org
11. AO Surgery Reference. Open reduction K-wire fixation – distal humerus [Internet]. Available from: https://surgeryreference.aofoundation.org
12. Sanogo C, Daffe M, Coulibaly K, Diallo A, Traore S, Tambassi S, et al. Blount method in the management of supracondylar fractures of the humerus in children. Surg Sci. 2023;14:331-7. doi:10.4236/ss.2023.145037.
13. Hasan SU, Pervez A, Usmani SUR, Tahseen MU, Asghar S, Ahmed JW, et al. Comparative analysis of pinning techniques for supracondylar humerus fractures in paediatrics: a systematic review and meta-analysis. J Orthop. 2023;44:5-11. doi:10.1016/j.jor.2023.08.005.
14. Phan MD, Vo NQ, Mai TT, Truong QH, Truong KT, Nguyen PD. Management of pediatric supracondylar humerus fractures using lateral cross-wiring technique. Cureus. 2024;16(4):e59029. doi:10.7759/cureus.59029.
15. Micheloni GM, Novi M, Leigheb M, Giorgini A, Porcellini G, Tarallo L. Supracondylar fractures in children: management and treatment. Acta Biomed. 2021;92(S3):e2021015. doi:10.23750/abm.v92iS3.11725.

16. Kashayi-Chowdojirao S, Chirla S, Eppakayala S, Sultana S, Lakkireddy M. Outcome of surgically managed pediatric radial neck fractures. Cureus. 2022;14(10):e30947. doi:10.7759/cureus.30947.
17. Valisena S, Gonzalez JG, Voumard NM, Hamitaga F, Ciritsis BD, Mendoza Sagaon M, et al. Kapandji technique for pediatric distal radius fractures: a case series. Eur J Orthop Surg Traumatol. 2019;29(2):413-20. doi:10.1007/s00590-018-2297-5.
18. Joeris A, Lutz N, Blumenthal A, Slongo T, Audigé L. AO pediatric comprehensive classification of long bone fractures. Acta Orthop. 2017;88(2):129-32. doi:10.1080/17453674.2016.1258533.
19. Ulus SA, Yiğit Ş, Özkul E. Comparative outcomes of early, elective, and delayed treatment for lateral condyle fractures in children. Med Sci Monit. 2024;30:e942728.
20. Islam MA, Hafizullah K, Khan MRI, Uddin MS, Rayhan MF. Functional outcome of CRPP in pediatric supracondylar fractures. Barind Med Coll J. 2025;11(2):79-88. doi:10.70818/bmcj.v011i2.0239.
21. Muslu O, Cengiz T, Aydın Şimşek Ş, Yurtbay A, Keskin D. Outcomes of CRPP in pediatric supracondylar fractures. Cureus. 2023;15(11):e49358. doi:10.7759/cureus.49358.
22. Kämppä N, Hulkkonen S, Grahn P, Laaksonen T, Repo J. Validity of QuickDASH in pediatric upper extremity fractures. Acta Orthop. 2024;95:192-9. doi:10.2340/17453674.2024.40181.
23. Liebs TR, Lorance A, Berger SM, Kaiser N, Ziebarth K. Quality of life after distal forearm fractures in children. Children (Basel). 2022;9(10):1487. doi:10.3390/children9101487.
24. Minifee CD, DeFilippo CG, Carmichael KD. Complications in pediatric supracondylar fractures with pinning techniques. J Pediatr Orthop B. 2024;33(6):585-9. doi:10.1097/BPB.0000000000001189.
25. Meng C, Meng Z, Huang X, Zhao F, Yang Q. CRPP vs open reduction in pediatric lateral condyle fractures: a meta-analysis. Front Pediatr. 2023;11:1205755. doi:10.3389/fped.2023.1205755.
26. Suangyanon P, Chalayon O, Worawuthangkul K, Kaewpornsawan K, Ariyawatkul T, Eamsobhana P. Pediatric elbow measurement parameters and reliability. J Clin Orthop Trauma. 2019;10(4):792-6. doi:10.1016/j.jcot.2018.07.019.
27. Wang YC, Song JJ, Li TT, et al. Evaluation of radial neck fractures based on Judet classification. Bone Joint J. 2024;106-B(9):964-9. doi:10.1302/0301-620X.106B9.BJJ-2023-0986.R2.

Author position & Contributions

- Dr. Tehreem Mehmood: PGT FCPS Orthopaedics. Study conception, data collection, statistical analysis and drafting the manuscript. tehreem.mehmood@zu.edu.pk https://orcid.org/0009-0003-5460-7043
- Dr. Saddam Mazar: Fellow Paediatric Orthopaedic Surgery, Data verification, manuscript review, and correspondence, drmazar@gmail.com, https://orcid.org/0000-0002-9426-5100
- Prof. Anisuddin Bhatti: Professor & consultant Orthopaedic and paediatric Orthopaedic Surgery. Surgical supervision, critical revision and final approval. Performed surgeries, Concept and design, re-writing initial draft, critical review and permission to publish. Anisuddin.bhatti@zu.edu.pk https://orcid.org/0000-0003-1873-0039

Original Article:

Delays in Presentation of Supracondylar Fractures and Their Impacts on Clinical Outcomes

Abdul Ghaffar, Sidra Tul Zaitoon, Shazia Soomro, Asif Tehrani, Muhammad Yousuf Bhatti Pervez Ali,

Department of Orthopaedic Surgery, Jinnah Postgraduate Medical Centre (JPMC), Karachi, Pakistan

ABSTRACT

Background:

Supracondylar fractures are one of the most common elbow fractures among children in which delayed presentations are quite common in developing countries. This study evaluates how delay in presentation of supracondylar humeral fracture impacts surgical management and final functional outcomes in pediatric population

Methods:

A prospective cohort study was involving 75 children (2-12 years) with supracondylar fracture Gartland type II–IV patients conducted at JPMC, Karachi, divided into 2 groups, according to time of presentation. Group A (Early, ≤24h) and Group B (Delayed, >24h). Outcomes were assessed in terms of surgical approach (Open vs. Closed) and Flynn's Criteria at 6 months.

Results:

75 patients were enrolled in this study in which 46(61.3%) presented early and 29 (38.7%) were delayed, mean age was 6.44(+_1.832) ranges from 3-10 years, majority of patients were having type 3 of Gartland's classification of supracondylar fractures 66.7%, 28% were having type 2 and 5.3% were having type, 61.3% patients underwent closed reduction and 38.7% underwent open reduction, 69.3%patients develop no complication, 5.3%developed infection and 25.3% were presented with stiffness after surgery , in early presentation group 45 patients underwent closed reduction and only 1 underwent open reduction and in delayed presentation group 28 patients underwent open reduction, highly significant correlation was found between presentation and surgical approach ($P < 0.001$) Functional recovery (Flynn's Criteria) was significantly superior in the early group (100% Excellent/Good) compared to the delayed group (93.1% Fair/Poor, $P < 0.001$)

Conclusion:

Delays in presentation >24hours of supracondylar humeral fracture in paediatric population is most significant predictor of surgical complexity and poor functional recovery as compared to those patients who presented early <24hours of injury

Keywords:

Supracondylar fracture, Delayed presentation, early presentation, flyn's criteria, Gartland's classification.

Corresponding Author:
Sidra Tul Zaitoon
Email: sidra9503@gmail.com.
FCPS Orthopaedic
Department of Orthopaedic Surgery
Jinnah Postgraduate Medical Centre, Karachi

INTRODUCTION

Supracondylar humerus fracture in paediatric population are the most common elbow injuries (1, 2, 3)typically due to fall on outstretched hand common in children aged 3 to 7 years and most globally accepted classification for these fractures are Gartland system (type I: undisplaced; type II: displaced with intact cortex; type III: completely displaced; type IV: unstable in multiple planes), close reduction percutaneous is widely accepted and gold standard treatment for timely cases however delays in presentation is quite common in developing countries(4) like Pakistan due to transportation issues , socioeconomic barriers, rely on bone setters, financial instability, lack of awareness and initial conservative management are associated with swelling, neurovascular compromise, and malunion, delayed presentation is associated with severe soft tissue edema , callus formation and many other complication due to multiple factors which results in difficulty in achieving anatomical reduction(5) with closed reduction (6) Although previous studies have reported outcomes from developed countries and most of them depends on early presentation but there is limited data available from developing countries. This prospective cohort study at tertiary care hospital JPMC, Karachi, hypothesizes that delays in presentation is associated with increase need of open reduction and worse functional outcomes in terms of Flynn's criteria(7, 8) but early presentation is associated with better functional outcomes and lesser complications(9, 10)

MATERIALS AND METHODS

A prospective cohort study was conducted at Department of Orthopaedic Surgery, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from November 2025 to February 2026, enrolled 75 children aged 2 to 12 years with confirmed supracondylar fractures of humerus with Gartland type II-IV were included, patients were having open fractures, pathological fractures ipsilateral limb injuries, prior deformities, compromised neurovascular status were excluded from study, Ethical approval was obtained from the JPMC Institutional Review Board (IRB No.F.2-81/2025-genl/783/JPMC), and informed consent was taken from guardians and parents, demographics, type of fracture via plain radiographs and initial neurovascular status, time of injury were recorded and patients were divided into two groups according to their time of presentation, the patient who were presented within the 24 hours after the injury. and the one represented after the 24 hours after injury, all patients were managed surgically under general anaesthesia either with close reduction and k wire or open reduction and k wire depends on type of fracture, swelling, instability and clinical status of patients, evaluation, decision and surgery was done by expert paediatric orthopaedic surgeon, Kwires were removed at 6th week post operatively Post-operative follow-up was conducted at 2 weeks, 6 weeks, 3 months, and 6 months; primary outcomes were surgical approach taken (closed vs open), final outcomes were measured at 6 months using Flynn's Criteria, which assesses carrying angle and elbow range of motion (ROM); excellent (0-5° loss motion, <5° carrying angle change), good (5-15°/5-10°), fair (15-30°/10-15°), poor (>30°/>15°). Secondary outcomes were measured in terms of complications (infection, stiffness, nerve palsy, malunion).

Data were analysed using SPSS version 27. Continuous variables were expressed as

mean ± standard deviation and compared using independent sample t-test. Categorical variables were analysed using chi-square test. A p-value <0.05 was considered statistically significant.

RESULTS

Seventy five patients were enrolled in this study who met the inclusion criteria in which 46(61.3%) presented early<24hours of injury and 29 (38.7%) were presented delayed >24hours , mean age was 6.44(+_1.832) ranges from 3-10 years, majority of patients were having type 3 of Gartland's classification of supracondylar fractures 66.7%, 28% were having type 2 and 5.3% were having type, 61.3% patients underwent closed reduction and 38.7% underwent open reduction, 69.3%patients develop no complication, 5.3%developed infection and 25.3% were presented with stiffness after surgery , in early presentation group 45 patients underwent closed reduction and only 1 underwent open reduction and in delayed presentation group 28 patients underwent open reduction, highly significant correlation was found between presentation and surgical approach ($P < 0.001$) Functional recovery was assessed via Flynn's Criteria and it was found significantly superior in the early group (100% Excellent/Good) compared to the delayed group (93.1% Fair/Poor, $P < 0.001$)

DISCUSSION

This prospective cohort study confirms that early presentation of supracondylar humeral fractures are associated with better functional outcomes however delayed presentation >24hours of paediatric supracondylar humeral fractures needs for open reduction due to fibrous tissue formation, callus formation which make close reduction difficult which results in impaired functional recovery and increased stiffness 25.3%, delayed presentation attributed to multiple local factors like traffic challenges, intervention by bone setters, lack of awareness; all of them results in worse outcomes, patients who presents with in 24hours get benefit from closed reduction and percutaneous pinning due less soft tissue swelling and ultimately good functional outcomes in terms of Flynn's criteria decrease risk of complications

LIMITATIONS

Limitations of this study was that, it was Non-randomized design, no nerve conduction test was done, Single-center study, short-term follow-up of patients at 3rd month only, no cost-effectiveness analysis was done

CONCLUSION

In this prospective cohort study, early presentation leads to superior functional outcomes and lesser complications, late presentation leads to inferior functional outcomes and more complications, this study emphasizes the need of community education regarding risk of traditional bone settings and awareness regarding benefits of early orthopaedic intervention to ensure morbidity free recovery for paediatric patients

ETHICAL APPROVAL

Ethical approval was obtained from the Institutional Review Board of Jinnah Postgraduate Medical Centre. Written informed consent was obtained from parents or legal guardians.

CONFLICT OF INTEREST

The authors declared no conflicts of interest with respect to research, authorship or publication.

FUNDING

No external funding was received. The authors received no financial support for the research, authorship or publication of this article.

REFERENCES

1. Mubarak FS, Anzar MAM, Kanagaratnam K. Descriptive study on epidemiology, clinical presentation, treatment, and outcome of supracondylar fractures treated in a base hospital of Sri Lanka: a single-center study. Cureus. 2023;15(6).
2. Gouzoulis MJ, Yang A, Joo PY, Kaszuba SV, Frumberg D, Grauer JN. Emergency department visits following supracondylar Humerus fractures. Journal of Pediatric Orthopaedics. 2025;45(3):128-33.
3. Easwar T, Stephen M. Supracondylar Fracture of Humerus. Journal of Orthopaedic Association of South Indian States. 2022;19(Suppl 1):S60-S7.
4. Abdelraheem MA. Open reduction and fixation of late-presenting pediatric supracondylar humeral fractures: A prospective study. Orthopedic Research and Reviews. 2024:221-31.
5. Sullivan MH, Wahlig BD, Broida SE, Larson AN, Shaughnessy WJ, Stans AA, et al. Does shorter time to treatment of pediatric supracondylar humerus fractures impact clinical outcomes? Journal of Pediatric Orthopaedics. 2023;43(6):350-4.
6. Wu X, Lin R, Chen J, Chen S. Closed reduction with percutaneous Kirschner wire drill-and-pry for pediatric supracondylar humeral fractures with bony callus formation and delayed presentation. Injury. 2023;54(2):547-51.
7. Yaqub M, Rajappa K, Rudraprasad M, Bhasme AS. Delayed Presentation of Pediatric Supracondylar Humerus Fractures: Surgical Approach and Outcomes. Indian Journal of Orthopaedics. 2026:1-7.
8. Erdoğan F, Öztürk Ö, Cengiz T, Şimşek ŞA, Coskun HS, Dabak N. The Impact of Surgical Timing on Complications and Clinical Outcomes in Surgery for Displaced Pediatric Supracondylar Humerus Fracture. Ortopedia, traumatologia, rehabilitacja. 2024;26(6):257-63.
9. Ismayl G, Kim W, Iqbal M, Sajid S. Early versus delayed treatment for Gartland type III supracondylar humeral fractures in children: a systematic review and meta-analysis. Indian Journal of Orthopaedics. 2022;56(11):1871-81.
10. Ulus S, Akar M. Comparison of complications and results of early vs. delayed surgery for pediatric supracondylar humeral fractures. European Review for Medical & Pharmacological Sciences. 2023;27(24).

Case Report

Title: Post-Intervention Hand Function in Children with Cerebral Palsy: Relationships with Daily Performance and Predictors of Functional Outcomes.

Authors & Affiliation: Dr. Saddam Mazar Baloch, Prof. Dr. Anisuddin Bhatti

Department of Orthopaedics, Dr Ziauddin Hospital, Clifton, Karachi, Pakistan

Background

In cities like Karachi, children with cerebral palsy often struggle to use their hands properly. This makes everyday activities, eating independently, doing schoolwork, or playing, very difficult. Long-term studies of hemiplegic cerebral palsy show only slight natural improvement in hand function over the years. Grip patterns may become a little more advanced, but the weaker hand is rarely used more in daily life without active help. [1]. There is a common gap between what a child can do in a clinic test and what they actually do at home when treatment is limited to therapy or medicine.

At Dr Ziauddin Hospital (Clifton, Karachi), we perform single-event multilevel upper limb surgery (SEMLS) in selected children. Surgery corrects multiple issues at once (tight wrists, turned-in forearms, thumb-in-palm deformity) to improve positioning, grasping, releasing, and bimanual use.

Post-surgery physiotherapy helps maintain gains and encourages real-world use. This is especially important in our setting, where consistent therapy access can be challenging. [2,3]. Spastic cerebral palsy usually responds better than cases with dystonia or mixed tone, where outcomes vary more. [4]

Objective

To observe changes in hand and arm function after SEMLS in a very small group of children with cerebral palsy, identify possible predictors of better results, assess parent-reported daily hand use and satisfaction, and explore whether good physiotherapy follow-through seemed to help maintain improvements.

Methods

We followed 5 children with cerebral palsy (MACS levels II, III, average age 7.6 years, 3 boys and 2 girls) who had upper limb SEMLS carried out by one surgeon, Prof. Dr. Anisuddin Bhatti, at the Department of Orthopaedics, Dr Ziauddin Hospital, Clifton, Karachi. The types were: spastic hemiplegic (3), spastic diplegic (1), and mixed spastic-dystonic (1).

The operation included tendon transfers, muscle releases or rerouting, and joint stabilisations as needed for each child. Physiotherapy began in hospital straight after surgery (pain relief, gentle passive movement, correct positioning), then continued as outpatient sessions, usually 3 to 5 times a week at the start, with active exercises, strengthening, practice using both hands, splint management, and training for parents on home activities. Later sessions focused more on practical daily tasks such as feeding or buttoning clothes.

We examined the children before surgery (T_0), at 3 months (T_1), and at 6 months (T_2) using four standard tests:

- QUEST (0-100): measures what the hand can do

- AHA (0-100): checks how well both hands work together
- ABILHAND-Kids (logit scale): parents rate everyday hand tasks
- SHUEE dynamic subscale (0-100): looks at grasp and positioning during movement

Parents also scored how much daily hand use had improved (simple 0-10 scale) and gave their overall satisfaction (1 = very dissatisfied, 10 = very satisfied Likert). We analysed changes over time with mixed-effects models and looked at basic links with correlations and regression. The hospital ethics committee gave approval and every parent gave written consent.

Results

Hand capacity improved clearly after surgery. QUEST scores rose by about 18 points on average (from 60.7 ± 11.5 to 78.7, p = 0.002) and SHUEE dynamic scores increased by roughly 7 points (p = 0.008). Improvements in using both hands together and parents' views of daily ability were smaller but still noticeable (AHA +7.8 points, p = 0.003; ABILHAND-Kids +1.3 logits, p = 0.04). The connection between better capacity and better daily use was only moderate (r = 0.50).

Parents reported that daily hand use got easier by around 3 points on the 0-10 scale (p = 0.04). Self-feeding and buttoning clothes were the activities most often mentioned as improved. At 6 months, average parent satisfaction was 7.5 out of 10, and 40% gave a score of 8 or higher. Families who said they followed physiotherapy sessions and home exercises more closely tended to keep their QUEST gains better (r = 0.58). Children with spastic hemiplegic cerebral palsy generally showed larger improvements than those with mixed spastic-dystonic type, though the small numbers in some groups limit what we can conclude. There were no serious complications during the follow-up.

Table 1: Details of the patients

Age (mean ± SD)		7.6 ± 2.1 years
Male/Female		3 / 2
MACS level II / III		3 / 2
Dominant side affected		3
Other conditions (e.g. seizures)		1
Type of cerebral palsy	Spastic hemiplegic	3
	Spastic diplegic	1
	Mixed spastic-dystonic	1

Table 2: Main test scores before and after surgery (mean ± SD)

	Before surgery	3 months	6 months	Change	p-value
QUEST (0-100)	60.7 ± 11.5	77.2 ± 10.8	78.7 ± 11.2	+18.0	0.002
AHA (0-100)	27.2 ± 13.1	35.0 ± 12.4	35.0 ± 12.8	+7.8	0.03
ABILHAND-Kids (logits)	1.8 ± 1.4	3.1 ± 1.3	3.1 ± 1.4	+1.3	0.04
SHUEE Dynamic (0-100)	53.5 ± 14.0	60.6 ± 13.5	60.6 ± 13.8	+7.1	0.008

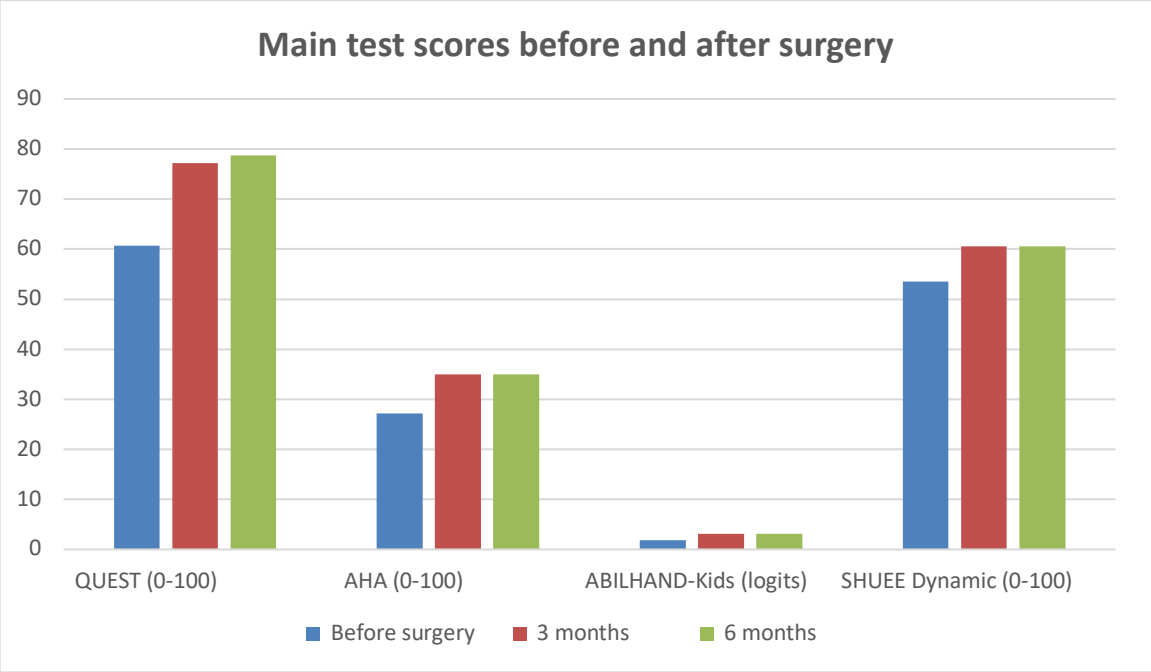


Table 3: Parents' views and physiotherapy (mean ± SD or %)		
	3 months	**6 months**
Daily use improvement (0-10 scale)	4.8 ± 1.4	5.8 ± 1.6
	Overall change +3.0 (p=0.04)	
Parent satisfaction (1-10)	7.0 ± 1.8	7.5 ± 1.9
Parents scoring 8 or higher	40%	40%
Outpatient physiotherapy sessions (total by 6 months)	-	11.7 ± 4.2
Home exercise adherence (%)	70 ± 14	78 ± 13

Discussion

The gains we saw in hand capacity (QUEST and SHUEE) match what other teams have found after similar multilevel upper limb surgery in children with cerebral palsy. [2,7] However, the changes in how the children actually used their hands every day were smaller, and the link between clinic test results and real-life use stayed only moderate, exactly what long-term studies have also shown. [1]

When families managed to attend physiotherapy sessions and do the home exercises more regularly, the children tended to keep their improvements better. But because this is a small observational study without a comparison group, we cannot be certain that physiotherapy alone caused the difference. Parents were generally pleased with the outcome, they noticed better hand appearance, less need to help their child, and more confidence, which is similar to what families report in other studies. [6]

There are important limitations. With only 5 children the study is small, follow-up is short (just 6 months), and everything was done at one hospital by one surgeon, so the results may not apply everywhere. Some parent rating scales were simple and not formally validated. Comparisons between different types of cerebral palsy are only suggestions because some groups had very few children. These findings should be seen as early observations that need larger, longer studies to confirm.

Conclusion

In this small group of children, upper limb SEMLS was linked with worthwhile improvements in hand capacity and more modest gains in using both hands together and daily tasks at 6 months. Closer follow-through with physiotherapy appeared

connected to holding onto those gains, and most parents felt satisfied with the results. Larger studies with longer follow-up, better comparison groups, and more precise ways to measure therapy are needed to understand these findings properly, especially in places like Pakistan where access to ongoing treatment can be challenging.

Limitations

- Very small sample (n=5)
- Short follow-up (6 months)
- Single-surgeon, single-center design
- Some parent scales were simple and not formally validated

References

1. Fedrizzi E, Pagliano E, Andreucci E, Oleari G. Hand function in children with hemiplegic cerebral palsy: prospective follow-up and functional outcome in adolescence. Dev Med Child Neurol. 2003 Feb;45(2):85-91. Erratum in: Dev Med Child Neurol. 2003 Mar;45(3):206. PMID: 12578233.

2. Soh EZF, Gong HS. Surgical Reconstruction of the Upper Extremity in Patients With Cerebral Palsy: Indication, Techniques, and Rehabilitation Considerations. Ann Rehabil Med. 2025 Oct;49(5):279-289. doi: 10.5535/arm.250007. Epub 2025 Oct 31. PMID: 41177150; PMCID: PMC12608054.

3. Combey A, Bard-Pondarré R, Erhard L, Chaléat-Valayer E. Retrospective study of functional benefits and satisfaction in multisite upper-limb surgery in children with unilateral cerebral palsy. Hand Surg Rehabil. 2024 Feb;43(1):101623. doi: 10.1016/j.hansur.2023.11.008. Epub 2023 Nov 23. PMID: 38000449.

4. Merckx L, Poncelet F, De Houwer H, Laumen A, Peeters L, Nuttin B, Pauwels P, Van Campenhout A, Ortibus E, De Vloo P. Upper-extremity spasticity and functionality after selective dorsal rhizotomy for cerebral palsy: a systematic review. J Neurosurg Pediatr. 2023 Sep 15;32(6):673-685. doi: 10.3171/2023.7.PEDS22526. PMID: 37877954.

5. Araneda R, Ebner-Karestinos D, Paradis J, Klöcker A, Saussez G, Demas J, Bailly R, Bouvier S, Carton de Tournai A, Herman E, Souki A, Le Gal G, Nowak E, Sizonenko SV, Newman CJ, Dinomais M, Riquelme I, Guzzetta A, Brochard S, Bleyenheuft Y. Changes Induced by Early Hand-Arm Bimanual Intensive Therapy Including Lower Extremities in Young Children With Unilateral Cerebral Palsy: A Randomized Clinical Trial. JAMA Pediatr. 2024 Jan 1;178(1):19-28. doi: 10.1001/jamapediatrics.2023.4809. Erratum in: JAMA Pediatr. 2024 Feb 1;178(2):206. doi: 10.1001/jamapediatrics.2023.6170. PMID: 37930692; PMCID: PMC10628844.

6. Romans S, Mosa A, Wall LB. Impact on Families of Upper Extremity Surgical Treatment for Children with Cerebral Palsy. J Hand Surg Glob Online. 2026 Jan 24;8(2):100943. doi: 10.1016/j.jhsg.2025.100943. PMID: 41624975; PMCID: PMC12860347.

7. Fitoussi F, Lallemant-Dudek P. The upper limb in children with cerebral palsy. Evaluation and treatment. Orthop Traumatol Surg Res. 2024 Feb;110(1S):103763. doi: 10.1016/j.otsr.2023.103763. Epub 2023 Nov 20. PMID: 37992866.

8. Yuan Z, Lennon N, Church C, Shrader MW, Miller F. Outcomes of Pediatric Orthopedic Management of Ambulatory Cerebral Palsy Utilizing a Closely Monitored, Lifespan-Guided Approach. Children (Basel). 2025 Sep 17;12(9):1252. doi: 10.3390/children12091252. PMID: 41007117; PMCID: PMC12469097.

9. Gokceoglu YS, Bilgili F, Sardogan C, Koyuncu D, Demirel M, Akalan E. Changes in upper limb kinematics in children with cerebral palsy after lower limb surgery: a retrospective comparative study. BMC musculoskeletal disorders. 2026 Mar 3.

10. Fong MM, Gibson N, Williams SA, Jensen L. Clinical functional outcome measures for children with cerebral palsy after gait corrective orthopaedic surgery: A scoping review. Dev Med Child Neurol. 2023 Dec;65(12):1573-1586. doi: 10.1111/dmcn.15622. Epub 2023 May 6. PMID: 37147852.