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【临床研究】

# 早期手术与延迟手术治疗儿童 Gartland III 型肱骨髁上骨折疗效比较

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**摘要:** **目的** 比较早期手术与延迟手术治疗儿童 Gartland III 型肱骨髁上骨折(SHF)的临床效果。**方法** 选择2018年3月至2020年9月郑州大学附属儿童医院收治的92例 Gartland III 型 SHF 患儿为研究对象,所有患儿行闭合或切开复位外侧入路扇形克氏针内固定术,根据手术时机将患儿分为早期手术组(受伤至手术时间 < 24 h, n = 51)和延迟手术组(受伤至手术时间 ≥ 24 h, n = 41)。记录并比较2组患儿的手术时间、闭合转切开复位例数及术中拍X线片次数。术后1 a,测量2组患儿患肢与对侧健肘关节活动度、Baumann角和提携角,对2组患儿的肘关节功能进行 Mayo 肘关节功能量表(MEPS)评分和 Flynn 评分,依据 Flynn 评分判定2组患儿的临床疗效。观察2组患儿并发症发生情况。**结果** 早期手术组患儿中术中闭合转切开复位1例(1.96%),延迟手术组患儿中术中闭合转切开复位1例(2.44%),2组患儿术中闭合转切开复位率比较差异无统计学意义( $\chi^2 = 0.667, P > 0.05$ )。早期手术组和延迟手术组患儿术中拍X线片次数分别为(15.2 ± 3.1)、(16.4 ± 3.5)次,2组患儿术中拍X线片次数比较差异无统计学意义( $t = 0.535, P > 0.05$ )。早期手术组和延迟手术组患儿手术时间分别为(31.2 ± 5.4)、(33.5 ± 5.2) min,2组患儿手术时间比较差异无统计学意义( $t = 0.512, P > 0.05$ )。术后1 a,2组患者健侧和患侧肘关节活动度、Baumann角、提携角比较差异均无统计学意义( $P > 0.05$ )。术后1 a,早期手术组和延迟手术组患儿肘关节功能 MEPS 评分分别为(95.1 ± 2.5)、(92.6 ± 3.5)分,2组患儿肘关节功能 MEPS 评分比较差异无统计学意义( $t = 0.653, P > 0.05$ )。早期手术组和延迟手术组患儿临床疗效优良率分别为92.0%(47/51)、90.2%(37/41),2组患儿临床疗效优良率比较差异无统计学意义( $\chi^2 = 0.751, P > 0.05$ )。早期手术组和延迟手术组患儿并发症发生率分别为1.96%(1/51)、2.44%(1/41),2组患儿并发症发生率比较差异无统计学意义( $\chi^2 = 0.873, P > 0.05$ )。**结论** 早期手术和延迟手术治疗儿童 Gartland III 型 SHF 疗效相当,且延迟手术并未增加切开复位率和并发症发生率。

**关键词:** Gartland III型肱骨髁上骨折;早期手术;延迟手术;儿童  
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## Comparison of the effect of early surgery and delayed surgery in the treatment of children with Gartland type III supracondylar humeral fracture

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**Abstract:** **Objective** To compare the clinical effect of early surgery and delayed surgery in the treatment of children with Gartland type III supracondylar humeral fracture (SHF). **Methods** A total of 92 children with Gartland type III SHF admitted to the Children's Hospital Affiliated to Zhengzhou University from March 2018 to September 2020 were selected as the research subjects. All children underwent closed or open reduction and lateral approach fan-shaped Kirschner wire internal fixation, and the children were divided into early operation group (the time from injury to surgery < 24 hours, n = 51) and delayed operation group (the time from injury to surgery ≥ 24 hours, n = 41) according to the timing of surgery. The operation time, the number of closed to open reduction and the number of X-rays taken during operation were recorded and compared between the two groups. One year after operation, the motion of the elbow joint, Baumann angle and carrying angle of the affected limb and the contralateral healthy limb of the children in the two groups were measured; the elbow function of the children in the two groups was evaluated by Mayo elbow performance score (MEPS) and Flynn score, and the clinical effect of children in the two groups was evaluated according to Flynn score. The complications of children in the two groups were observed. **Results** One case (1.96%) in the early operation group was converted from closed to open reduction, and one case (2.44%) in the delayed operation group was converted from closed to open reduction, there was no significant difference in the rate of closed-to-open reduction between the two groups ( $\chi^2 = 0.667, P > 0.05$ ). The number of intraoperative X-rays irradiation in the early operation group and the delayed operation group was (15.2 ± 3.1) and (16.4 ± 3.5) times, respectively; and

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there was no significant difference in the number of intraoperative X-rays irradiation between the two groups ( $t=0.535, P>0.05$ ). The operation time of the children in the early operation group and the delayed operation group was  $(31.2 \pm 5.4)$  and  $(33.5 \pm 5.2)$  minutes, respectively; and there was no significant difference in the operation time between the two groups ( $t=0.512, P>0.05$ ). One year after operation, there was no significant difference in the motion of the elbow joint, Baumann angle and carrying angle between the two groups ( $P>0.05$ ). One year after the operation, the MEPS score of the elbow joint function of the children in the early operation group and the delayed operation group was  $(95.1 \pm 2.5)$  and  $(92.6 \pm 3.5)$ , respectively; and there was no significant difference in the MEPS score of the elbow joint function between the two groups ( $t=0.653, P>0.05$ ). The excellent and good rate of clinical efficacy in the early operation group and the delayed operation group was 92.0% (47/51) and 90.2% (37/41), respectively; and there was no significant difference in the excellent and good rate between the two groups ( $\chi^2=0.751, P>0.05$ ). The incidence of complications in the early surgery group and the delayed surgery group was 1.96% (1/51) and 2.44% (1/41), respectively; and there was no significant difference in the incidence of complications between the two groups ( $\chi^2=0.873, P>0.05$ ). **Conclusion** Early surgery and delayed surgery in the treatment of Gartland type Ⅲ SHF in children can obtain equal curative effects, and the delayed operation does not increase the open reduction rate and the incidence of complications.

**Key words:** Gartland type Ⅲ supracondylar humeral fracture; early operation; delayed operation; children

肱骨髁上骨折 (supracondylar humeral fracture, SHF) 是儿童最常见的骨折类型之一, 约占儿童肘部骨折的 60%<sup>[1]</sup>, 常伴有患肢肿胀、疼痛、功能障碍、畸形等, 如处理不当常导致骨筋膜室综合征、功能障碍等并发症<sup>[2]</sup>。目前, 对于 Gartland I、II 型 SHF 通常采用手法复位和闭合复位石膏固定治疗, 可取得良好效果, 但对于骨折移位明显的 Gartland Ⅲ型 SHF, 一般认为需急诊早期手术复位克氏针内固定, 就诊延迟或延迟治疗会引起切开复位率增加及术后并发症<sup>[3-4]</sup>。近来有学者提出, 不伴有明显神经、血管损伤的 Gartland Ⅲ型 SHF 不再属于严格意义上的急诊手术适应证<sup>[5-6]</sup>, 但仍有较大争议。本研究对早期手术与延迟手术治疗儿童 Gartland Ⅲ型 SHF 的临床效果进行比较, 以期为临床治疗儿童 Gartland Ⅲ型 SHF 提供参考。

## 1 资料与方法

**1.1 一般资料** 选择 2018 年 3 月至 2020 年 9 月郑州大学附属儿童医院骨科收治的 Gartland Ⅲ型 SHF 患儿为研究对象。病例纳入标准: (1) 经影像学检查确诊为 Gartland Ⅲ型 SHF; (2) 年龄  $\leq 14$  岁; (3) 符合手术指征, 均行闭合或切开复位外侧入路扇形克氏针内固定术; (4) 随访时间  $\geq 12$  个月。排除标准: (1) 开放性骨折; (2) 伴有神经或血管损伤; (3) 屈曲型骨折; (4) 病理性骨折; (5) 合并上肢骨折或有肘关节骨折史。本研究共纳入 Gartland Ⅲ型 SHF 患儿 92 例, 根据手术时机将患儿分为早期手术组 (受伤至手术时间  $< 24$  h) 和延迟手术组 (受伤至手术时间  $\geq 24$  h)。早期手术组 51 例, 男 28 例, 女 23 例; 年龄 1 ~ 14 ( $5.4 \pm 2.3$ ) 岁, 受伤至入院时间 1 ~ 19 ( $7.2 \pm 2.6$ ) h, 受伤至手术时间 7 ~ 24 ( $11.4 \pm 2.6$ ) h。延迟手术组 41 例, 男 22 例, 19 例; 年龄 1 ~ 13 ( $5.2 \pm 2.1$ ) 岁, 受伤至入院时间 16 ~ 71 ( $25.4 \pm 7.2$ ) h, 受伤至手术时间 25 ~ 78 ( $32.3 \pm 7.6$ ) h。2

组患儿的性别、年龄比较差异无统计学意义 ( $P>0.05$ ), 具有可比性。本研究通过医院伦理委员会批准, 所有患儿家属或监护人签署知情同意书。

**1.2 手术方法** 所有患儿行全身麻醉, 麻醉成功后取仰卧位。除患肢外, 患儿身体其余部位覆盖铅衣防护 X 线。常规患肢消毒, 铺无菌巾, 根据 C 型臂 X 线机透视下骨折移位情况行手法整复骨折; 患肢屈肘 90°, 前臂旋后位, 施术者右前臂横行压住患肢上臂, 左手行患肢牵引纠正重叠短缩移位; 继续维持牵引状态, 术者右手拇指、食指、中指分别置于肘关节内外侧处, 轻柔推挤肘关节纠正骨折侧方及前后移位, 此时肱骨远端骨折处有明显骨擦感, 接着畸形消失, C 型臂 X 线机透视下观察骨折复位满意。嘱助手维持肘关节屈曲至最大位置, 术者应用骨微动力系统于肱骨外髁处钻入 2 枚克氏针, 针呈扇形排布; 如骨折固定不稳固, 则钻入第 3 枚克氏针, 再次 C 型臂 X 线机透视见骨折对位、对线良好, 克氏针尖端出对侧骨皮质少许, 克氏针尾端剪短折弯置于皮外, 敷料缠绕克氏针尾, 无菌敷料包扎。术毕屈肘约 80° 行患肢石膏托固定。

**1.3 术后处理** 术后注意观察患肢末梢血液循环情况, 术后第 1 天即行手指功能锻炼并观察有无神经损伤, 患肢肘关节予以冷敷消肿; 术后 3 d 复查 X 线片及血常规, 如血常规检查提示炎症则予以抗生素治疗, 血常规正常予以出院。术后 2、4 周常规门诊复查, 术后 4 周行 X 线片检查, 观察骨折愈合后拆除石膏, 拔除克氏针。嘱家属协助患儿进行肘关节功能锻炼, 锻炼时如患儿配合则由患儿自由伸展、屈曲肘关节, 患儿不配合时则由家属协助患儿进行肘关节有限被动功能锻炼。

**1.4 观察指标** (1) 手术情况: 包括手术时间、闭合转切开复位例数及术中拍 X 线片次数。(2) 肘关节活动度: 术后 1 a 测量 2 组患儿患肢与对侧健肢肘关节活动度, 即上肢最大伸直位角度 (超过 180°

时按照 180°算)减去上肢最大屈肘位角度。(3) Mayo 肘关节功能量表(Mayo elbow performance score, MEPS)评分<sup>[7]</sup>:术后 1 a,对 2 组患儿进行 MEPS 评分,量表评价内容包括:疼痛程度(45 分)、运动功能(20 分)、肘关节稳定性(10 分)、日常活动(25 分),满分 100 分,评分越高表示肘关节功能越好。(4)Baumann 角、提携角:术后 1 a,测量 2 组患儿患肢和对侧健肢的 Baumann 角、提携角。Baumann 角即经过外侧髌胫板的斜线与肱骨干中轴线的夹角,平均 72°(64°~81°)。提携角即臂轴与前臂轴的延长线相交形成一向外开放的角度,约 165°~170°,其补角为(15±5)°。(5)临床疗效:术后 1 a,依据肘关节功能 Flynn 评分<sup>[8]</sup>评价 2 组患儿的临床疗效。优:肘关节屈伸受限 10°,肘内翻 < 5°;良:肘关节屈伸受限 11°~20°,肘内翻在 6°~10°;可:肘关节屈伸受限 21°~30°,肘内翻 11°~15°;差:肘关节屈伸受限 >30°,肘内翻 >15°。(6)并发症:观察 2 组患儿并发症发生情况。

**1.5 统计学处理** 应用 SPSS 21.0 软件进行数据统计与分析。计量资料以均数±标准差( $\bar{x} \pm s$ )表

**表 1 2 组患儿肘关节活动度、Baumann 角及提携角比较**  
**Tab.1 Comparison of the the elbow joint motion, Baumann angle and carrying angle of children between the two groups** ( $\bar{x} \pm s$ )

组别	n	肘关节活动度/°		Baumann 角/°		提携角/°	
		健侧	患侧	健侧	患侧	健侧	患侧
早期手术组	51	148.3±5.3	146.2±5.9	72.4±4.2	71.3±4.4	14.8±6.1	15.9±2.7
延迟手术组	41	149.2±5.9	145.1±6.7	71.8±5.5	71.1±5.4	15.9±2.7	16.7±6.2
t		0.775	0.738	0.842	0.803	0.781	0.752
P		>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

**2.3 2 组患儿肘关节功能 MEPS 评分比较** 术后 1 a,早期手术组和延迟手术组患儿肘关节功能 MEPS 评分分别为(95.1±2.5)、(92.6±3.5)分,2 组患儿肘关节功能 MEPS 评分比较差异无统计学意义( $t=0.653, P>0.05$ )。

**2.4 2 组患儿临床疗效比较** 早期手术组患儿临床疗效优 40 例,良 7 例,可 4 例,优良率为 92.0%(47/51);延迟手术组患儿临床疗效优 34 例,良 3 例,可 3 例,优良率为 90.2%(37/41);2 组患儿临床疗效优良率比较差异无统计学意义( $\chi^2=0.751, P>0.05$ )。

**2.5 2 组患儿并发症比较** 早期手术组患儿术后出现钉道感染 1 例(1.96%),延迟手术组患儿术后出现钉道感染 1 例(2.44%),2 组患儿并发症发生率比较差异无统计学意义( $\chi^2=0.873, P>0.05$ )。2 组患儿均无医源性尺神经损伤。

**3 讨论**

SHF 常发生于 4~6 岁的儿童,是儿童最常见的骨折类型之一。目前 SHF 的主要治疗方法包括手法闭合复位石膏外固定、手术复位克氏针内固

示,2 组间比较采用 t 检验;计数资料以例数和百分率表示,2 组间比较采用  $\chi^2$  检验; $P<0.05$  为差异有统计学意义。

**2 结果**

**2.1 2 组患儿手术情况比较** 早期手术组患儿术中闭合转切开复位 1 例(1.96%),延迟手术组患儿术中闭合转切开复位 1 例(2.44%),2 组患儿术中闭合转切开复位率比较差异无统计学意义( $\chi^2=0.667, P>0.05$ )。早期手术组患儿术中拍 X 线片(15.2±3.1)次,延迟手术组患儿术中拍 X 线片(16.4±3.5)次,2 组患儿术中拍 X 线片次数比较差异无统计学意义( $t=0.535, P>0.05$ )。早期手术组患儿手术时间为(31.2±5.4)min,延迟手术组患儿手术时间为(33.5±5.2)min,2 组患儿手术时间比较差异无统计学意义( $t=0.512, P>0.05$ )。

**2.2 2 组患儿肘关节活动度、Baumann 角及提携角比较** 结果见表 1。术后 1 a,2 组患者健侧和患侧肘关节活动度、Baumann 角、提携角比较差异均无统计学意义( $P>0.05$ )。

定<sup>[9]</sup>。该部位为肘关节位置,往往可能伤及骨骺,处理不当易导致肘部骨骼发育畸形、肘关节活动受限、神经血管损伤等严重并发症<sup>[2]</sup>。

近年来, Gartland III 型 SHF 的手术治疗时机成为儿童骨科医师讨论和关注的焦点,且争议较大<sup>[10-11]</sup>。一般认为, Gartland III 型 SHF 应该进行早期手术复位,就诊延迟或延迟手术可能会增加患儿骨筋膜室综合征、神经损伤、血管损伤、感染等并发症发生率,特别是延迟治疗可能会导致闭合复位困难,进而增加切开复位率<sup>[3-4]</sup>。有研究显示, Gartland III 型 SHF 延迟治疗的切开复位率为 3%~46%<sup>[12-14]</sup>,差异较大。WALMSLEY 等<sup>[15]</sup> 研究显示,对于超过 8 h 未治疗的 Gartland III 型 SHF,切开复位率明显增加,同时手术时间也会随着延迟治疗时间的增加而延长。GUPTA 等<sup>[16]</sup> 研究显示,对于接受延迟手术治疗的 Gartland III 型 SHF 患儿有时需要反复复位(多达 6 次)才能达到满意效果,而反复闭合手法复位常常导致并发症增加,如周围神经损伤、血管损伤、术后感染等。目前, Gartland III 型 SHF 患儿早期与延迟手术具体时间尚无统一意见。本研究将受伤至接受手术治疗的时间 < 24 h 定为

早期手术,  $\geq 24$  h 为延迟手术。

本研究结果显示,2 组患儿术中闭合切开复位率、术中拍 X 线片次数、手术时间、肘关节活动度、Baumann 角、提携角、肘关节功能 MEPS 评分、临床疗效优良率及并发症发生率比较差异均无统计学意义,与有关文献报道一致<sup>[5-6,10-11]</sup>。SUGANYMA 等<sup>[11]</sup>认为,未合并神经血管损伤的 Gartland III 型闭合型 SHF 可以在受伤第 2 天计划时间内接受手术治疗。OKKAOGLU 等<sup>[17]</sup>对比了延迟手术与早期手术( $< 12$  h)治疗 Gartland III 型 SHF 患儿的临床疗效,结果显示 2 组患儿临床疗效相当。YILDIRIM 等<sup>[18]</sup>认为,延迟手术尽管不会影响患儿预后,但可能会降低闭合复位的成功率,甚至受伤时间超过 32 h 的患儿无法再进行闭合复位。笔者认为,闭合复位的难度主要与骨折移位有关,而与延迟治疗无必然关系,但在延迟手术中,若闭合复位困难,切忌反复暴力闭合复位,以免增加神经血管和软组织损伤的风险。

本研究 2 组患儿均未出现医源性尺神经损伤,这可能与所有患儿为外侧穿入克氏针有关。尺神经损伤为闭合复位穿针内固定治疗 SHF 的常见并发症,一般认为,内外侧交叉克氏针固定及穿针时肘关节过度屈曲是引起尺神经损伤的主要原因。延迟手术的 Gartland III 型 SHF 患儿往往因为肘关节肿胀而不能在尺神经沟触及尺神经,此时应用外侧扇形穿针技术可有效避免损伤尺神经,且其固定的稳定性与交叉穿针相似<sup>[19]</sup>。

综上所述,对于 Gartland III 型 SHF 患儿,早期手术和延迟手术均可取得良好的治疗效果,二者疗效相当,延迟手术并未增加切开复位率,亦未延长手术时间。但本研究样本量较小,随访时间较短,且为单中心研究,有待今后多中心、大样本量进一步研究,以期临床提供更可靠的参考依据。

#### 参考文献:

[1] SAROFF D A. Time to treatment; the question of beneficial surgical delays[J]. *J Bone Joint Surg Am*, 2001, 83(11):1755-1756.

[2] 方建文. 肱骨髁上骨折并发症分析[J]. *中外医疗*, 2019, 38(27):33-35, 105.

FANG J W. Analysis of complications of supracondylar fracture of humerus[J]. *Chin Foreign Med Treat*, 2019, 38(27):33-35, 105.

[3] 杨健,唐青松,杨周健,等. 闭合和切开复位联合克氏针内固定治疗儿童 Gartland III 型肱骨髁上骨折的临床效果比较[J]. *创伤外科杂志*, 2020, 22(5):354-358.

YANG J, TANG Q S, YANG Z J, et al. Clinical effect of closed and open reduction combined with Kirschner wire internal fixation in the treatment of Gartland type III supracondylar fracture of humerus in children[J]. *J Trauma Surg*, 2020, 22(5):354-358.

[4] FARROW L, ABLETT A D, MILLS L, et al. Early versus delayed surgery for paediatric supracondylar humeral fractures in the absence of vascular compromise: a systematic review and meta-analysis

sis[J]. *Bone Joint J*, 2018, 100(12):1535-1541.

[5] OKKAOGLU M C, OZDEMIR F E, OZDEMIR E, et al. Is there an optimal timing for surgical treatment of pediatric supracondylar humerus fractures in the first 24 hours[J]. *J Orthop Surg Res*, 2021, 16(1):484.

[6] KWIATKOWSKA M, DHINSA B S, MAHAPATRA A N, et al. Does the surgery time affect the final outcome of type III supracondylar humeral fractures[J]. *J Clin Orthop Trauma*, 2018, 9(Suppl 1):S112-S115.

[7] SCHNEEBERGER A G, KÖSTERS M C, STEENS W, et al. Comparison of the subjective elbow value and the Mayo elbow performance score[J]. *J Shoulder Elbow Surg*, 2014, 23(3):308-312.

[8] CEKANAUŠKAS E, DEGLIUTE R, KALESINSKAS R J, et al. Treatment of supracondylar humerus fractures in children, according to Gartland classification[J]. *Medicina(Kaunas)*, 2003, 39(4):379-383.

[9] 蔡龙,李文斌,黄永波. 儿童肱骨髁上骨折治疗进展[J]. *中国骨与关节杂志*, 2018, 7(11):840-844.

CAI L, LI W B, HUANG Y B. Treatment of supracondylar fracture of the humerus in children[J]. *Chin J Bone Joint*, 2018, 7(11):840-844.

[10] PACI G M, TILESTON K R, VORHIES J S, et al. Pediatric supracondylar humerus fractures; does after-hours treatment influence outcomes[J]. *J Orthop Trauma*, 2018, 32(6):e215-e220.

[11] SUGANUMA S, TADA K, YASUTAKE H, et al. Timing of surgery for pediatric supracondylar humerus fractures and early postoperative results[J]. *J Hand Surg Asian Pac Vol*, 2020, 25(2):226-231.

[12] BALES J G, SPENCER H T, WANG M A, et al. The effects of surgical delay on the outcome of pediatric supracondylar humeral fractures[J]. *J Pediatr Orthop*, 2010, 30(8):785-791.

[13] CRAMER K E, DEVITO D P, GREEN N E. Comparison of closed reduction and percutaneous pinning versus open reduction and percutaneous pinning in displaced supracondylar fractures of the humerus in children[J]. *J Oahop Trauma*, 1992, 6(4):407-412.

[14] SHARMA A, WALIA J P S, BRAR B S, et al. Early results of displaced supracondylar fractures of humerus in children treated by closed reduction and percutaneous pinning[J]. *Indian J Orthop*, 2015, 49(5):529-535.

[15] WALMSLEY P J, KELLY M B, ROBB J E, et al. Delay increases the need for open reduction of type-III supracondylar fractures of the humerus[J]. *J Bone Joint Surg Br*, 2006, 88(4):528-530.

[16] GUPTA K, GUPTA M, KUTTY S, et al. Displaced supracondylar fracture of the humerus in children: a modified technique of closed reduction[J]. *Indian J Orthop*, 2006, 40(2):108.

[17] OKKAOGLU M C, OZDEMIR F E, OZDEMIR E, et al. Is there an optimal timing for surgical treatment of pediatric supracondylar humerus fractures in the first 24 hours[J]. *J Orthop Surg Res*, 2021, 16(1):484.

[18] YILDIRIM A O, UNAL V S, OKEN O F, et al. Timing of surgical treatment for type III supracondylar humerus fractures in pediatric patients[J]. *J Child Orthop*, 2009, 3(4):265-269.

[19] ROY M K, ALAM M T, RAHMAN M W, et al. Comparative study of stabilization of humerus supracondylar fracture in children by percutaneous pinning from lateral side and both sides[J]. *Myensingh Med J*, 2019, 28(1):15-22.