Does Delay to Surgery in Type III Supracondylar Humerus Fractures Lead to Longer Surgical Times and More Difficult Reductions?

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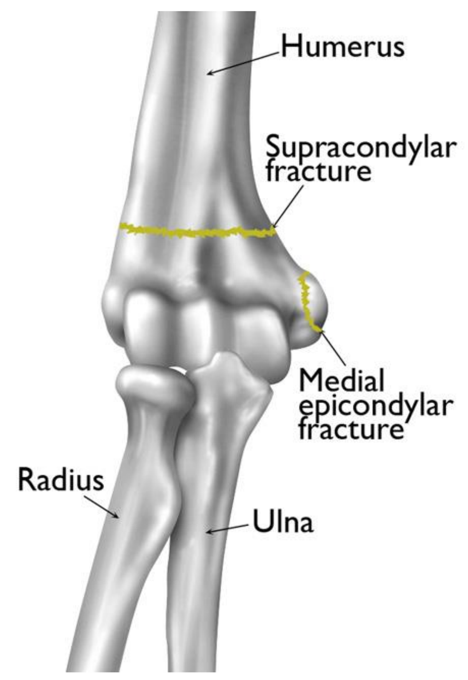
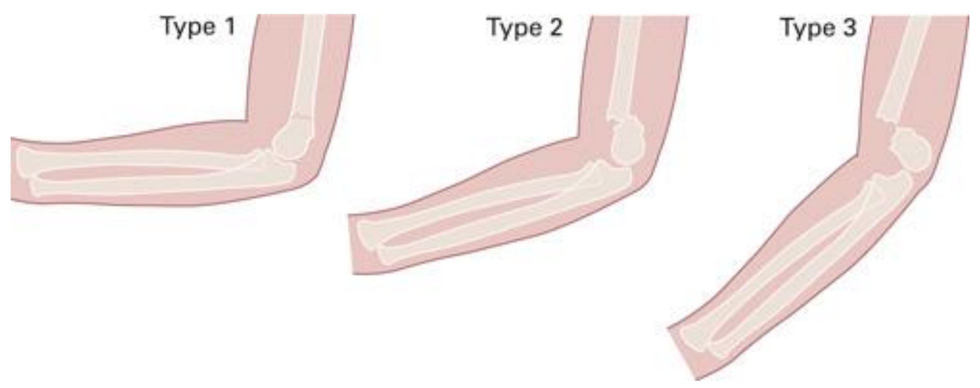
Background

Supracondylar humerus fractures:

- the most common pediatric elbow injury
- usually caused by a fall on an outstretched hand, hyperextending the elbow
- symptoms are pain, swelling, inability to move affected elbow
- neurovascular complications such as median nerve palsy and compartment syndrome can occur



- are classified by the Gartland Classification System as:
  - non-displaced (Gartland Type I)
  - displaced with posterior cortical contact (Gartland Type II)
  - displaced with no cortical contact (Gartland Type III)



Gartland Type III fractures are typically treated surgically by closed reduction and percutaneous pinning.

Emergent treatment of Type III supracondylar fractures was the standard of care until the late 1990's. Numerous studies have shown that delay in reduction of pediatric supracondylar humerus fractures does not affect clinical outcomes.

As many hospitals adopt dedicated daytime trauma operative time, more type III fractures are being pinned non-emergently after hospital admission. We sought to determine if delay in surgical treatment of type III supracondylar humerus fractures would affect the operative time of pinning of these fractures.

Methods

This is an IRB-approved, retrospective review of a series of 317 modified Gartland type III supracondylar fractures treated operatively at a tertiary referral center from 2011 to 2013. Exclusion criteria include patients with open injury fracture, flexion fracture, or other ipsilateral fracture, patients who underwent concurrent vascular surgery and patients who presented to the hospital over 24 hours after injury. Mean patient age was 5.4 years (range, 2-10y).

Injuries were classified by energy, and an injury was classified as high energy if the patient had pulselessness, nerve injury, tenting, or ecchymoses, and low energy if the patient had none of those signs.

To balance the study design, 15 hours was selected as the cut-off between early and delayed treatment.

A total of 53.6% (170/317) fractures were treated early, and 46.4% (147/317) were delayed. Surgical time was defined as "incision start" to "incision close". Fluoroscopy time was used as a surrogate for difficulty of reduction.

Results

Table 1. Demographic and Fracture Characteristics of Early Versus Delayed Treatment

	Early Treatment < 15 h	Delayed Treatment > 15 h	P
No. fractures	170	147	
Sex [n (%)]			
Female	77	66	0.944
Male	93	81	
Mean age (y)	5.4	5.4	0.865
Complications	1	1	
Time from injury to surgery (h)	10.5	18.5	0.00
Time from presentation to surgery (h)	7.4	14.7	0.00
OR time (m)	63	59.6	0.304
Surgery time (m)	35.8	32.7	0.370
Fluoroscopy time (sec)	53.8	48	0.234

Table 2. Fracture Characteristics of High versus Low Energy Injuries

	High Energy Injury	Low Energy Injury	P
No. fractures	143	174	
Time from injury to presentation (h)	3.4	3.4	0.494
Time from injury to surgery (h)	12.9	15.2	0.00
Time from presentation to surgery (h)	9.5	11.8	0.00
OR time (m)	65.1	58.3	0.002
Surgery time (m)	37.3	31.9	0.005
Fluoroscopy time (sec)	54.4	48.4	0.032

As shown in Table 2, time from injury to OR was shorter for high-energy fractures (fractures with soft tissue or neurovascular injury) versus low energy fractures (12.9 vs. 15.2 hours, $p < 0.0001$).

However, surgical time (37.3 vs. 31.9 minutes, $p = 0.005$) and fluoroscopy time (54.4 vs. 48.4 sec, $p = 0.032$) were longer in high-energy fractures vs. low-energy fractures.

Table 3. Fracture Characteristics of by Injury Energy and Time to Treatment

	High Energy Injury			Low Energy Injury		
	Early Treatment < 15 h	Delayed Treatment > 15 h	P	Early Treatment < 15 h	Delayed Treatment > 15 h	P
No. fractures	88	55		82	92	
Time from injury to presentation (h)	3	4.1	0.046	3.1	3.7	0.051
Time from injury to surgery (h)	9.8	18	0.00	11.2	14.9	0.00
Time from presentation to surgery (h)	6.8	13.9	0.00	8.1	15.1	0.00
OR time (m)	67.1	62	0.158	58.5	58.1	0.567
Surgery time (m)	39.3	34.1	0.091	32	31.9	0.284
Fluoroscopy time (sec)	56.7	50.7	0.302	50.6	46.5	0.778

As shown in Table 3, among low energy fractures, no significant difference was detected in surgical time between the early and delayed treatment groups (32.0 vs. 31.9 minutes, $p = 0.284$) or in the fluoroscopy time (50.6 vs. 46.5 seconds, $p = 0.778$).

Conclusions

Delay in surgery did not result in a longer surgical time or more difficult reduction for type III SCHFx. Patients with low energy fractures still underwent a shorter operative time even with delay from injury to surgery. When excluding high-energy injuries, surgical treatment of Gartland type III SCHFxs may be delayed without increasing surgical time or difficulty of reduction.

References

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