

Long-term Outcome of Shoulder and Hand Function in Children Following Early Surgical Intervention



Nicklaus Children's
Health System

for an Upper Brachial Plexus Injury

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Introduction

- The management and evaluation of the shoulder is typically the primary concern for upper brachial plexus injuries however, there may exist concomitant hand function deficits rather than isolated shoulder deficits.

Objectives

- The purpose of this study is to review long term hand function outcomes in children with an upper branchial plexus birth injury who underwent early nerve reconstruction.

Materials and Methods

Study design

- A retrospective chart review of patients undergoing primary nerve reconstruction for BPBI between 2000-2005

Study population

- Of the 55 patients with upper BPBI requiring reconstruction, 32 (58.2%) were available for long term follow-up.

Outcomes

- Patients underwent clinical evaluation, including calculation of shoulder function by Miami shoulder score and hand function by 9-hole peg test.
- Comparisons were made to the available normative population mean times matched for age, sex, and hand dominance.

Results

Table 1: Demographics of long-term follow-up patients

	Mean Birth Weight	Mean Age of Surgery (months)	Mean Age at Follow Up (Years)	Hand Dominance & Injured Side
Males (n=13)	9 lbs and 0 oz	9	15	RD: 10 ; 6 LBPI ; 4 RBPI LD: 3 ; 3 RBPI
Female (n=19)	8 lbs and 6 oz	11	15	R: 13 ; 12 LBPI ; 1 RBPI L: 6 ; 2 LBPI ; 4 RBPI
Total (n=32)	8 lbs and 7 oz	10	15	R: 22 ; 18 LBPI ; 5 RBPI L: 10 ; 2 LBPI ; 7 RBPI

- 13 males and 19 females were included in the study (n=32), with a mean age at surgery of 10 months (SD 4.5 months) and final follow-up of 15 years (SD 2y 2mo).

Table 3: Aggregate results of the nine-hole peg test

	9-HPT – involved hand(s) (mean of attempts)	9-HPT – uninvolved hand(s) (mean of attempts)	Difference in performance(s) (involved-uninvolved)	Percent difference (percent of uninvolved) ^a	Normative mean(s) (involved hand) ^b	Normative mean(s) (uninvolved hand) ^b	Normative Differences (involved-uninvolved)	Normative percent difference (percent of uninvolved) ^a
Mean	25.2	22.4	2.9	12.8	17.7	17.0	0.68	4.2
SD	5.5	4.4	3.1	13.6	0.87	0.96	0.96	5.66
Range	19 to 48	18 to 42	-4 to 11	-14 to 43	17 to 19	16 to 18	-1 to 2	-7 to 14

^a Percent data were rounded to the nearest total percentage. ^b Normative data was extracted from Poole et al. and are sex, age, and hand dominance matched. Discrepancies between the involved and the uninvolved extremities are recorded as positive when the involved hand was worse (longer time to complete the test) and negative when it was better (shorter time to complete the test).

Figure 2: Long-term shoulder evaluation (Miami scores)

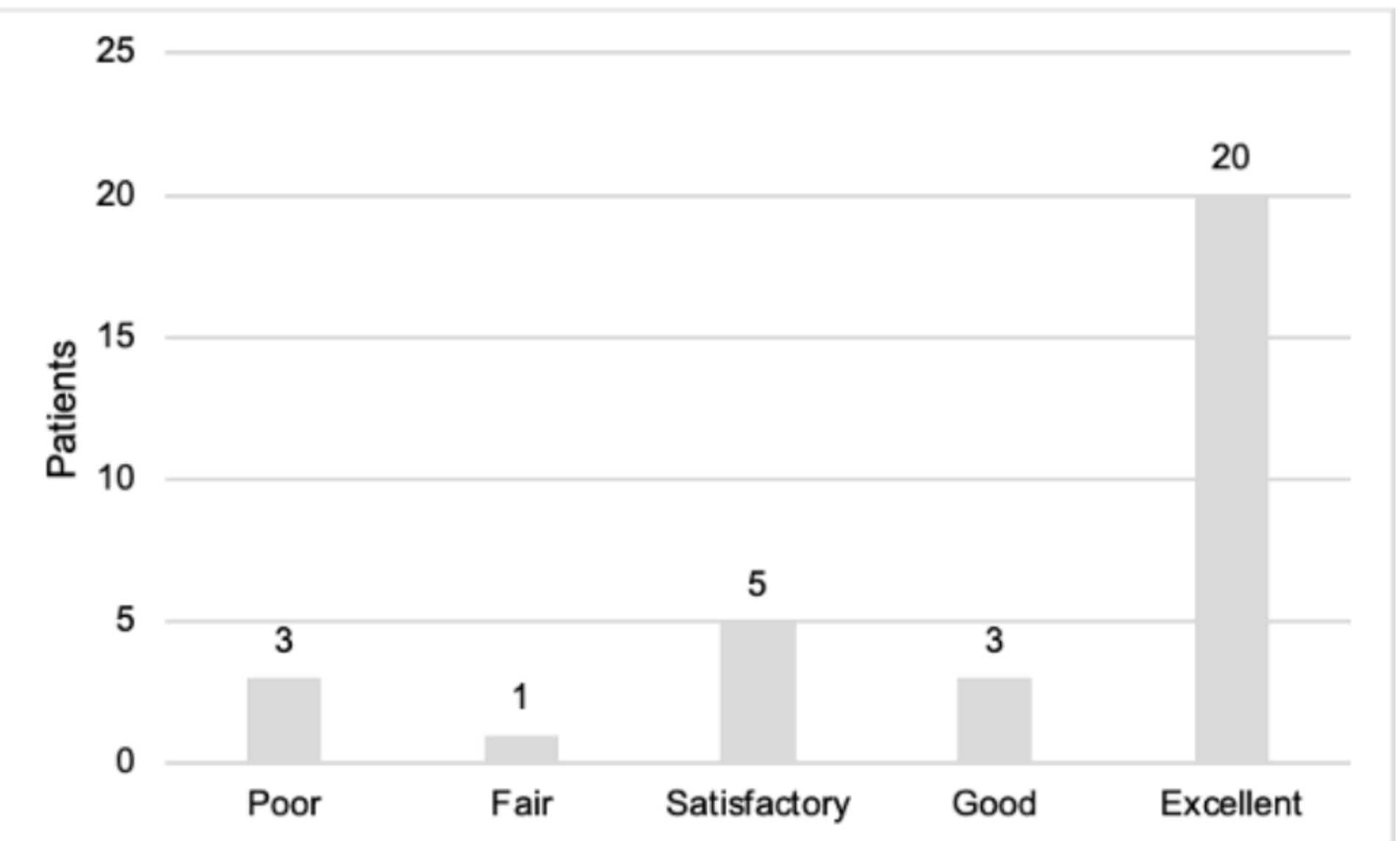


Table 2: Miami shoulder classification

Average active abduction/forward flexion (°C)	Active external rotation (°C)	Total score ^a	Grade
0	Fixed deformity	0	0 (no function)
<45	Full passive <10	1–2	1 (poor)
<90	<30	3–4	2 (fair)
90–120	30–45	5–6	3 (satisfactory)
120–150	45–90	7–8	4 (good)
>150	90	9–10	5 (excellent)

^a Maximum shoulder score=10; decrease score by 1 point for a contracture of >20°C.

Figure 1: Patient completing nine-hole peg test



Conclusions

- The majority of our patients treated for a C5/C6 BPBI demonstrate persistent long-term hand deficits which may play a role in residual functional disability and if identified sooner may redirect early treatment strategies.