



Clavicle Fracture is Not Associated with an Increased Risk of Brachial Plexus Birth Palsy in the Setting of Shoulder Dystocia



Rikesh A. Gandhi MD¹, Christopher J. DeFrancesco BS^{1,2}, Apurva S. Shah MD, MBA¹

¹The Children's Hospital of Philadelphia, PA, USA

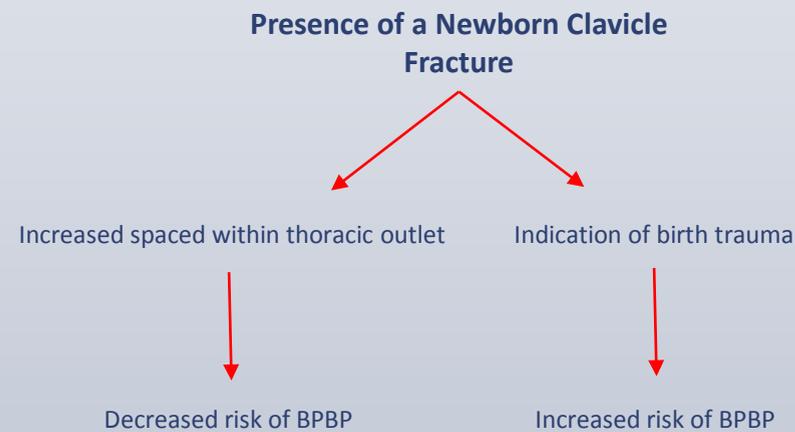
²Perelman School of Medicine, University of Pennsylvania, PA, USA

INTRODUCTION

- 4,000 infants are diagnosed with a brachial plexus birth palsy (BPBP) annually in the United States (1).
- Shoulder dystocia** is the **strongest known risk factor** for BPBP, increasing the risk by over 100 fold (2).
- Impaction** sustained during a shoulder dystocia is known to **increase the risk of clavicle fracture** at the time of birth (3, 4).

Clinical Significance

- A clavicle fracture **increases the space** in the **thoracic outlet** and could be **protective against** brachial plexus birth palsy. In contrast, the presence of a clavicle fracture may be a **surrogate for birth trauma** and thus be associated with an **increased risk of BPBP**.



- Wall et al. suggest that a concurrent clavicle fracture at birth may increase the odds of neurologic recovery (5). In contrast, Leshikar et al. suggest a clavicle fracture is neither protective against brachial plexus injury nor predictive of injury severity (6).

Objective

The purpose of this study was to use a large, national database, to determine definitively if a clavicle fracture in the setting of shoulder dystocia is associated with an increased or decreased risk of BPBP.

METHODS

- The Kids' Inpatient Database (KID) from 1997-2012 (7) was utilized for this study.
 - A pediatric inpatient administrative database made available through the Healthcare Cost and Utilization Project (HCUP), which is sponsored by the Agency for Healthcare Research and Quality.
 - Provides a nationwide sampling of patient discharges from all community, and non-rehabilitation hospitals in states participating in HCUP.
- BPBP was the primary outcome variable. Exposure variables included shoulder dystocia, clavicle fracture due to birth trauma, closed clavicle fracture, and open clavicle fracture. All variables were defined using ICD-9 codes.
- Newborns with shoulder dystocia were stratified into two subgroups:
 - Dystocia without a clavicle fracture
 - Dystocia with a clavicle fracture
- Multivariate logistic regression was used to quantify the risk for BPBP.

RESULTS

- 5,564,628 sample births extrapolated to 23,385,597 live births in the population (95% CI 22,780,168 - 23,991,026) were studied over the 16-year period.
- BPBP occurred at a rate of **1.2 per 1,000 births**.
- Shoulder dystocia occurred in 0.23% (53,787/23,385,597) of all live births (Table 1).
- 0.26% (60,803/23,385,597) sustained a clavicle fracture (Table 1).
- Shoulder dystocia and clavicle fracture were more common among infants with BPBP as compared to all births** (Table 2). Among cases of BPBP, 18.78% were associated with shoulder dystocia and 7.84% with clavicle fracture.
- 1.26% of BPBP cases were associated with both shoulder dystocia and clavicle fracture.

Table 1: Estimated prevalence of clavicle fracture and shoulder dystocia among all US births, 1997-2012

	1997	2000	2003	2006	2009	2012	All years	p-value 1997 vs 2012
Clavicle fracture	0.3322%	0.3247%	0.2542%	0.2205%	0.2085%	0.2088%	0.2575%	<0.0001
Shoulder dystocia	0.2710%	0.2383%	0.1994%	0.1949%	0.2348%	0.2617%	0.2325%	0.6228
without clavicle fracture	0.2553%	0.2247%	0.1868%	0.1832%	0.2219%	0.2467%	0.2190%	0.6424
with clavicle fracture	0.0154%	0.0131%	0.0122%	0.0114%	0.0127%	0.0145%	0.0132%	0.5217

Table 2: Estimated prevalence of clavicle fracture and shoulder dystocia among infants with BPBP, 1997-2012

	1997	2000	2003	2006	2009	2012	All years	p-value 1997 vs 2012
Clavicle fracture	7.1641%	8.6531%	7.147%	7.9965%	7.9992%	8.2666%	7.84%	0.1603
Shoulder Dystocia	17.3874%	15.8144%	18.4982%	18.4509%	21.8681%	24.2795%	18.78%	<0.0001
without clavicle fracture	16.2536%	14.9249%	17.2109%	17.1833%	20.082%	22.2721%	17.46%	<0.0001
with clavicle fracture	1.1337%	0.7978%	1.2005%	1.2676%	1.7496%	1.8922%	1.26%	0.0386

- In the setting of shoulder dystocia, **BPBP occurred in 9.82% of births without clavicle fracture and 11.77% of births with clavicle fracture** (Table 3).

Table 3: Unadjusted comparison of BPBP by disease determinant, 1997-2012

Variable	BPBP Incidence			p-value 1997 vs 2012	Unadjusted Relative Risk All Years	
	1997	2012	All years			
Risk factors						
Clavicle Fracture	Yes	3.61%	3.51%	3.75%	0.8053	32.95
	No	0.16%	0.08%	0.11%	<0.0001	
Shoulder Dystocia	Yes	10.73%	8.22%	9.94%	0.0056	99.18
	No	0.14%	0.07%	0.10%	<0.0001	
Without fracture	Yes	10.65%	8.00%	9.82%	0.0042	96.42
	No	0.14%	0.07%	0.10%	<0.0001	
With clavicle fracture	Yes	12.28%	11.55%	11.77%	0.7961	96.87
	No	0.17%	0.09%	0.12%	<0.0001	

- In the setting of shoulder dystocia, **the presence of a clavicle fracture (OR 126.7 vs. 112.1, p=0.262) was not statistically associated with decreased or increased risk of BPBP** (Table 4).

Table 4: Multivariate Analysis of brachial plexus birth palsy risk by shoulder dystocia subgroups

Main Variables	Odds Ratio (95% Confidence Interval)
Risk factors	
Shoulder Dystocia	
Without clavicle fracture	112.1 (103.5-121.1)
With clavicle fracture	126.7 (103.5-155.1)

CONCLUSION

- This population-level investigation suggests that, among newborns with shoulder dystocia, clavicle fracture is not associated with a significant change in the risk of BPBP.
- Additional factors such as the timing of the fracture and severity of the dystocia need to be examined in a prospective fashion to determine if clavicle fracture during a shoulder dystocia may be protective.

REFERENCES

- Foad SL, Mehlman CT, Ying J. The epidemiology of neonatal brachial plexus palsy in the United States. J Bone Joint Surg Am. 2008;90(6):1258-64.
- Sibinski M, Synder M. Obstetric brachial plexus palsy--risk factors and predictors. Ortop Traumatol Rehabil. 2007;9(6):569-76.
- Lopez E, de Courtivron B, Saliba E. [Neonatal complications related to shoulder dystocia]. J Gynecol Obstet Biol Reprod (Paris). 2015;44(10):1294-302.
- Karahanoglu E, Kasapoglu T, Ozdemirci S, Fadiloglu E, Akyol A, Demirdag E, et al. Risk factors for clavicle fracture concurrent with brachial plexus injury. Arch Gynecol Obstet. 2016;293(4):783-7.
- Wall LB, Mills JK, Leveno K, Jackson G, Wheeler LC, Oishi SN, et al. Incidence and prognosis of neonatal brachial plexus palsy with and without clavicle fractures. Obstet Gynecol. 2014;123(6):1288-93.
- Leshikar HB, Bauer AS, Lightdale-Miric N, Molitor F, Waters PM, Group TS. Clavicle Fracture Is Not Predictive of the Need for Microsurgery in Brachial Plexus Birth Palsy. J Pediatr Orthop. 2016.
- HCUP Kids' Inpatient Database (KID). In: (HCUP) HCUP, editor. Rockville, MD: Agency for Healthcare Research and Quality, Rockville, MD; 1997, 2000, 2003, 2006, 2009, and 2012.