

The Prognostic Value of Concurrent Phrenic Nerve Palsy in Newborn Babies With Neonatal Brachial Plexus Palsy

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Purpose To investigate the prognostic value of concurrent phrenic nerve palsy for predicting spontaneous motor recovery in neonatal brachial plexus palsy.

Methods We reviewed the records of 366 neonates with brachial plexus palsy. The clinical and follow-up data of patients with and without phrenic nerve palsy were compared.

Results Of 366 newborn babies with neonatal brachial plexus palsy, 21 (6%) had concurrent phrenic nerve palsy. Sixteen of these neonates had upper-type palsy and 5 had total-type palsy. Poor spontaneous motor recovery was observed in 13 neonates with concurrent phrenic nerve palsy (62%) and in 129 without concurrent phrenic nerve palsy (39%). Among neonates born via vertex delivery, poor motor recovery was observed in 7 of 9 (78%) neonates with concurrent phrenic nerve palsy and 115 of 296 (39%) without concurrent phrenic nerve palsy.

Conclusions Concurrent phrenic nerve palsy in neonates with brachial plexus palsy has prognostic value in predicting poor spontaneous motor recovery of the brachial plexus, particularly after vertex delivery. (*J Hand Surg Am.* 2015;40(6):1166–1169. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Therapeutic IV.

Key words Obstetric brachial plexus palsy, phrenic nerve palsy, prognostic value.

NEONATAL BRACHIAL PLEXUS PALSY (NBPP) often results from traction on the plexus during delivery.¹ This injury is commonly associated with shoulder dystocia, high birth weight, and an abnormal fetal presentation. Most patients with NBPP improve spontaneously.² However, some patients do not spontaneously recover and surgical

intervention is warranted to improve motor function. Many surgical options are available^{3,4} to improve NBPP, including neuroma excision, nerve grafts, and nerve transfers, but there is no consensus regarding when these techniques should be used because of the difficulty of predicting the natural course of these injuries.

Phrenic nerve palsy can occur alone, but often it occurs in the context of NBPP.⁵

The current study analyzed concurrent phrenic nerve palsy in patients with NBPP and investigated the prognostic value of phrenic nerve palsy in predicting spontaneous motor recovery.

PATIENTS AND METHODS

We performed a retrospective medical record review of 366 newborn babies with NBPP who were evaluated at our institute between 1991 and 2012. All of the neonates underwent a detailed NBPP examination

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Received for publication September 25, 2014; accepted in revised form January 31, 2015.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

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0363-5023/15/4006-0015\$36.00/0
<http://dx.doi.org/10.1016/j.jhssa.2015.01.039>

at regular intervals by the same orthopedic surgeon. Phrenic nerve palsy was identified by the presence of cyanosis and rapid respiration and was confirmed by pediatricians by plain chest radiographs revealing an elevation of the hemidiaphragm before 1 week of age.

We compared patients with phrenic nerve palsy (group A) and those without phrenic nerve palsy (group B) on the basis of body weight, length of gestation, type of palsy, mode of delivery, and motor recovery. The level of injury was determined by physical examination at 1 month of age and was classified as either upper-type (Narakas classification group 1 and 2) or total-type (Narakas classification group 3 and 4).⁶ Poor motor recovery was defined as a lack of active elbow flexion at 6 months in upper-type palsy. A lack of active elbow flexion was defined as a failure to demonstrate active movement of elbow flexion more than 30° against gravity. In total palsy, poor motor recovery was defined as a lack of active finger flexion at 3 months in total-type palsy.

Statistical analysis

Results of each parameter (body weight, gestation period, type of palsy, and mode of delivery) were analyzed by Mann–Whitney test (compared between group A and B). Motor recovery and prognostic value were analyzed by chi-square test (compared with the frequency of motor recovery between group A and B). The differences were considered to be statistically significant at $P < .05$.

RESULTS

Demographic data

Of 366 neonates with NBPP, 21 (6%) had a concurrent phrenic nerve palsy. Therefore, group A included 21 neonates and group B included 345. Of the 366 neonates, 213 were boys (59%). In group A, 13 neonates were boys (62%). In group B, 178 neonates were boys (52%).

Body weight at birth

Average body weight at birth was 3,180 g (range, 692–4,580 g) in group A and 3,789 g (range, 481–5,636 g) in group B (Fig. 1). Average body weight of group B was significantly higher than that of group A ($P < .01$).

Gestation period

Average length of gestation was 38 weeks (range, 25–41 wk) in group A and 39 weeks (range, 22–43 wk) in group B. There was no significant difference between groups.

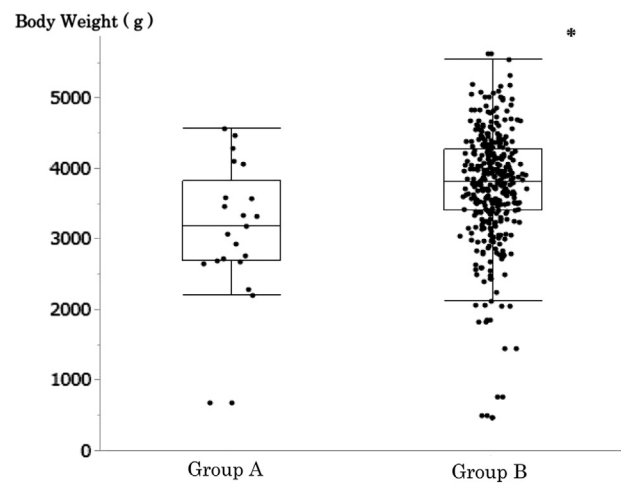


FIGURE 1: Body weight at birth. Average body weight at birth was 3,180 g (range, 692–4,580 g) in group A and 3,789 g (range, 481–5,636 g) in group B (* $P < .01$, Mann-Whitney U test).

Type of palsy

In group A, 16 neonates had upper-type palsy (76%) and 5 had total-type palsy (24%). In group B, 222 had upper-type palsy (64%) and 123 had total-type palsy (36%).

Mode of delivery

Breech delivery was more frequent in group A (12 [57%]) than group B (34 [11%]). Vacuum extraction and shoulder dystocia were more frequent in group B (152 [48%] and 157 [50%], respectively) than group A (6 [29%] and 4 [19%], respectively).

Motor recovery

Poor spontaneous motor recovery of the limb was observed in 13 neonates in group A (62%) and 129 in group B. Chi-square test indicated a significant difference ($P = .03$) in spontaneous motor recovery between groups.

Among neonates with upper-type palsy, poor spontaneous motor recovery was observed in 8 in group A (50%) and 28 in group B (13%). Poor spontaneous motor recovery was significantly higher in group A ($P < .01$). Among neonates with total-type palsy, poor spontaneous motor recovery was observed in 5 in group A (100%) and 101 in group B (82%). Chi-square test ($P < .01$) indicated a significant difference in spontaneous motor recovery between groups.

In patients with phrenic nerve palsy, poor motor recovery was observed in 7 neonates with vertex presentation (78%) and 6 with breech delivery (50%). In group B, poor motor recovery was observed in 115 neonates born via vertex delivery (39%) and 14

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