RESEARCH ARTICLE

A STUDY ON THE RISK FACTORS FOR OBSTETRICAL BRACHIAL PLEXUS PALSY

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Abstract

Objective

Considerable medical and legal debates have surrounded the prognosis and outcome of obstetrical brachial plexus injuries and obstetricians are often considered responsible for the injury. In this study, we assessed the factors related to the outcome of brachial plexus palsy.

Material & Methods

During 24 months, 21 neonates with obstetrical brachial plexus injuries were enrolled.

Electrophysiology studies were done at the age of three weeks. They received physiotherapy and occupational therapy. They were examined every 3 months for one year and limbs function was assessed according to Mallet scores; also, maternal and neonatal factors were collected by a questionnaire.

Results

There were 10 boys and 11 girls.

Of all, 76.2% had Erb's palsy, 19% had total brachial palsy and 4.8% had klumpke paralysis.

Risk factors including primiparity, high birth weight, shoulder dystocia, and prolonged second stage of labor were assessed.

Electrophysiology studies showed neuropraxia in 52.4% and axonal injuries in 42.9% of the patients.

At the end of the first year, 81% of the patients had functioned recovery around grade III or IV of Mallet scores.

There were only significant relationships between functional improvement and neurophysiologic findings.

Conclusion

Outcome of obstetrical brachial injuries has a close relationship to neurophysiologic study results than other risk factors.

Keyword: Obstetrical brachial injuries, Neonate, Neurophysiologic study

Introduction

Obstetrical brachial plexus palsy is defined as a flaccid paresis of an upper extremity due to traumatic stretching of the brachial plexus and occurs at birth. It happens in 0.4-2.5 per 1000 live births (1). Upper plexus palsy which involves C5-C6 and sometimes C7 is called Erb's palsy and is the most common type.

Lower plexus palsy which involves C8 and T1 also is called klumpke paralysis, it is very rare and accounts for <2% of all reported brachial plexus palsies. Total plexus palsy, called flail limb, involves C5-C8 and sometimes T1 and is the second

most common type of injury (2).

Although most injuries are transient, with full return of function occurring in 70-92% of cases, some result in prolonged and persistent disability and become the major source of pregnancy related medical litigation (3).

The outcome of each type of palsy varies according to the degree of the initial injury and Erb's palsy is thought to have a good prognosis (1-4); however, assessing the outcome of obstetrical brachial palsy is not facilitated by the population distribution and length of observation; therefore, in this study, we assessed the outcome according to the type of palsy, risk factors and neurophysiology studies, at the end of the first year.

Patients and methods:

During 24 months (2008-2010), 21 neonates with obstetrical plexus injury who had

been referred to our department were enrolled after obtaining informed consent.

In each case, birth weight, preterm delivery, Apgar score, maternal characteristics (diabetes mellitus, maternal age, primiparity) and labor-related factors (shoulder dystocia, presentation, the mode of deliveries, the length of the second stage of labor) were recorded.

Range of motion of the limb, both active and passive, were noted after a detailed brachial plexus examination which assessed power of shoulder abduction, external and internal rotation, elbow flexion and extension, forearm supination and wrist and hand extension. Each case was examined every week until the third week when neurophysiological studies were carried out. Then, they were visited every 3 months until one year of age, and in each visit functional recovery was assessed with a special grading system based on" the Mallet system" as below:

Grade I: absence of function

Grade II: external rotation

Grade III: external rotation and hand to mouth (elbow range or motion>90)

Grade IV: external rotation and hand to the mouth and to the back of head (shoulder abduction >120◦).

Grade v: complete recovery

The mean follow-up period was 18 months and at least 1 year.

All patients received physiotherapy and occupational therapy since the first week of life and during the study.

Mann-Whitney u test and kruskal wallis test were used for data analysis and $p < 0.05$ was considered significant.

Results

From 21 infants, 10 were boys and 11 were girls. Sixteen infants (76.2%) had Erb's palsy (c5-c6 palsy), 4 (19%) had total brachial plexus injury (c5-c8) and 1 (4.8%) had klumpke paralysis (c7-T1).

There were no patients with bilateral lesions.

There was no difference in the involvement of right and left sides (49.5%. vs. 50.5%).

In view of the risk factors for obstetrical brachial plexus palsies in this study, results were as follows:

Eleven (52.4%) cases had a birth weight over 4 kg; the average birth weight was 3.9 (3.4-4.5) kg.

There were no cases of breech presentation and preterm delivery was seen only in one.

There were no mothers with diabetes mellitus; on the other hand, most of them did not know their body weight gain during pregnancy.

The mean maternal age was 27.7 (20-37) years.

Thirteen (61.9%) mothers were primiparas and 8 (38%) were multiparas.

Shoulder dystocia happened in 10 (47.6%) and prolonged labor in 10 (47.6%) cases.

A low Apgar score (<7) was seen in 6 (28.7%) patients.

The mode of delivery was caesarean section in 1 (4.8%) case and normal vaginal delivery in others (95.2%). Neurophysiology studies in the third weeks of life showed conduction blocks (neuropraxia) in 11 (52.4%) infants, 1(4.8%) case was not tested and 9 (42.9%) infants had axonal injuries. From patients with axonal injuries, one case had avulsion in preganglionic region and five (23.8%) cases showed to have axonal injuries with good regeneration. The lesions were in postganglionic regions in 11 (52.3%) cases and preganglionic in 3 (14.2%); there were no reports on the region of injury in the rest of the infants. However, for statistical analysis, we performed analysis according to the two above-mentioned types of injury (neuropraxia and axonal injuries). Functional grading according to Mallet system in the third months and in the final follow up is shown in Figure 1.

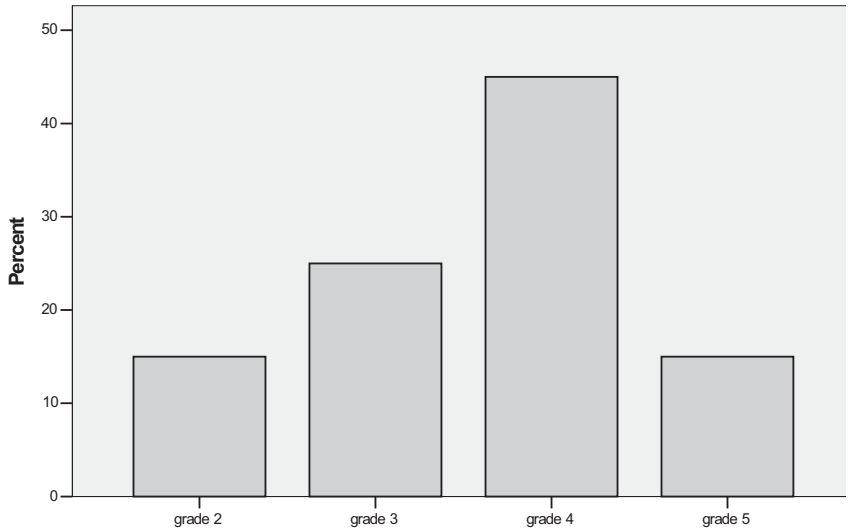

Figure 1. Functional grading according to Mallet system in 3 months

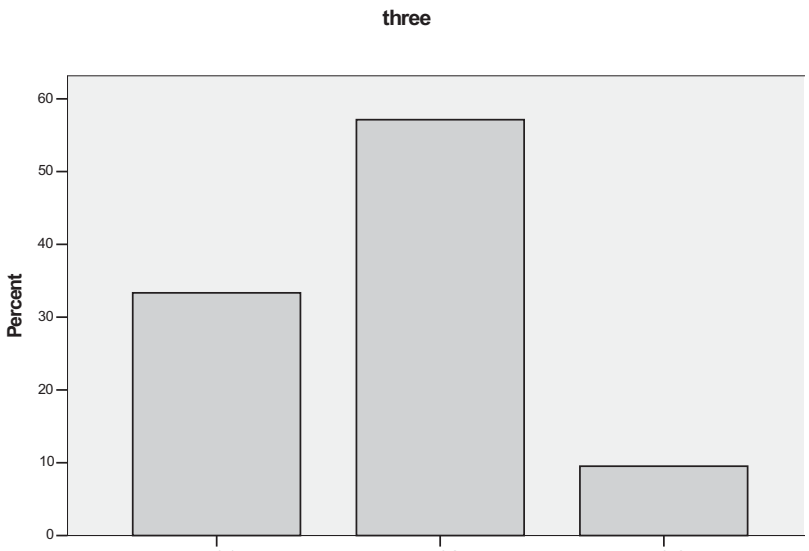

Figure 2. Functional grading according to Mallet system in 12 months

Every measured variable was analysed to see if it was associated with final recovery; there was no significant relationship between functional recovery grading and body birth weight (p=0.5), maternal age and maternal parity (p=0.6), mode of delivery and preterm delivery (p=0.4), Apgar score (p=0.4), prolonged labour and shoulder dystocia (p=0.3) according to Mann-Whitney u test.

The relationship between functional grading and types of palsy showed that recovery in Erb's palsy was more than other types of palsy but the difference was not significant (p=0.2) (Table 1).

The relationship between functional grading and neurophysiology studies showed improvement in patients with neuropraxia was more significant than those with axonal injuries (p=0.03) (Table 2).

Table 1: Relationship between functional recovery and type of palsy

Improvement from grade III to V		Improvement from grade III to IV		grade III or less		Mallet scale / Type of palsies
%	n	%	n	%	n	
100	3	10	83.3	60	3	Erb's Klumpke
0	0	8.3	1	0	0	Total
0	0	1	8.3	40	2	

P = 0.239 based on kruskal wallis test

Table 2: Relationship between functional recovery and electrophysiology findings

Improvement from grade III to V		Improvement from grade III to IV		grade III or less		Mallet scale / Electrophysiology studies
%	n	%	n	%	n	
0	0	45.5	5	80	4	Axonal injuries
100	4	54.5	6	20	1	Neuropraxia

P= 0.034 based on Mann – Whitney Test

Discussion

Obstetrical brachial plexus injuries are devastating complications of pregnancy and delivery. Persistent injury constitutes a significant proportion of obstetrically related medical litigation (1).

Although its incidence is not common in our country compared to available literature reports (0.1% vs. 0.3%), its outcome is very important for parents.

In our study like other reports, Erb's palsy (76.2%) was the most common but klumpke palsy (4.7%) was very rare (4-7-5).

We noted no sex preponderance but different studies have reported different results (6-7-8).

The risk factors for brachial plexus palsies can be divided into three categories of neonatal, maternal, and labor-related factors.

The most significant risk factor cited in the literature is high birth weight (>4 kg). Several studies have shown that increasing weight is strongly associated with an increased risk of shoulder dystocia (1-9-10). In our study, 52.4% of the cases were over 4Kg.

Fetal position is very important. Brachial injury is seen

more frequent with breech deliveries and the lesions are more severe than those occurring in cephalic presentation; however, none of our cases had a breech presentation.

Maternal status includes diabetes mellitus, obesity or excessive weight gain, maternal age, maternal pelvic anatomy and primiparity. Among these diabetes mellitus is more significant as a risk factor (10). Mean maternal age in our study compared with other reports was not high, most mothers did not know about their weight gain during pregnancy, no mother with diabetes was seen and most of them were primipara (10).

Brachial plexus injury complicates 8-23% of shoulder dystocia cases (1-10); in our study, it was seen in 47.6% of cases that is high, but we did not find any statistical relationships between the above-mentioned risk factors and functional recovery. The mode of delivery and the length of the second stage of labor have been evaluated by many investigators. Vaginal delivery is related to the occurrance of these palsies (1-9) but since it was the mode of delivery in 95.2% of our patients, we could not compare it with cesarean section.

We did not have any assisted deliveries by using vacuum extraction or direct compression of the fetal neck during delivery by forceps which can cause stretching of the cervical nerve roots.

Prolonged labor increases the risk of injury that was seen in 47.6% of our patients but was not related with functional improvement.

Many authors suggest that the absence of muscle contraction recovery in the biceps and deltoid by3 months of age is predictive of poor outcome and the ages of three and eight months are recommended ages for early operative intervention. However, as is shown in Figure I, more than 66% of our patients had grade III and IV (according to Mallet system) and at 12 months, 81% of our cases had function as grade III or more and only 19% (4 cases) were referred to the neurosurgery department that is similar to other reports (7-8-11). The relationship between the type of palsy and function improvement was not signification although recovery in Erb's palsy was high.

Some studies have reported that the role of neurophysiologic studies in the prediction of the prognosis of brachial plexus palsy is currently uncertain an indefinable (1); however, we noted that functional recovery and outcome had a significant relationship with electrophysiology studies ($p=0.03$).

In conclusion, A major concern of clinicians in obstetrical brachial plexus palsy is the accurate prediction of the prognosis which makes correct assessment necessary. This study showed that neurophysiology study had a significant relationship with functional improvement.

Acknowledgement

This study was undertaken with the approval of the Ethical Committee of Mashhad University of Medical Sciences.

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