The Presentation, Predisposing Factors and Outcome of Erb's Palsy in Duhok City

Saad Mahmood Zebary*, Dr. Khalid Nawaf Abdulrrahman**

* Duhok Training Center; Paediatric ** College of Medicine; University of Duhok

Corresponding Author: Dr. Sa'ad Mahmood Zebary. Email: saadalzebary1984@gmail.com

Abstract

Background and objectives: Neonatal brachial plexus palsy is a common birth injury. Although spontaneous recovery is expected to occur in most of affected newborns, some might be severely handicapped. The objectives of this research were to study the predisposing factors and injury outcome of Erbs' palsy in neonates. **Methods:** All infants diagnosed with Erbs' palsy and managed at a rehabilitation center in Duhok city were included in the study during the period September, 2016 to August, 2017. The data collected were sex, birth weight, the affected upper limb, referral time, the residential area, delivery place, delivery type, presence of cephalopelvic disproportion or protracted (prolonged) labor and the mother height and were compared with a control group of term neonates. **Results:** The total number of patients were 53; 30 males (56.6%) and 23 females (43.4%). The mean birth weight of patients was 3975 (± 453) grams, and that of the control group was 3421 (±602) grams. The right side was affected in 35 (66%) and left side in 18 (34%) of cases. In 44 (83%) of case, the delivery was vaginal and in 9 (17%) cases through cesarean section. Shoulder dystocia was present in 26 (49%) and cephalopelvic disproportion in 14 (26.4%) of cases. Good functional recovery was seen in 44 (83%) of patients within six months of physiotherapy. **Conclusions:** Shoulder dystocia, large birth weight of 4 kg or more and cephalopelvic disproportion were the major risk factors.

Keywords: Brachial plexus palsy; Erb's palsy; Shoulder dystocia; Macrosomia.

Introduction

The five spinal nerve roots C5, C6, C7, C8 and T1combine into three trunks to form the brachial plexus. Injury to the upper trunk (C5-C6) results in Erb's palsy, whereas injury to the lower trunk (C8-T1) is called Klumpk's palsy. The middle trunk (C7) injury is rarely isolated[1, 2].Erb's palsy, named after Wilhelm Heinrich Erb (1840-1921), a German neurologist who described a case in 1874, is the most common type and mild form of brachial plexus injury during delivery. It is also called Erb-Duchenne paralysis because an earlier case was described by Duchenne in 1872 [3]. This birth injury results in the classic 'porter's tip' or 'waiter's tip' appearance[4-6]. Despite recent advances in modern obstetrics, the incidence of this birth injury has not declined during the last decades, even in developed countries, and it varies from 0.5 to 3 cases per 1000 live births[5, 6]. Although several risk factors have been reported, just a minority of deliveries with identifiable risk factors will result in Erb's palsy, and its occurrence remains an essentially unpredictable event[7-9]. However, shoulder dystocia, defined as difficulty in delivering the shoulders after the head has delivered, has been reported in at least half of the cases, as the main risk factor for occurrence of Erb's palsy, and in almost all cases of shoulder dystocia, a clear relation to the birth weight was found [8-11]. According to the recent studies, more than half of the patients (55%) will be completely recovered within six months and more than one third (35%) will have a satisfactory outcome, but with some shoulder functional limitation. The remaining will be severely handicapped, requiring surgical intervention[12, 13]. There is no enough data on Erb's palsy in our hospitals; therefore, this research has been conducted to identify the aspects related to this injury, the predisposing factors and its outcome in our center.

Patients and methods

A retrospective study was carried out in the center dedicated to physical therapy and rehabilitation of children, belonging to the Duhok Medical Education Complex. This center is designed to accommodate children who need physiotherapy for various causes, including Erb's palsy. We analyzed the medical records of patients referred for physiotherapy with the diagnosis of Erb's palsy, during the period from September, 2016 to August, 2017. The diagnosis of Erb's palsy in the rehabilitation center is clinical, made by pediatricians and orthopedicians and based on the clinical observations and manipulations of the infant. In addition, they classify the palsy depending on Narakas classification[1, 14, 15]. Accordingly, neonates were diagnosed as having Erb's palsy if they have the following signs [14, 15]: the characteristic position: adduction and internal rotation of the arm with the forearm pronated, absence of biceps reflex, absence of Moro reflex on the affected side and normal power of the forearm, normal hand grasp and absence of Horner's sign.

Information including the age and sex of the infant, birth weight, residence of the family, the place of labor and mode of delivery were retrieved. The researcher was keen on the need to bring the special card after labor, which is provided to the mother by the doctor supervising the labor, to ascertain the birth weight, mode and duration of labor, any complications and intervention. The stature of the mothers was measured in all cases. In the current case-control study, the researchers examined the children affected by upper limb and its severity. At the same time, the study included a number of normal term infants equal to the number of the patients, who delivered in the Hospital as a control group, to compare their birth weight with that of the patients.

Treatment in all cases started with physiotherapy by a staff specialized in physiotherapy for children. Patients' response to treatment was assessed every month. For evaluation of the functional outcome related to Erb's palsy, the pediatricians, orthopedicians and physiotherapists at the rehabilitation center designed the follow-up examinations in details. The study was approved from the ethical committee of Kurdistan Board for Medical Specialties. In addition, verbal consent was taken from the mothers of the children who participated in the research, after clarifying the purposes for them. The statistical package used was SPSS. The descriptive statistics of percentage and standard deviation (SD) were used. The t-test was used to compare between the mean birth weight of the patients and control group. A p-value $\leq$ 0.05 was considered significant. The Odds ratio was used to compare between cases and controls.

Results

The total number of patients diagnosed with Erb's palsy during period of study was 53. Thirty (56.6%) were males and 23 (43.4%) were females.

The right side affected in 35 (66%) and left side in 18 (34%) of cases. The time of referral of patients to the center for treatment ranged between 4 and 10 days after birth, with a mean of 8 days. The birth weight of patients and control group is shown on Table 1. A significant difference was found between the mean birth weight of patients and control group (p-value 0.04). In addition, the birth weight of 10 patients (18.8%) was over 4 kg, compared to only one infant (1.8%) in the control group (odds ratio 12).

Table (1): The birth weight of patients and control group

Birth Weight (Kg)	Patients (n=53)	Controls (n=53)
<2.5	0	5
2.5-3	3	11
3-3.5	7	32
3.5-4	33	4
>4	10	1
Mean (±S.D)**	3.97 (0.45)	3.28 (0.6)

**using t-test, p-value is 0.04.

The infant's family residence was as follow: urban in 10 (18.9%), rural in 21 (39.6%) patients and 22 (41.5%) cases were displaced families. The place of delivery is shown on Table 2. In more than half of patients, the place of delivery was the primary health centers and small hospitals at the districts and small towns.

Table (2): Type and place of delivery in patients

Place and mode	Frequency (%)
Place of delivery	
Public hospital	19 (36)
Private hospital	7 (13)
Others*	27 (51)
Mode of delivery	
Vaginal	44 (83)
Normal	16 (30.2)
Assisted (manipulation)	23 (43.4)
Forceps or vacuum extraction	5 (9.4)
Caesarean section	9 (17)

*Health centers and small hospitals at districts and

The obstetric risk factors are shown on Table 3. On physical examination of patients, we found that in 51 cases (96.2%), the presentation was consistent with upper plexus lesion (Erb's palsy), and only 2 cases (3.7%) were more severely affected than others in terms of movement and arm position.

Table (3): Obstetric risk factors

Risk factor*	Frequency (%)
Shoulder dystocia**	26 (49)
Cephalopelvic disproportion***	14 (26.4)

*No risk factor was present in 4 cases.

** Protracted delivery, defined as delivery not completed within 12 hours, occurred in 5 cases of shoulder dystocia. ***10 cases were due to macrosomia (>4 kg) and 4 cases due to maternal short stature (< 140cm).

After three months of regular physiotherapy, 23 patients (43%) showed good response to physiotherapy, depending on the movement of the affected upper limb. After six months of treatment and follow-up, there were signs of marked improvement in the movement of the affected upper limb in 44 patients (83%), and the treatment was stopped. Seven patients (13%) did not complete the treatment and we lost them in the follow-up period. Two patients (4%) were referred to the orthopedic surgery due to lack of any improvement after six months of physiotherapy.

Discussion

The higher proportion of males than females with Erb's palsy in this study is comparable to that reported in earlier studies[1, 3-6, 8-11]. From reviewing the references on this topic, we did not find agreement on why the number of males is higher than that of females. Some have attributed this to the fact that males are heavier at birth than females,[2, 4, 5] so they are more susceptible to birth injuries and others to a relative increase in male births over female births [8, 10, 11]. This study indicated that the great majority of patients were from rural areas and displaced families. Although previous studies did not address the residence of the child's family, perhaps because this aspect is not important to

them, we consider that the importance of this aspect is no less than the other aspects. The pregnant women in the rural areas and in displaced families may not have good antenatal care, and many pregnancies with risk factors for Erb's palsy such as macrosomia and cephalopelvic disproportion was found in 14 (26.4%) of our patients. It has been found that delivery by cesarean section may prevent brachial plexus palsy in cases of macrosomia, particularly if associated with cephalopelvic disproportion[1-6]. In a related context, this study showed that most patients were born in the health centers of some districts, which are poorly equipped and funded, in addition to the poorly trained birth attendants in these centers. This is what has been observed in researches conducted in developing countries[16]. On physical examination of patients, we found that in 51 cases (96.2%), the presentation was consistent with upper plexus lesion (Erb's palsy), and only 2 cases (3.7%) were more severely affected than others in terms of movement and arm position. In addition, these 2 patients showed no response to physiotherapy after six months, and we considered them as combined upper and lower brachial plexus injury (C5-C7 and T1). It is well-known that the upper brachial plexus lesion (Erb's palsy) is the most common type of neonatal brachial plexus injury, and the percentage of this lesion among cases of brachial plexus injuries in earlier researches was between 87-91%[10, 17, 18]. We observed that the right upper limb was more affected than the left side (66% vs 34%). This finding is consistent with that reported in earlier researches, were two thirds of cases occurred in the right side[16, 19]. In the current study, a significant difference was found between the mean birth weight of patients and that of the control group. In addition, the estimated Odds ratio (12) indicates that neonates with birth weight > 4 kg were at higher risk to develop Erb's palsy than those with birth weight < 4 kg. On the other hand, shoulder dystocia, which is the major well-known risk factor, was present in about half of cases. As referred to in the literature, neonatal macrosomia and shoulder dystocia are considered to be the most significant combined maternal and infant risk factors for brachial plexus palsy, including Erb's palsy[10, 20-23]. The proportion of patients born by cesarean section in this study (17%), which is higher than what is mentioned in other studies, is noteworthy. This finding supports the hypothesis that cesarean sections have a protective effect, but cannot avoid neonatal brachial plexus palsy completely[11]. As it is written in the literature, Erb's palsy in newborns delivered by cesarean section is extremely rare (1% of all cases)[1, 24, 25]. The role of cesarean section in reducing the incidence of Erb's palsy and other brachial plexus palsies is supported by the lower incidence of this birth injury in Brazil than that in many European countries. The researchers attributed this to the high proportion of cesarean sections in Brazil[26]. In this regard; the American College of Obstetricians and Gynecologists (ACBG) recommends cesarean section for estimated birth weight higher than 5 kg[27]. Early referral of patients (< 2 weeks) for physiotherapy is necessary for better outcome. This may explain the marked improvement in most of our patients in a period of 3-6 months, as most of them were referred within 10 days of birth. To ensure that the circulation of the shoulder joint is not affected, recent studies recommend that the affected upper limb and the shoulder joint should not be left without exercises for more than two weeks after injury[28, 29]. On the other hand, late referral of patients for physiotherapy management (> 2 weeks) is associated with poor outcome as demonstrated by a study carried out in Nigeria[16]. We found that marked functional recovery occurred in 83 % of our patients after six months of regular physiotherapy, taking into consideration that seven patients (13%) did not complete their treatment and we do not know what happened to them.

Conclusions

Shoulder dystocia, with or without macrosomia, and cephalopelvic disproportion were the strongest risk factors for Erb's palsy. Proper antenatal care will diagnose many cases of cephalopelvic disproportion and macrosomia. Difficult vaginal deliveries would be avoided by proper management of delivery by qualified medical personnel. Cesarean section would be a rational approach for prevention of Erb's palsy. Early referral of patients for treatment is necessary for better outcome. Good functional recovery was seen in the great majority of our patients within 6 months of regular physiotherapy.

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