

Birth related Erb's Palsy: Obstetrical correlates and Outcome

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ABSTRACT

Objective: This study aims to determine the obstetrical correlates and outcome of birth related Erb's palsy.

Study Design: Retrospective cohort study.

Place and Duration of Study: This study was conducted in Obstetrics & Gynaecology and Orthopedics & Traumatology Departments of Khyber Teaching Hospital Peshawar from Dec 2004 to Nov 2009.

Materials and Methods: Hospital records from Dec 2005 to Nov 2010 were searched. A cohort of all cases of birth related Erb's palsy over a 5 year period was recorded. Birth records of cases were obtained. Cases were contacted and called for followup and assessment of functional outcome from Jan through March 2013.

Results: A total of 30,367 live births were recorded during the study period out of which there were 28 cases of obstetrical Erb's palsy. Their birth records revealed that 27 were delivered vaginally and only 1 through cesarean section. In 17 cases delivery was complicated by shoulder dystocia out of which 10 mothers were diabetic. Mean weight at birth was 3.8 kg. All cases were managed conservatively. Twenty five cases presented for follow up. Twenty cases had no residual functional deficit. Five children had some form of functional deficit present.

Conclusion: Erb's palsy is seen more commonly in births complicated by shoulder dystocia and in diabetic mothers with high birth weight babies. Conservative management is effective but regular follow up is needed to pick up those cases that require surgical intervention to prevent lifelong handicap.

Key Words: Erb's Palsy, risk factors, Brachial plexus injury

INTRODUCTION

Obstetrical brachial palsy (OBP) results from stretching of the brachial plexus as the baby passes through the birth canal.¹ If the baby's head and shoulders are pulled in opposite directions during delivery, the upper part of the brachial plexus is stretched (Erb's palsy).^{1,2} This condition is associated with large-birth-weight infants and difficult deliveries.^{1,2,3} The condition can also be caused by excessive pulling on the shoulders during a cephalic presentation, or by pressure on the raised arms during a breech delivery.⁴ Erb's palsy can also affect neonates affected by a clavicle fracture unrelated to dystocia.^{5,6} The reported incidence of OBP varies from 0.04 to 2.5 per 1000 live births.^{7,8,9}

Smellie, in 1768, was the first to write a clinical description of this problem. Danyau performed an autopsy of a newborn with brachial plexus palsy in 1851, providing the first anatomic description of this lesion.¹⁰ In 1872 Duchenne described traction to the arm in infants and identified the lesion as being the upper part of the brachial plexus.¹⁰ Two years later Erb described electrical stimulation of this lesion in children and adults. Although Duchenne first described the lesion, Erb's name is commonly associated with it; Erb-Duchenne palsy is an equally correct term for this lesion.^{10,11}

Classically this lesion has been described as involving the C5-C6 and C7 roots of brachial plexus.¹ The paralysis can be partial or complete; the damage to each nerve can range from bruising to tearing.^{8,9} Children

with Erb-Duchenne palsy present with the involved arm limp at their side, the shoulder internally rotated, the elbow positioned in full extension, the forearm pronated, and the fingers and wrist flexed.¹³ Many of these children undergo full spontaneous recovery within the first 3 months.^{12,13} Even when sensory and motor return does occur, the child often ignores the arm.¹² The key to therapy is helping the child develop an awareness of the arm and its useful potential. The focus of therapy should therefore consist of instructions to the parents about ways they can facilitate the use of the arm while motor and sensory function returns.^{14,15}

Depending on the nature of the damage, the paralysis can resolve on its own over a period of months, necessitate rehabilitative therapy, or require surgery.¹⁶ It is well documented that the majority of these patients (80–90%) recover without surgical intervention.^{16,17} The three most common surgical treatments for Erb's Palsy are: Nerve transplants (usually from the opposite arm or limb), Sub Scapularis releases and Latissimus Dorsi Tendon Transfers.¹⁸

MATERIALS AND METHODS

This was a retrospective study. Hospital Ethical committee was informed and consent was taken. Hospital records of all births from 2005 to 2010 were searched. All cases of Erb's palsy were recorded. A detailed obstetrical history of all cases was obtained from the concerned obstetrical department. Mode of delivery, presentation of the baby at birth, any disease in mother during pregnancy like diabetes, and

complications of delivery like shoulder dystocia was recorded. Weight of the baby at birth was noted down. Time to diagnosis and management of the case was obtained. Address and/or telephone numbers of all cases was recorded and they were contacted. Cases were asked to come for follow up to orthopedic outpatient department. Twenty five children presented for follow up while remaining three could not be traced. Functional assessment of cases was done. The clinical examination included tests of all upper extremity musculature, always in comparison with the contralateral normal side in a proximal-to-distal fashion. Special attention was paid to determine muscle contraction by palpating individual muscle groups. The British Medical Research Council Grading System was used to grade power of individual muscles on a scale of 0-5. To assess shoulder function a modified Mallet scale was used with a grading of 1 to 5 for evaluation of shoulder abduction, shoulder external rotation, hand to nape position, hand to back position, and hand to mouth position. Elbow function was assessed by Gilbert elbow scale. Hand function was evaluated by using a Raimondi hand scale (from 0, which equals total palsy, to 5, which is a normal functioning hand).

RESULTS

There were a total of 30,367 live births recorded during the study period. Out of these 28 cases had Erb's palsy giving an incidence of 0.09 %. There were 18 males and 10 females. Ten mothers were diabetic. Mode of delivery was vaginal in 27 and cesarean section in only 1 case. In 17 cases birth was complicated by shoulder dystocia managed aggressively. Presentation at birth was cephalic in 21 cases and breech in 7 cases. In 5 cases birth was assisted with forceps and in 3 cases with vacuum. Mean birth weight was 3.8 kg. Mean BMI of mothers was 29.2 kg/m². All were term births with a mean gestational age of 38.1 weeks. Mean duration of second stage of labour was 1.3 hours. Condition was only slightly more common in multiparas (15/28 cases).

Tale No. 1: Obstetrical Correlates of cases with Erb's Palsy

Mode of delivery	Vaginal: n=27	Cesarean section: n=1
Presentation	Cephalic n=21	Breech n= 7
Birth Weight	Mean= 3.8kg	
Maternal diseases	Diabetes n= 10	
Maternal parity	Multiparas: 15	Primiparas:13
Complications of Birth	Shoulder dystocia: 17	
Maternal BMI	Mean= 29.2 kg/m ²	
Gestational age	Mean=38.1 weeks	
Duration of second stage	Mean=1.3 hours	

Mean time to diagnosis was 2.1 days. Diagnosis was clinical and was made by referral from the obstetric and pediatrics department of Khyber Teaching Hospital to the orthopedic department of the same hospital. The right side was affected slightly more often (15 cases) than the left side (13 cases). Radiological assessment was done in 18 cases to rule out clavicular fracture and any shoulder pathology. In 4 cases there was concurrent clavicular fracture present. Electromyography (EMG) was not done in any case.

All cases were managed conservatively with physiotherapy. Follow up record from orthopedic department revealed that only 5 cases presented for follow up at 3 months. The rest were lost to follow up. Record of clinical findings at follow up visit was not available.

Table No.2: Grading of muscle power in children with incomplete recovery according to British Medical Council grading system.

Patients' Serial number	Muscle power		
	Biceps	Triceps	Deltoid
1	3/5	4/5	4/5
2	1/5	4/5	5/5
3	3/5	3/5	2/5
4	2/5	4/5	4/5
5	4/5	1/5	2/5

Table No.3: Shoulder function in children with incomplete recovery according to Modified Mallet classification.

Patients' Serial number	Abduction	External rotation	Hand to neck	Hand on spine	Hand to mouth
1	30°-90°	0-20°	Difficult	T12	Partial trumpet sign
2	>90°	> 20°	Not possible	Not possible	None
3	<30°	<0°	None	S1	Marked trumpet sign
4	30°-90°	Normal	None	Not possible	None
5	<30°	<0°	Easy	None	<40° of abduction

Table No.4: Elbow function in children with incomplete recovery according to Gilbert elbow scale: flexion (1: no or minimal muscle contraction, 2: incomplete flexion, 3: complete flexion); extension (0: no extension; 1: weak extension; 2: good extension); flexion deformity (extension deficit) (0: 0-30 degrees, -1:30-50 degrees, -2:> 50 degrees).

Patients' Serial number	Flexion	Extension	Flexion deformity
1	2	2	0
2	1	2	-1
3	2	1	0
4	1	2	0
5	3	0	-2

Table No. 5: Hand function according to Raimondi hand score from Grade 0 to Grade 5

Patients' Serial Number	Grade
1	Grade 3(Satisfactory)
2	Grade 2(Fair)
3	Grade 4(Good)
4	Grade 1(Poor)
5	Grade 2(Fair)

Mean age of children, at presentation to the present follow up was 4.2 years with a mean weight of 18.2 kg and height of 35.2 inches. Out of 25 cases assessed, 20 had complete recovery with no functional deficit. Functional deficit in 5 cases with incomplete recovery is presented in tabular form. Overall biceps was the most commonly affected muscle leading to limitation of flexion at the elbow. Two children had less than 30 degrees abduction at the shoulder. Hand function was satisfactory in only one child.

DISCUSSION

Injury to upper roots of brachial plexus (Erb's palsy) is an uncommon consequence of birth trauma. The injury is usually where nerve roots form the trunks of the brachial plexus. Erb's palsy results from a lesion at Erb's point where C5 and C6 unite to form the upper trunk of the brachial plexus.^{1,2} Erb's palsy is initially frightening. The infant's arm hangs limply from the shoulder with flexion of the wrist and fingers due to weakness of muscles innervated by cervical roots C5 and C6. The classical sign of Erb's palsy is the 'waiter's tip hand'.^{1,3,4}

When a newborn has a brachial plexus injury (BPI), it is often assumed that poor obstetrical technique is to blame. However, there is controversy about the role of the delivery 'operator'.¹⁹ Considerable medical and legal debate has surrounded the etiologic factors of this traumatic lesion, and obstetricians are often considered responsible for the injury.¹⁹ The main risk factors are large fetal size (often from maternal diabetes) and shoulder dystocia. The largest study of BPI and shoulder dystocia²⁰ found a striking association between the two (206 dystocias among 323 BPIs (63%). Gibert et al²¹ reported a frequency of 53% of shoulder dystocia in neonates with brachial plexus injury. In our study in 14/25 (56%) neonates, birth was complicated by shoulder dystocia.

Other risk factors for brachial plexus palsy are macrosomic babies and maternal diabetes. Mean birth weight of neonates in our study was 3.8 kg which was comparatively more than mean birth weight (3.2kg) of the rest of babies born during the same period. Presentation was breech in 6 cases. Breech delivery often leads to lower brachial plexus injury known as Klumpke's palsy. Only one case was delivered through cesarean section. In that case the mother was diabetic

and the baby was macrosomic with a birth weight of 4.8 kg. Same risk factors were identified in a number of studies.

Obstetrical brachial plexus palsy has an excellent prognosis. Fortunately, nearly all affected infants recover in the first few months. Erb's palsy resolves completely in the first year of life in 80% to 96% of patients and in nearly 100% if recovery begins within four weeks of birth.¹⁶ Surgical exploration may assist some infants with no recovery by five to six months. Only the rare child is left with a significant disability. In our study complete recovery rate was 80% which is close to that reported by Michael J et al²². We found 5 (20 %) children having left with some form of handicap. Pondaag et al¹⁶ quoted the same incidence of incomplete spontaneous recovery.

In our study, neither of the cases had undergone surgical intervention. Although conservative management is effective as the birth related Erb's palsy has a history of spontaneous resolution. However this is not true in all cases. Repeat examinations should be carried out every 4-6 weeks until 3 months. At this time, a decision should be made about the need for surgery, which in turn depends on clinical and electrophysiological findings. It is generally agreed that a lack of antigravity biceps function at 3 months is an indication for surgery. No such follow up strategy is used in our set up. Furthermore consideration is often not given to surgical correction. This leads to lifelong disability in such children. Rehabilitative exercise schedule is not properly followed due to lack of awareness and lack of education in mother which is another reason for delayed recovery and/or incomplete recovery. The traditional practice of tight wrapping of the baby in a military position prevents the baby from actively moving the affected limb which leads to stiffness of the limb.

Our study had several limitations. Our study is retrospective in nature and based on hospital records. Some of the cases might have been missed due to lack of documentation. Furthermore initial follow up record was not available as there is no proper documentation system in the outpatient departments of our hospital. Due to lack of availability of EMG services in our hospital this valuable tool was not utilized in any case.

CONCLUSION

Obstetrical Erb's palsy is more often a consequence of difficult delivery. By far shoulder dystocia is the culprit in more than half of cases. Fetal macrosomia and maternal diabetes which themselves are the main risk factors for shoulder dystocia further increases the risk of this nerve injury. Obstetricians are often blamed for the injury, however all the factors increasing the risk of difficult delivery cannot be anticipated antenatally. Wherever possible all the efforts should be put for prevention of this problem like doing an elective cesarean section in a diabetic mother with

macrosomic baby. Early diagnosis and timely rehabilitative treatment should be started. The most important aspect of early treatment is the prevention of contractures by passive exercises. Proper follow up and surgical reconstruction in carefully selected children is the key to prevent lifelong handicap.

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