OBSTETRIC BRACHIAL PLEXUS INJURIES IN CHILDREN: ANALYSIS OF 60 CASES

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ABSTRACT

The present study was conducted to see various risk factors related with obstetric brachial plexus injury in children in relation to home and hospital conducted deliveries. This represents case-review control study on hospital based data. The study was conducted in Armed Forces Institute of Rehabilitation Medicine Rawalpindi from Jan 1998-Feb 2002.

60 cases of Obstetric Brachial Plexus Injury diagnosed on electrophysiological studies were reviewed. Relevant obstetric history and data was taken through self- administered questionnaire from patient's electrodiagnostic evaluation files at the institute. To compare the population of the response, Z test of population was used as appropriate statistical test at P<.05 level of significance. This is first local study where association of disease was studied in reference to home and hospital conducted deliveries.

Palsy was more common in deliveries conducted at home 43 patients (71.9%) while it was less common in deliveries conducted at hospitals 17 patients (P <.001). Obstructed labour was very common associated risk factor (P<.008) in 37 patients (61.6%) whereas 23 deliveries showed no signs of obstruction. Study of other risk factors revealed breech deliveries in 6 cases (10%) and vertex presentation in 54(90%) cases. Upper root lesions C5,6,7 were much more common in 45 patients (75%) as compared to isolated lower root lesions C8, T1 2 cases (3.33%), whereas complete paralysis was seen in 13 out of 60(21.5%) cases. Root avulsion in 12 (20%) cases out which 10 were home delivered. 13 cases (21.6%) showed evidence of instrumentation. No associated injury was seen.

It is concluded that obstetric brachial plexus injury was more common (P<.001) in deliveries conducted at home. Association of birth palsy and breech presentation was seen in small number of cases but all had more severe lesions.

Keywords: Obstetric brachial plexus injury, electrodiagnostic studies, risk factors

INTRODUCTION

Obstetric brachial plexus palsy is a traction injury of brachial plexus occurring during delivery resulting in paralysis of arm with or without paralysis of forearm or hand Since the days of Hippocrates, literature has shown many descriptions of infants who were unable to move their arms but it was in mid-1700s by Smellie[1,2] that an obstetric cause for the arm paralysis was considered. The term obstetrical brachial plexus palsy (OBPP) was coined when a correlation was made between excessive traction of the brachial plexus during delivery and arm paralysis, by Duchene in 1872 and Erb in 1874 respectively[3]. It results in a typical posture of hand and arm, which is now called as ERB-DUCHENE PALSY. Klumpke in 1855 linked the paralysis of lower roots of brachial plexus and sympathetic fibers[3] with birth injury. It results in paralysis of hand muscles and pupillary abnormalities. This palsy involving lower roots is called KLUMPKE'S PALSY. There are multiple theories on etiology but most commonly reported is compression and extreme lateral traction. After a number of reports on obstetric brachial plexus injuries (OBPI) in the absence of birth trauma and even after caesarian section, infective, ischemic and intrauterine malposition have also been suggested [4,5,6,7,8,9].

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This has led to the proposal that there are 2 groups of OBPI, one caused at birth and other during intrauterine life probably due to malposition.

Incidence of OBPI is highly variable, depends upon many factors and mostly reported as 0.5 to 2 per 1000 live births in different parts of the world [3]. It is clearly related with difficult labour, large babies and instrumental deliveries. Other risk factors include maternal obesity, increased gestational age, patellyoid pelvis and abnormal presentation. Electrodiagnostic studies (EDS) are an adjunctive tool and help to localize and prognosticate the outcome of OBPP [10]. In this article we have presented 05 years of experience of clinical evaluation and EDS in children. Study was designed to know distribution regarding sex, side, site and extent of involvement, to understand various risk factors in relation to home and hospital conducted deliveries.

MATERIALS AND METHODS

This study was carried out at Armed Forces Institute of Rehabilitation Medicine Rawalpindi on electrodiagnostically confirmed cases of obstetric palsy from 1998 to 2002. It was case- review control study on hospital based data of 60 children having demographic and clinical characteristics of referred patients. Relevant obstetric history and electrophysiological data was taken through self-administered questionnaire from patient's electrodiagnostic evaluation files at the institute. Self- administered questionnaire was formulated to get a uniform data for all the patients. Data included age of child, mode of delivery, presentation, type of birth, sex, side, extent of involvement and other associated injuries if any were recorded. Children with history of trauma, cerebrovascular accident, hemiplegic or monoplegic Cerebral Palsy and where obstetric history was not available were excluded from study. Data was analyzed by using SPSS Version-10 on computer and descriptive statistics were used for data presentation. To compare the population of the response, Z test of population was used as appropriate statistical test at $p<.05$ level of significance. Target population included dependents of army personnel from all over Pakistan, and civilian staff alongwith patients referred from civil hospitals of Rawalpindi, Islamabad, AJK and NWFP.

Table: A comparison of home and hospital conducted deliveries* in OBPI

Variables	Home (43)	Hospital (17)
Right Sided	65.11%(n=28)	54.60% (n=11)
Obstructed labour	65.11% (n=28)	41.17% (n=07)
Breech Presentation	6.90% (n=03)	17.60% (n=03)
Vertex Presentation	93.00% (n=43)	82.00% (n=14)
Root Avulsion	23.20%(n=10)	11.70% (n=02)
Upper Root C5,C6&C7	79.00%(n=34)	64.70% (n=11)
Lower Root C8, T1	2.30%(n=01)	25.80% (n=01)
Complete C5-T1	25.50%(n=11)	11.70% (n=02)

(Self Administered) Questionnaire

Patient's Name

Father's Name

Address

Age

Please (✓) in relevant boxes:-

Sex

Male ☐

Female ☐

Side of involvement

Right ☐

Left ☐

Bilateral ☐

Site of involvement

C5-6 ☐

C5,6,7 ☐

C8,T9 ☐

C5-T1 ☐

Extent of involvement

Root Avulsion ☐

Progress of labour

Normal ☐

Prolonged or obstructed ☐

Vertex presentation ☐

Breech presentation ☐

Instrumentation ☐

Place of delivery

Home ☐

Hospital ☐

Nerve Conduction Studies were performed with model MS6 and Neuropak 2 using surface electrodes. Motor and sensory studies of median, antebrachial cutaneous nerve C6, C7 and C8 roots were also carried out. Amplitude and velocities were calculated and compared with standard values and normal side.

Electromyography was done with Neuropak 2 Nikhon Kohden Corporation (Electromyography) JAPAN using concentric needle electrodes. Thenar, Hypothenar, Triceps, Scapular, Paraspinal and other muscles were sampled and analyzed. The spontaneous activity (fibrillations, positive sharp waves), insertional activity and motor unit action potentials (MUAPs) were recorded. MUAPs were analyzed for duration, amplitude, polyphasia and interference.

RESULTS

A total of 60 cases of obstetric palsy were reviewed who underwent EDS. Most of the cases (57) were unilateral as compared to (3), which were bilateral. 54 patients (90%) were between 1 to 2 years of age, having mean age of 16 months. There was no significant difference in male to female ratio which was 1.1:1. A comparison of side to side involvement showed more involvement of right side 36 cases as compared to left side which were 21, whereas 3 cases were bilateral. Comparison between hospital and home / privately conducted deliveries showed that palsy was more common in deliveries conducted at home 43 (71.9%) while it was less common in deliveries conducted at hospitals 17 patients (P <.001). Obstructed labour is a known risk factor and out of 60 cases 37 patients had obstructed labour and 23 had smooth progress of labour (P<.008). Further analysis of data showed 67.4 % of deliveries conducted at home and 47% of deliveries conducted at hospital had obstructed labour, showing obstruction to be more in home conducted deliveries but it was statistically not significant. Most of the cases 54 (90%) were Vertex presenting while 6 (10%) were breech presenting. Out of 60 cases 13(21.6%) needed forceps and other instrumentation. Upper root lesions C5,6,7 were seen in 45 patients (75%) as compared to isolated lower root lesions C8, T1 2 cases (3.33%). Complete paralysis involving C5, 6, 7 8, T1 was seen in 13 out of 60(21.5%) cases. Root avulsion is a bad prognostic sign and was seen in 12 cases out of which 10 cases were home delivered. Evidence of root avulsion was less common in hospital conducted deliveries but statistical evidence was lacking. There was no evidence of Horner's syndrome or clavicular fracture.

DISCUSSION

In our series of 60 patients 43 deliveries (71.9%) were conducted at home (P <.001). Most of deliveries are still being conducted by inexperienced staff and unskilled birth attendants in developing countries who can not anticipate and manage the potential complication. Unskilled birth attendants convert a normal labour into complicated one. This draws attention to poor obstetrical services at mass level where most of deliveries are conducted without cover of obstetrician by traditional birth attendants [11].

History of difficult deliveries is a known risk factor for OBPI [12]. Prolongation of second stage of labour more than 60 minutes can result in difficult and obstructed labour. Precipitous second stage is the most prevalent labor abnormality that is associated with shoulder dystocia1 [13]. Shoulder dystocia is failure of shoulders to deliver spontaneously with gentle downward traction on foetal head. After delivery of the vertex both shoulders remain above pelvic brim or the anterior shoulder remains choked behind pubic symphysis after the posterior shoulder has entered the pelvic cavity. It is managed by suprapubic pressure method and Mc Robert's maneuver. Study by Al-Rageh and colleagues [14], a population based study showed that in a series of 57 patients(including recovered and non- recovered) 56% showed evidence of difficult delivery. In my study it was seen that 23 out of 60 (38%) patients had no signs of difficult delivery and had normal course of labour whereas 37 out of 60 (61.6%) of the patients had shown history of difficult delivery (P<.008).Obstructed deliveries were seen in both home and hospital conducted deliveries although more common in home deliveries probably because of unskilled hands attending labour. This association although more in home deliveries but could not be proved statistically. There is evidence of risk of recurrence of shoulder dystocia in subsequent deliveries [15, 16] ranging from-13.8%, hence in vast majority of cases chances of recurrence of shoulder dystocia are small. Despite

association of antenatal risk factors like macrosomia, diabetes mellitus, maternal obesity and post term pregnancy with shoulder dystocia, most of cases can occur without risk factors. Predictive value of these risk factors alone or in combination is low [17].

Most common origin of OBPI is large baby (more than 4000 g) with vertex presentation who suffers shoulder dystocia. Vaginal delivery of macrocosmic infants is achievable but carries a risk of perinatal trauma [18]. Birth weight appears to be the important variable in predicting obstetric brachial plexus palsy. Unfortunately antepartum estimation of foetal weight clinically or by ultrasound examination is unreliable especially in macrosomia [17,19]. Due to insufficient information available at previous data, association of macrosomia could not be studied however presentation was studied. Study by Ubachs, a hospital based study on non-recovered cases of OBPI showed vertex presentation in 102 out of 113 cases. In our study 54 out of 60 cases (90%) had vertex presentation. Breech presentation and breech vaginal delivery is associated with birth trauma and brachial plexus injury [20,21]. Breech extraction is a risk factor both at caesarian section and vaginal delivery. In our series 6 out of 60 (10%) had breech extraction and all the three bilateral cases were delivered breech. Study by Hardy, a hospital based study on recovered and non-recovered cases of OBPI on 36 established cases revealed that 2% of the cases had breech presentation. Studies by H Wolf [22] and others, a hospital based study have showed increased incidence and severity of OBPI after vaginal breech delivery as compared to cephalic delivery [8,25]. Study by H Wolf and others has shown that there is no distribution of risk factors for recovered and non-recovered OBPI cases.

Instrumental vaginal deliveries have been associated with higher risks of brachial plexus injuries [23]. The proposed mechanisms are association of instrumental deliveries with shoulder dystocia and direct cervical compression of the fetal neck by forceps in procedures involving rotations of the presentation which may result in brachial plexus injuries. In our study in 18 out of 60 (30%) of the cases forceps or other instruments had been applied for extraction of baby. Study by Al-Rajeh showed instrumentation in 35% of the cases.

Male to female ratio has not been emphasized much in the past [22]. In my study there was dominance of males i.e. 33 out of 60 (55%) and 27 females (45%). Study by Ubachs and H Wolf found that slightly predominance of females. Their study showed that female infants with OBPI had lower birth weight than male infants with OBPI.

In vertex presentation due to left occipitoanterior presentation there are more chances of involvement of right side and it was observed in my study 36 out of 57 (66%) showed right-sided involvement whereas three cases had bilateral involvement.

Unilateral / bilateral comparison revealed that bilateral palsy was seen in 5 % of the cases and correlated with increased severity of lesion in my study whereas study by Ubachs revealed bilateral cases to be 8%. All the cases showed element of neurotmesis, and were associated with poor prognosis.

Upper roots C5-C6 type injury was seen in 21 out of 60 (35%) of cases whereas upper root C5-7 type were seen in 24 out of 60 i.e. (40%). Study by Ubachs 8 on 102 cases of cephalic presenting obstetric palsy revealed 56.8% of cases had involvement of C [5,6,7] whereas C5-T1 involvement showed 41.1%. In our study isolated C8-T1 showed 6.6% whereas complete paralysis was in 13 out of 60 (21.5%). Due to peculiar anatomy of brachial plexus ruptures are more common in upper type and avulsions are more common in lower type of paralysis as proved in study [8]. Bad prognostic signs [24,25] are root avulsion, lower paralysis, total paralysis at birth, pupillary signs and Horner's sign. Root avulsion was seen in 12 out of 60 (20%), being more in breech and home conducted deliveries but statistical evidence was lacking. No evidence of Horner's syndrome or clavicle fracture was found which has been linked in previous literature. There is no local study or data available on OBPI and its association with home and hospital conducted deliveries. This makes this study a unique one where comparison between the two was studied.

CONCLUSION

Obstetric brachial plexus injury was more common in deliveries conducted at home. This draws attention towards poor obstetrical services at mass level. Association of birth palsy and

breech presentation was seen in small number of cases but all had more severe lesions.

It is suggested that emphasis should be done on early detection of high-risk patients/mothers by proper antenatal care under obstetrician cover. Electrodiagnostic studies help in counseling the parents about prognosis and effectiveness of conservative treatment.

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