

# Brachial plexus impairment

## *Incidence and predisposing factors*

*Fariha M. Buzghia, MD, Rabia F. Al-Beriky, MD.*

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### ABSTRACT

**Objective:** To study brachial plexus impairment, incidence and predisposing factors.

**Methods:** A retrospective study of cases of brachial plexus palsy diagnosed post delivery at Al-Jamahiria Maternity Teaching Hospital, Benghazi, Libya from 1st January 1993 to 1st December 1993.

**Results:** Out of a total of 17,288 deliveries in 1993, there were 20 cases of brachial plexus impairment (0.115% or 1.15/1000 births). The predisposing factors were maternal age >24 years (85%), increased parity (100%), obesity (35%), diabetes mellitus (20%), term infant (100%), birth weight of  $\geq 4$  kg, attending juniors and midwives (75%).

**Conclusion:** Maternal age >24 years, increased parity, obesity, diabetes mellitus, term infants, birth weight  $\geq 4$  kg and an attendant of little experience were the most valuable risk factors predisposing to brachial plexus palsy at birth. We conclude that birth control and glucose controls are very important for prevention, though cesarean delivery can be performed for at risk mothers. Serial training programs on the management of obstetric emergencies, such as shoulder dystocia, are essential for the junior doctors and midwives.

**Keywords:** Brachial plexus palsy, maternal, infant characteristics, prevention.

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It is well known that brachial plexus palsy is due to extreme lateral traction on the fetal head during the last phase of delivery and in some places such cases may be even litigated.<sup>1</sup> The injury has been divided classically into those affecting the 5th and 6th cervical segments (Erb's or Duchenne's palsy), the first thoracic segment (Klumpke's palsy) and a combination of all these segments.<sup>2</sup> Klumpke's palsy is less common (2-3%) and has a less favorable prognosis with 40% recovery rate at one year of age compared with the 72-92% recovery rate with Erb's palsy.<sup>2</sup> In contrast there have been some cases of brachial plexus impairment of almost certainly an intrauterine onset<sup>3-5</sup> (not seen in this study).

**Methods.** Retrospectively, 17,288 consecutive births during 1993 at a major teaching hospital, Al-

Jamahiria hospital, Benghazi, Libya which is affiliated to the Al-Arab Medical University, were studied with full assessment of the frequency of brachial plexus impairment in newborns. Predisposing factors of this type of birth trauma were also identified. Brachial plexus impairment was diagnosed by pediatricians in the labor ward, no cases were reported from the post-natal ward or by the mothers, also no cases were reported from the post-cesarean section ward. All cases were admitted to the neonatal intensive care unit attached to the hospital for further management and follow up. All the cases were analyzed and distributed according to the type of impairment, maternal age, parity, associated medical illness, mode of delivery, duration of labor and associated other traumas.

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From the Faculty of Medicine, Al-Arab Medical University, Benghazi, Libya.

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Address correspondence and reprint request to: Dr. F. Buzghia, Assistant Professor, Faculty of Medicine, Al-Arab Medical University, PO Box 18251, Benghazi, Libya. Tel. +218 (61) 34166/67/69.

**Table 1** - Twenty cases with brachial plexus impairment.

Type of impairment	Right N (%)	Left N (%)	Both N (%)
Erb's	8 (40)	5 (25)	0 (0)
Weakness	3 (15)	3 (15)	1 (5)
<b>Total</b>	<b>11 (55)</b>	<b>8 (40)</b>	<b>1 (5)</b>
N - number			

**Results.** There were 37 cases of birth trauma in the same period of time with an incidence rate of (0.21%) or 2.1/1000 births, 20 of them had brachial plexus impairment (0.115%), that ranged from weakness of an upper extremity to a specific diagnosis of Erb's palsy, but no Klumpke's palsy. Most were unilateral, either right (11 cases) as the occipito-anterior position is common with risk of impaction of right shoulder under the symphysis pubis, or left (8 cases) and one case was bilateral **Table 1**. The maternal associated risk factors: age, parity and medical illness are shown in **Table 2**. Most of the cases were either in the active reproductive age group 25-34 years or above or grandmultipara. The important associated medical diseases were obesity, diabetes mellitus and essential hypertension which, seem to have no affect on the infant weight as this was seen in 3 cases (15%). The first was para 11, 45 years old with infant weight 4.410 kg, the 2nd was para 10, 40 years old with infant birth weight 4.100 kg, and the 3rd was para 8, 38 years old with infant weight 4.410 kg. Labor and delivery variations are listed in **Table 3**. In this study the duration of both first and 2nd stages of labor was normal in all brachial plexus impairment cases. Attending juniors, midwives (75%),

**Table 2** - Maternal characteristics of brachial plexus impairment cases.

Characteristics	N	(%)
<b>Age</b>		
20-24	3	(15)
25-34	9	(45)
≥35	8	(40)
<b>Parity</b>		
0	0	(0)
2-5	8	(40)
>5	12	(60)
<b>Maternal illness</b>		
Obesity	7	(35)
Diabetes mellitus	4	(20)
Hypertension	3	(15)
None	6	(30)
N - number		

spontaneous vaginal delivery occurred in 50% while 40% of them were delivered by vacuum, no cases were reported post cesarean. History of shoulder dystocia was reported in 75% of cases. **Table 4** presents the different modes of delivery in the same hospital during the same period of study with 847 vacuum deliveries (8 were involved in our series), 452 breech (2 were involved and 96 forceps (none were involved). The contrasts in infant characteristics are shown in **Table 5**. There were no preterm infants in this series, with most of the infants being 37-40 weeks gestation (75%) and 5 cases (25%) passed their date. Almost 90% were more than 4000 gm. The associated birth trauma was fractured clavicle in 2 cases, fractured humerus in one case and this was male of weight 4.850 kg, his mother was 40 years old, para 10 medically free and 2nd stage of labor was normal. One case had additional cephalohematome among the vacuum group.

**Discussion.** As reflected earlier in the title of this article, the goal of study was to find out the incidence of brachial plexus impairment, its predisposing factors and to find out any preventive methods by which we can avoid this trauma. We recorded 20 cases of brachial plexus impairment in one year with an incidence rate 0.115%. Maternal age

**Table 3** - Labor and delivery characteristics.

Characteristic	N	(%)
<b>First stage</b>		
up to 5 hours	14	(70)
up to 10 hours	5	(25)
more than 10 hours	1	(5)
<b>Second stage</b>		
up to 10 minutes	9	(45)
up to 30 minutes	6	(30)
more than 30 minutes	5	(25)
<b>Attendant</b>		
Midwife	4	(20)
Junior doctor	11	(55)
Senior doctor	5	(25)
<b>Mode of delivery</b>		
Spontaneous vertex	10	(50)
Forceps delivery	0	(0)
Vacuum delivery	8	(40)
Breech delivery	2	(10)
Cesarean delivery	0	(0)
<b>Shoulder dystocia</b>		
Yes	15	(75)
No	5	(25)
Episiotomy	10	(50)
Perineal tear	10	(50)
N - number		

**Table 4** - Presents the different modes of delivery in the same hospital during the same period of study with 847 vacuum deliveries (8 were involved in our series), 452 breech (2 involved) and 94 forceps (none involved).

Mode of delivery	N (%)	Brachial plexus injuries	
		N	(%)
Spontaneous vertex delivery	14778 (85.5)	10	(50)
Forceps delivery	94 (0.5)	0	(0)
Vacuum delivery	847 (4.9)	8	(40)
Breech delivery	452 (2.6)	2	(10)
Cesarean delivery	1117 (6.5)	0	(0)
<b>Total</b>	<b>17288(100)</b>	<b>20</b>	<b>(100)</b>
N - number			

>24 years, increasing parity (multi-grandmulti) are very important predisposing factors. Difficulties in labor were not seen among our cases except vacuum delivery and shoulder dystocia. Infant weight and gestational age are another 2 important factors as the occurrence of brachial plexus impairment was seen mostly in term infants (100%) and more with those of weight >4000 gm (30%) or >4500gm (60%).

The women of the older age group (>24 years) and of repeated pregnancies are at risk of having macrocosmic infants with the possible occurrence of shoulder dystocia, particularly if there is an associated metabolic disorder such as obesity or diabetes mellitus.<sup>6-9</sup> The duration of both first and 2nd stages of labor in this series were found to be almost normal, though other investigations reported that the prolongation of the 2nd stage is a diagnostic point in predicting a large infant or subsequent shoulder dystocia with or without trauma, or both.<sup>8</sup> Benedetti and Gabbe in 1978<sup>10</sup> defined the prolonged 2nd stage of labor as greater than 2 hours in the primigravida and greater than one hour in multi or grandmulti. Other labor abnormalities such as prolonged deceleration phase<sup>11</sup> or arrest disorders<sup>12</sup> are found significantly correlated with shoulder dystocia with or without trauma. The attendants were also of significance, as it is seen that more than half of the cases (55%) were delivered by junior doctors (of experience less than 3 years). A 4th were delivered by seniors and the rest by midwives (20%), this has revealed that either the juniors and midwives were not alert enough to recognize the risky cases, or did not know how to manage shoulder dystocia, or as Resnik<sup>13</sup> reported, that shoulder impaction may occur unexpectedly following a short labor with a brief 2nd stage in a spontaneous vertex delivery where seniors themselves may not be able to prevent its occurrence of even its further neonatal complications. The route of delivery is also seen in the same table, where spontaneous vaginal vertex delivery occurred in half of the cases (50%) and 2 cases were delivered as

breech (10%). One of those 2 was term of birth weight 3.130kg and the 2nd was term of birth weight 4.00kg.

There were 8 cases delivered by vacuum (40%), the indication in 5 of those was maternal exhaustion and the other 3 were of no clear indication. There was no forceps delivery among this collection. In other investigations presented,<sup>14</sup> 61% of the injured infants were delivered by mid forceps. Shoulder dystocia was reported in 15 cases (75%) while in 5 cases (25%) shoulder dystocia was not associated (though there is no agreement among studies on the definition of the degree of difficulty in delivering the shoulder that is necessary to diagnose shoulder dystocia.<sup>15</sup> It was also not associated with 56% of cases reported by Raymond et al<sup>5</sup> while Levine et al<sup>16</sup> presented an incidence of brachial plexus injury with shoulder dystocia as 2.6 per 1000 births, this remained unchanged when compared with the rates reported from 1974 to 1976 and from 1979 to 1981. Application of episiotomy as an important preventive minor surgical procedure of both infant and maternal trauma, though it does not prevent shoulder impaction, helps in reduction of perineal tightness during the release of the impacted shoulder was reported in half of the cases (50%), the 2nd half had vaginal tears of variable degrees, only 25% were resutured.

The prevention of this trauma by performing prophylactic cesarean section to all at risk cases does not appear to be practical, but it can be performed for patients with repeated birth trauma, grandmultiparous patients (with the additional advantage of sterilization) and fetal weight records of >4500gm. Cesarean delivery to that group of large infants has also been advised by many investigators.<sup>7,8,15</sup> Detection of fetal weight earlier in antenatal time or

**Table 5** - Occurrence of brachial plexus impairment in relation to gestational age, birth weight and associated trauma.

Infant characteristics	N	(%)
<b>Gestational age</b>		
< 36 weeks	0	(0)
37-40 weeks	15	(75)
> 40 weeks	5	(25)
<b>Birth weight</b>		
2501 - 3500 g	1	(5)
3501 - 4000 g	1	(5)
4001 - 4500 g	6	(30)
> 4500 g	12	(60)
<b>Associated trauma</b>		
Fractured clavicle	2	(10)
Fractured humerus	1	(5)
Others	1	(5)
None	16	(80)
N - number		

during early labor by the use of sonogram is advised for all at risk women to estimate head circumference, abdominal circumference, and shoulder diameter relationships. Mondanlow et al<sup>7</sup> considered 1.6cm chest-to-head circumference difference as an indication for cesarean section to avoid shoulder dystocia. Health education and birth control are recommended in our community. Good glucose control pre-pregnancy and antenatally have also been advised to avoid fetal macrosomia. Management after shoulder dystocia is also a very important step in reducing birth trauma and ensuring a good neonatal outcome. This necessitates repeated obstetric programs for the junior doctors and midwives. Finally a prospective study over a longer period of time is recommended to reassess the usual or additional risk factors and implement a new program of management.

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