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Functional Capacities and Prognostic Factors of OBPP in Dakar, Senegal. OBPP (Obstetric Brachial Plexus Palsy)

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ABSTRACT

Introduction: *Despite its high frequency in Africa, obstetric brachial plexus palsy is poorly studied in Senegal, which results in a lack of knowledge about functional limitations and prognostic factors. The objective of our study was to determine the functional abilities and prognostic factors of obstetric brachial plexus palsy in a hospital setting.*

Methods: *This was a retrospective, cross-sectional, tri-centric study conducted over a period of five years, including children with obstetric brachial plexus palsy (OBPP). Sociodemographic data, OBPP risk factors, therapeutic aspects, and electroneuromyographic findings were initially collected using a questionnaire based on medical records.*

Then, the children were recalled for an evaluation of functional abilities using the Mallet scale, and additional information was obtained from their health records.

Results: *Forty-seven (47) patients were included, with a mean age of 18 months. Males accounted for 53.2% of the cases. The predominant maternal risk factors were overweight (51.1%) and lack of education (48.9%). Delivery was dystocic in 95.5% of cases.*

Duchenne-Erb paralysis was the most frequent type (61.7%) and was neurapraxic in 34% of cases. Functional abilities corresponded to scores 3, 4, and 5 of the Mallet classification. The combination of bandaging and physiotherapy was the most commonly used treatment method (85.1%). The main prognostic factor was the severity of lesions on electroneuromyography (ENMG).

Conclusion: *Obstetric brachial plexus palsy remains a relevant obstetric condition, and its functional prognosis largely depends on the severity of the lesions.*

Keywords
Obstetric palsy, Brachial plexus, Functional abilities, Prognosis.

Introduction
Obstetrical brachial plexus palsy is a traumatic nerve injury of the upper limb caused by traction or overstretching of the plexus due to excessive downward displacement of the shoulder during delivery [1,3]. The global incidence, which varies by region, ranges from 0.38 to 5.1 cases per 1,000 live births [2]. It is lower in industrialized countries, particularly in Sweden, California, and

France [4,5].

In Africa, the annual frequency is 11% in Chad and 28.5% in Ivory coast [7], due to still fragile maternal and child health conditions and the presence of cardiovascular risk factors (obesity and diabetes) among women of childbearing age.

The prognosis is variable, often involving major disabling lesions that reduce the overall functional capacities of patients with obstetrical brachial plexus palsy (OBPP) and lead to medicolegal implications [4,5]. In Africa, where rehabilitative care is poorly developed, the functional prognosis appears to be less favorable, hence the relevance of our study.

Methods

This was a retrospective, cross-sectional, and descriptive study conducted from January 1, 2022, to May 31, 2022, involving children followed at Fann Hospital and the National Orthopedic Fitting Center in Dakar, Senegal, over a period of five years.

Data were collected from the consultation registers of the different departments of neurology and Physical Medicine and Rehabilitation departments of the CNHU of Fann, as well as the National Orthopedic Fitting Center of Dakar.

Children diagnosed with obstetrical brachial plexus palsy (OBPP) based on clinical and electroneuromyographic findings were included in the study.

Children and parents who could not be contacted, as well as newborns with associated osteoarticular injuries (such as humeral and/or clavicular fractures or shoulder dislocation), were excluded from our study.

A pre-established questionnaire was used for data collection from medical records. The children were then called in for an evaluation. The study parameters included sociodemographic characteristics, topographic type, functional capacities, prognostic factors, and therapeutic aspects. Functional capacities were assessed using the Mallet scale, and the topographic form was classified according to the Narakas classification.

Data were entered using Microsoft Google Forms, then converted into Excel and analyzed with SPSS software version 20.0.

The comparison of qualitative variables was performed using the Chi-square or Fisher's exact test, while the Student's t-test was used to compare the means of quantitative variables.

Finally, a bivariate analysis was conducted between, on one hand, the sociodemographic characteristics, topographic form, treatment, and ENMG aspects, and on the other hand, the functional capacities. The significance threshold was set at 0.05.

Results

We included 47 medical records of children with OBPP (Obstetrical Brachial Plexus Palsy), with a mean age of 18 months, of whom 40.4% were between 0 and 12 months old (Figure 1).

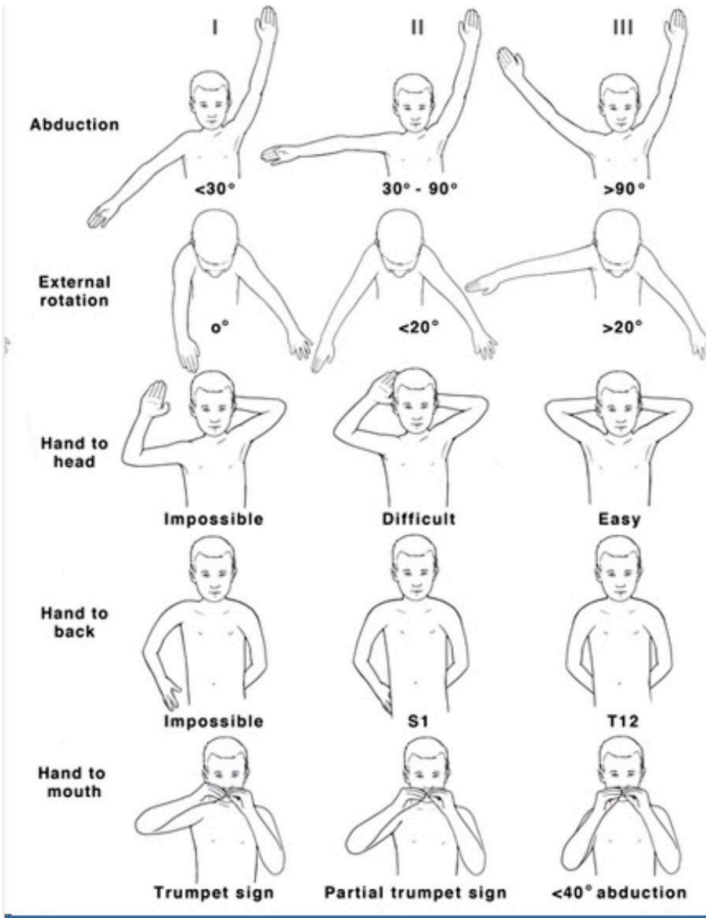

Figure 1: Mallet Score.

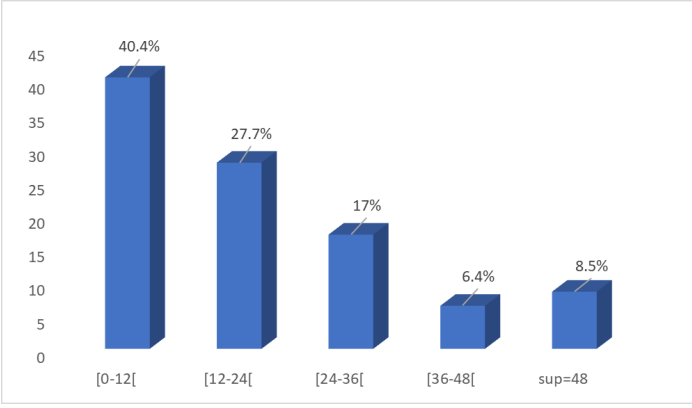

Figure 2: Age distribution of children.

The sex ratio was 1.13.

Seventy-six percent (76%) of the mothers were aged between 25 and 34 years. They presented with hypertension in 27% of cases, overweight in 51%, and diabetes in 12.8%.

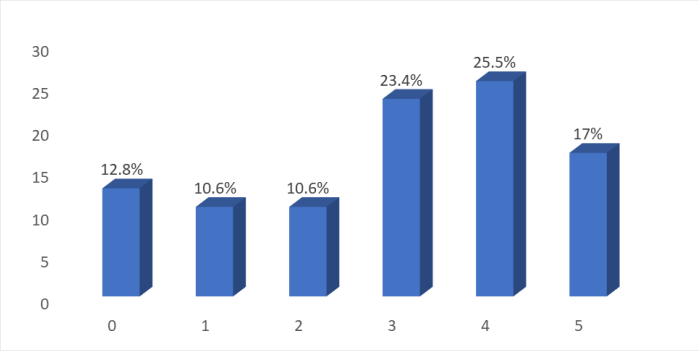

Figure 3: Progression according to the Mallet score.

Lack of schooling was observed in 48.9% of them.

Low parity was found in 42.6% of cases, and lack of schooling in 48.9% of cases. Delivery was vaginal in 95.7% of cases, performed by a midwife (85.1%), with a cephalic presentation (89.9%).

The birth weight of the infants ranged between 3,895 and 4,000 grams in 57.4% of cases, with extremes ranging from 2,500 g to 7,000 g.

The average consultation delay was 21.3 days.

Obstetrical brachial plexus palsy was located on the right side in 59.6% of cases. The upper type was predominant (61.7%).

Electroneuromyography (ENMG) was performed in 74.5% of cases.

- It was in favor of neurapraxia in 34% of cases, axonotmesis in 27.7%, and neurotmesis in 8.5%.
- The average time to management was 8.13 months, with extremes ranging from 1 to 24 months.
- Bandaging and physiotherapy were used in 85.1% of cases.
- The outcome was favorable in 80.8% of cases, with partial recovery in 72.3%.
- The most frequently observed Mallet score were
  3 (23.4%), corresponding to global arm abduction, external rotation with the elbow at the side, and the ability to bring the hand to the mouth.
  4 (25.5%): corresponding to global arm abduction, external rotation with the elbow at the side, and the ability to bring the hand to the mouth and to the back.
  5 (17%): corresponding to global arm abduction, external rotation with the elbow at the side, and the ability to bring the hand to the mouth, back, and neck.

The severity of ENMG lesions was the determinant prognostic factor for obstetrical brachial plexus palsy ($p = 0.003$).

Functional outcome was not associated with the mother's educational level ($p = 0.618$), the type of treatment administered ($p = 0.527$), the lesion topography ($p = 0.892$), or the sex of the patients ($p = 0.394$).

The mean age of our patients was 18 months, with extremes ranging from 2 to 60 months.

The diagnosis is often made in the delivery room, but financial constraints, cultural beliefs, and the use of traditional medicine—which is still very common in our regions—delay consultation for children with OBPP.
In agreement with the majority of series reported in the literature, we observed a male predominance (53.2%) [6-8].

This contrasts with the series by Mahmooduddine [9] and Somasundaram [10], in which both sexes were affected equally

According to literature, several etiological hypotheses have been proposed to explain the origin of obstetrical brachial plexus palsy (OBPP). The factors involved may be maternal, obstetrical, or fetal.

The maternal age group of 25–34 years was the most represented, accounting for 76.6%. This finding is consistent with the study by N'Guessan, which reported a rate of 64.71% for the 20–35 age group [11], and with the findings of D. Lassina [12]. Pauciparous women were the most represented in our series, with a rate of 42.6%. Hellé [13] and O. Btchagbel [14] reported similar results in their cohorts. Maternal diabetes and overweight remain significant and non-negligible determining factors in the occurrence of these lesions [15].

We reported overweight in 51.1% of cases and diabetes in 20% as risk factors for fetal macrosomia leading to OBPP, and hypertension in 34% of cases. These findings are consistent with certain data from the literature [16-18]. Hypertension has not been identified in the literature as a predisposing factor for OBPP, but it may act synergistically, as observed in our series, which found a hypertension/diabetes association in 8.5% of cases.

Regarding presentation and mode of delivery, OBPP was associated in 80.9% of cases with cephalic presentation and in 95.7% of cases with vaginal delivery. These observations are consistent with the findings of Hellé [13] and Ameziane [19].

In this series, we reported 79% of shoulder dystocia cases, considered an undeniable obstetrical factor in brachial plexus palsy and still regarded as the most commonly accepted injury mechanism [20]. The birth attendant and the place of delivery also play a determining role in the occurrence of OBPP. In this study, 85.1% of deliveries were attended by midwives, and 83% took place in health centers.

O.B. Tchagbele [14] and Borna [21] obtained similar results. The presence of obstetricians in health centers, although difficult to achieve in resource-limited countries like ours, would help reduce the occurrence of obstetric trauma cases.

The delivery of a macrosomic infant remains a major concern for obstetricians, especially when it occurs vaginally, as it is a primary risk factor for shoulder dystocia [22].The risk increases 6.2-fold for birth weights between 4000 and 4500 g [23], and 22.7-fold when the birth weight exceeds 5000 g [13,24-26]. This finding was also observed in our series. The right side was the most affected (59.6%), which aligns with several other studies that reported similar results [2,8,28]. According to Courtivon, the predominance of right-sided involvement in OBPP is related to the typical left occipito-anterior cephalic presentation, which is the most frequent presentation during delivery [28].

Duchenne-Erb paralysis accounted for 61.7% of cases, followed by C5–C6–C7 involvement in 27.6%, and C5–D1 in 10%. These findings are consistent with data reported in the literature and comparable to those of several studies [19,26,29-34].

Neurapraxia was found in 34% of cases, axonotmesis in 27.7%, and neurotmesis in 4.3%. Twelve patients did not undergo EMG testing. In 2013, S. Seria et al. [35] made similar observations in a study of 53 patients with OBPP, among whom 19 did not undergo EMG, and three types of lesions were identified in 34 patients.

The main therapeutic approaches in our series were immobilization with bandaging and functional rehabilitation. Concerning the therapeutic options observed in our study, 85.1% of patients were immobilized using bandages followed by functional rehabilitation, while 14.9% used an abduction-external rotation splint combined with physiotherapy.

Partial recovery was reported in 72.3% of cases, complete recovery in 8.5%, and 19.1% showed no improvement, with an average treatment duration of 8.3 months. These results may be related to the fact that most of our patients were delivered vaginally (95.7%), in cephalic presentation (80.9%), and presented with upper root involvement (C5–C6: 61.7%), where neurapraxia—a lesion that responds favorably to rehabilitation—is the most frequent [38,39].

The absence of recovery within three months and the presence of neurotmesis constitute surgical indications [38] [7,39,40]. No surgical treatment was recorded in our series. This is due to the lack of human and technical resources in this field, in contrast to the series by Egloff DV [41] and A. Gilbert [42].

The prognostic factors in our series were associated with the level of the lesion and the severity of nerve involvement on EMG, which is consistent with findings reported in the literature [5].

Conclusion

Obstetrical brachial plexus palsy remains a relevant obstetrical condition, with functional prognosis largely determined by the presence of neurapraxia (34%). The management of this condition in Africa needs to be strengthened through the development of surgical resources, as the main limiting factor remains the lack of qualified human resources.

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