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RESEARCH ARTICLE

PRELIMINARY STUDY OF OBSTETRIC PARALYSIS OF THE BRACHIAL PLEXUS AT THE NATIONAL CENTRE FOR DISABLED PERSONS IN YAOUNDÉ, CAMEROON, ABOUT A COHORT OF 15 CASES: FREQUENCY, PHYSIOTHERAPY TECHNIQUES AND SHORT-TERM RESULTS OF CONSERVATIVE TREATMENT IN A RESOURCE-LIMITED COUNTRY

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Abstract

Background: Neonatal brachial plexus palsy (NBPP) is a childbirth-related trauma whose frequency, risk factors, clinical forms and outcomes of physiotherapy techniques that can be used in our context are not known.

Method: This cohort study took place from June 1 to August 30, 2016. The incidence was determined at the Main Maternity Hospital of the Central Hospital of Yaoundé. The cohort of patients selected was evaluated at the National Centre for the Rehabilitation of Disabled Persons before and after physiotherapy. The physiotherapy techniques used were identical, 3 times a week for 3 months, for all children: stimulation, mobilization, immobilization, in addition to home exercises.

Results: The incidence of NBPP was 3%. The most frequent risk factors in the 15 cases were: low maternal socio-educational level (73.33%), low parity (53.33%), childbirth in a peripheral health facility (60%), weight gain over 15 kilograms during pregnancy (73.33%) and macrosomia (73.33%). We had 15 NBPPs, 73.33% on the left upper arm and 60% in girls. The average age of the children was 29.93[2-182] weeks. The mother's average age was 29.33[19-35] years at the time of birth. The proximal forms or the Erb type (80%), were the most represented followed by the total forms (20%). Toronto's average score before and after physiotherapy increased from 5.66[1-11] to 9.66[3-16] out of 21. We had 10 (66.66%) improvements, in the short term concerning the proximal forms.

Conclusions: We had some good results with physiotherapy techniques applicables in developing countries for the Erb palsy which is the most frequent NBPP. This is why we recommend physiotherapy first and surgery if failure after 3 months, if larger studies confirm our data.

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Introduction:-

Background

In the developing world where childbirth is still precarious, obstetric trauma is a concern and Neonatal Brachial Plexus Palsy (NBPP) with an incidence of 1.3 cases per 1000 births (Chauhan et al., 2014) is the first neurological injury of the newborn. This frequency is higher low income countries (Tchagbele et al., 2013). Despite the disability that this disease can cause if left untreated, it has not yet been the subject of a local physiotherapy study. The purpose of this study is to determine the incidence, risk factors, different clinical forms, physiotherapy techniques used and their short-term outcomes in NBPP.

Methodology:-

This was a prospective cohort with evaluation before and after intervention, that took place from June 1 to August 30, 2016, at the National Center for Disabled Persons in Yaoundé, Cameroon. We determined the incidence by monitoring all deliveries at the main maternity hospital in Yaoundé during this period. We also consecutively recruited 15 cases of NBPP diagnosed by pediatricians and orthopaedic surgeons in the city of Yaoundé and referred for physiotherapy to the CNRPH during our study period. We administered to mothers a face-to-face questionnaire followed by a clinical evaluation before and after physiotherapy management. The before and after functional assessment was based on the Toronto score presented below in table 1 (Christine GC, 2000, Michelow, 1994, Suzan VD, 2015).

Grade ¹	Description
0	No contraction
1	Contraction – no motion
2	Motion $\leq$ ½ range with gravity eliminated
3	Motion $>$ ½ range with gravity eliminated
4	Full motion with gravity eliminated
5	Motion $\leq$ ½ range against gravity
6	Motion $>$ ½ range against gravity
7	Full motion against gravity

Table 1:- The Toronto Muscular Grading System used in infants and young children. ¹A muscle grade is given to every joint movement at the shoulder, elbow, forearm, wrist, fingers and thumb.

Concerning physiotherapy (Figure 1), we did nerve stimulations, mobilizations, immobilizations against contractures and home programs.

Practically, on a massage table, we started with stimulations

Stimulations with the thin floss toothbrush began at the back on the upper trapezius bundle, from the upper surface of the distal 1/3 of the clavicle to the outer protuberance of the occiput, for 5 to 10 minutes (Figure 1A).

Then, it was necessary to stimulate the biceps, going from the posterior surface of the bicipital tuberosity of the radius, towards the muscular body of the biceps in a proximal direction, during 5 minutes (Figure 1B).

Stimulation of the extensors of the wrist and fingers began at the metacarpo-phalangeal joints by exerting superficial transverse frictions, then stimulation of the posterior surface from the wrist to the underside of the olecranon for 5 minutes (Figure 1C).

Mobilizations were done from distal to proximal joints

Finger mobilization

To do this, we stabilized the forearm with one hand and then with the other, we held the child's fingers and made :

Extension movements (Figure 1D) the fingers, then straightening without insisting on flexion movements, for fear of making the finger flexors more stronger.

Then we would do abduction/adduction movements (Figure 1E). At the thumb level, we focused on flexion-extension and opposition movements.

Wrist mobilization

Extension movements (Figure 1F): The child lies on his back, his arm along his body, the forearm is stabilized with one hand and then with the other hand holding the child's wrist and tilting it back and then returning to the neutral position.

Radial and ulnar inclination movements (Figure 1G), under the same conditions

Elbow mobilization

Extension flexion movements (Figure 1H): the child being in supine position, the arm in abduction of about 60°: one hand stabilizes the elbow by placing it in our palm, and then, we gently bend the elbow then we extend it.

Prono-supination movements: the child is in the same position as before and a prono-supination movement is performed.

Shoulder mobilization, scapula stabilized on the chest

Flexion / Extension (Figure 1I) movement: The child is in supine position, with one posterior hand the scapula is

stabilized and then with the other hand the shoulder is mobilized with the elbow in extension.

Shoulder abduction (Figure 1J): The child in the same position, the shoulder is stabilized with one hand and then with the other, the child's forearm is held and moved laterally in the frontal plane and then back to the initial position.

Rotation

The child remains in supine position, the arm in abduction with the elbow bent at 90° then the shoulder is burped in the sagittal plane laterally and medially (Figure 1K).

Immobilisations

At the end of the mobilization phase, we placed a plastered splint (Figure 1L), in the position of an oath, wrist in extension, generally worn at night.

Home Programs

At home, the mother played an essential role in the care of the child:

1. Dressing the child, starting with putting on the sick limb first and then the healthy limb, undressing in the order, starting by the normal limb;
2. Respecting the wearing times of night splints and
3. Ensuring passive mobilizations.

In older children, who already had more or less permanent sequelae (muscle retractions, shortening of the limb, joint stiffness), the manoeuvres were more intense compared to the young child, but were generally the same: brushed or electrical sensory-muscular stimulation, mobilization, immobilization, home program.

We used Epi-Info™ 7 for statistics and obtained ethical clearance. The interview forms were anonymous and the data collected confidential.

Results:-

The incidence of obstetric paralysis of the brachial plexus observed at the Main Maternity Hospital in Yaoundé was 3%. We followed 15 cases of NBPP, 9 (60%) girls and 6 (40%) boys with a sex ratio of 2/3 in favour of girls. The average age was 29.93 weeks or 7 months and one week (SD=49.4823) with a minimum of 2 weeks and a maximum of 182 weeks (3 years and 6 months). He had 4 (26.67%) right and 11 (73.33%) left NBPP s.

Regarding the **risk factors** studied, 11 (73.33%) mothers out of 15 lived in modest socio-economic conditions. The average age of mothers was 29.33[19-35] years at the time of birth. The parities ranged from 1 to 6: 8 (53.33%) mothers were at their first or second gesture and 7 (46.67%) at least at their third gesture. The gestational weight gain was between 0 and 10 Kilograms for 4 (26.67%) women, between 15 and 20 kilograms for 11 (73.33%) women. Mothers gave birth in peripheral class health facilities in 9 (60%) cases, intermediate class in 3 (20%) children and central class in 3 (20%) cases. The average birth weight was 4188.67[3100-5200] grams. The mother's average age was 29.33[19-35] years (SD=5.8023) at the time of birth.

Clinically, we had 15 children with NBPP . The average age was 29.93[2-182] weeks or 7 months and one week with a minimum of 2 weeks and a maximum of 3 years and 6 months (SD=49.4823). The left limb was the most affected, with 11 children or 73.33% compared to 4 right limbs or 26.67%. Female children were more affected by NBPP than males with 9 (60%) and 6 (40%) of cases respectively, giving a sex ratio of 2/3 in favour of females. The proximal plexus lesions types with 12 (80%) cases, were the most represented followed by the total forms with 3 (20%) children. In addition, 2 (13.33%) children had a total shape with Claude Bernard-Horner sign. We had no associated fracture (humerus, clavicle) and no diaphragm damage or head trauma. We did not do any other para-clinical examinations (electro-neuromyogram, brain scan, magnetic resonance). Our diagnosis was essentially clinical.



A Trapezius' stimulation



B Biceps stimulation



C Wrist extensor stimulation



D Finger extension



E Fingers : Abduction/Adduction



F Wrist Extension



G Radial inclinaison of the wrist



H Elbow : Flexion / extension



I Shoulder : Flexion/extension



J Shoulder 's abduction



K Lateral shoulder rotation



L Plaster and splint



M Massage table



N Fine floss toothbrush



O Cussons baby® powder box



P Electro-stimulator

The physiotherapy techniques used (see Figure 1) were identical for all children, namely stimulation, mobilization, immobilization and home exercises. The average number of sessions per week was three for all patients. The average follow-up was 3 months. Of the 15 children, 11 (73.33%) arrived for rehabilitation within 3 months of delivery, and 4 (26.67%) children between 4 and 6 months.

The Toronto Muscular Grading System's average score before and after physiotherapy increased from 5.66[1-11] to 9.66[3-16] out of 21. We had 2 very good results for high forms with total recovery. Recovery in the other 8 high forms was progressive and constant. It was slower in children with simple total form. The 2 children with Claude Bernard Horner syndrome did not recover (stationary result). These 3 cases were referred for neurosurgery. We had 12 (80%) remarkable improvements, in the short term with physiotherapy, concerning mostly the upper lesions types.

Materials and methods:-

Discussion:-

This preliminary study shows that NBPP s are not uncommon in our context. An incidence of 3% was found in a power plant maternity hospital in Yaoundé, the capital. The risk factors most represented in terms of proportions are: low socio-economic level, low parity, maternal weight gain of more than 15 kilograms, follow-up in a peripheral centre and macrosomia. The high forms are the most frequent and are improved by physiotherapy. We have described the technique. We regret a small decrease, the small size of our sample, the absence of para-clinical examinations and surgery.

Year of issue, Authors, Country	Incidence	Nombre of cases	Traitement	Good results
2016, Présente étude, Cameroon	3%	15	Stimulations Mobilisations Immobilisations	80% Short term
2014, Gunn and col., Belgium	0,3%	69	Physiotherapy and surgery if needed	75,36 Long term
2013, Tchagbeleand col., Togo	11%	65	Physiotherapy	83.1% Short term
2010 Pöyhiä and col., Finland	0.31%	132	Physiotherapy and surgery if needed	79,54% Long term
2010 Lagerkvist and col., Sweden	0,29%	98	Physiotherapy and surgery if needed	81 ;66% Long term

Table 2:-Comparison with Similar Studies

Conclusions and recommendations :-

We recommend further studies on the subject and in countries with similar conditions to ours in order to raise awareness and reduce obstetric trauma through prevention, based on risk factors. For high forms, the physiotherapy techniques we have used can be applied. Total forms with Claude Bernard Horner syndrome require other treatments (nerve repair, tendon transfers) as well as forms that do not respond after 3 months of physiotherapy.

List of abbreviations

NBPP : Neo-natal brachial Plexus Palsy

Declarations

Ethics approval and consent to participate from Comité Régional d'Ethique de la Recherche pour la Santé Humaine du Centre. Tél : 222212087/677944889/677757330. E-mail : crersh_centre@yahoo.com. N° d'enregistrement : IORG0007861-FWA00016054

Consent for publication

signed

Availability of data and material

All data generated or analysed during this study are included in this published article and its supplementary information files. Any other informations are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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