Review

Palmar grasp behavior in full-term newborns in the first 72 hours of life

Jadiane Dionísio *, Marcus Vinicius Marques de Moraes, Eloisa Tudella,
Werther Brunow de Carvalho, Vera Lúcia Jornada Krebs

Department of Paediatrics, University of São Paulo Medical School (FMUSP), Hospital das Clínicas, São Paulo, SP, Brazil

HIGHLIGHTS

• Variability of palmar grasp behavior in the first 3 days of extra uterine life
• The influence of extrinsic and intrinsic factors in palmar grasp behavior
• Differences in palmar grasp strength between genders in the first 3 days of life

ARTICLE INFO

ABSTRACT

Background: The palmar grasp behavior is one of the items of an infant's routine neurological tests. Its exacerbated presence after the fifth month of age or absence in the first day after birth is an important sign of neuro-sensori-motor disorders. This study aimed to describe the palmar grasp behavior of full-term newborns in the first 72 h of life.
Methods: This nonrandomized cross-sectional developmental study included 219 typical newborns aged 12–24 h, 25–48 h and 49–72 h. Three measurements were performed with newborns in the supine position, recording the palmar grasp time and strength. Statistical analysis was applied with significant level of $p < 0.05$.
Results: Higher palmar grasp strength was observed in newborns aged 49–72 h compared to newborns aged 12–24 h and 25–48 h ($F = 7.42$, $p = 0.01$). There was significant difference in palmar grasp strength between hands ($F = 6.55$, $p = 0.01$), only in 12–24 h, with greater strength in the left hand ($t = -2.43$, $p = 0.01$), and difference in palmar grasp between strength ($F = 18.7$, $p = 0.01$) with greater strength in females ($t = -5.40$, $p = 0.01$) only at the age 48–72 h.
Conclusions: It was concluded that the palmar grasp behavior modifies in the first 72 h of life.

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* Corresponding author at: Pedro Gustin, 64, Bloco 1, Apartment 601, Tubalina, Cep: 38.412-027, Uberlândia, Minas Gerais, Brazil. Tel.: +55 34 9163 9696.
E-mail addresses: jadydionisio@gmail.com, jadydionisio@hotmail.com (J. Dionísio), moraes.mvm@gmail.com (M.V.M. de Moraes), eloisatudella@yahoo.com (E. Tudella), werther.brunow@icr.usp.br (W.B. de Carvalho), vera.krebs@icr.usp.br (V.L.J. Krebs).
URL's: http://buscatextual.cnpq.br/buscatextual/visualizacv.do?id=K4240216Z8 (J. Dionísio), http://buscatextual.cnpq.br/buscatextual/visualizacv.do?id=K4702540U6 (M.V.M. de Moraes), http://buscatextual.cnpq.br/buscatextual/visualizacv.do?id=K4793969A1 (E. Tudella), http://buscatextual.cnpq.br/buscatextual/visualizacv.do?id=K4780234J0 (W.B. de Carvalho), http://buscatextual.cnpq.br/buscatextual/visualizacv.do?id=K4778053U0. (V.L.J. Krebs).

1. Introduction

The palmar grasp behavior is one of the items of an infant's routine neurological tests. This behavior remains present in the first months of life and its intensity is stronger during the first month and decreases gradually until it disappears around the fourth month [1–3]. Its exacerbated presence after the fifth month of age or absence in the first day after birth is an important sign of neuro-sensorimotor disorders [3–5].

In clinical practice, the palmar grasp behavior is evaluated by positioning the examiner's finger (or other thin and round-shaped object) at the base of the metacarpal of middle, ring and little fingers, that when stimulated produces flexion of fingers, closing them strongly, with no thumb flexion [6,7]. Due to the fact that it is a technique based on the examiner's experience and sensitivity, results may present significant variations.

For a long time, the main feature observed during a newborn's examination was the palmar grasp behavior [4,6,8,9]. Nevertheless, some authors realized the need to also evaluate the palmar grasp strength to verify symmetry between limbs, differences between genders, influence of testosterone as well as manual preference and predisposition to laterality [3,10–12].

Rochat [9] and Molina and Jouen [13] also observed that the palmar grasp behavior may vary according to the characteristics of the stimulus given to the newborn.

To satisfy the need to evaluate other variables of the palmar grasp behavior, Moraes, Tudella, Ribeiro, Beltrame & Krebs [14] developed an instrument capable of measuring the peak palmar grasp strength, the average strength performed and palmar grasp time. The M-FLEX® is a non-invasive, lightweight and portable equipment able to detect the palmar grasp characteristics in newborns and infants and express them in millimeters of mercury (mm Hg) and gram-force per square centimeter (gf/cm^2), enabling greater precision and accuracy in motor assessment.

There is evidence that manual preference and laterality are influenced by genetic factors and are pre-determined from the intrauterine period [15–17]. Coren and Porac [18] found that infants who performed greater action (force and strength) with the left upper limb during the evaluation showed laterality in the same limb in adulthood. Accordingly, Tan and Tan [11] found that newborns with greater palmar grasp strength in the left hand showed left laterality, whereas newborns showing greater palmar grasp strength in the right side became right-handed adults.

In order to verify the influence of gender on muscle strength, Tan et al. [10] found that female full-term newborns aged two days showed greater strength in the right hand than in the left hand, while male full-term newborns showed no difference between hands. The authors attributed this behavior to laterality and hormonal modulation.

Despite studies showing the importance of assessing the palmar grasp behavior, Zafeiriou [6] emphasizes that the assessment of reflexes and reactions is a fast, easy and reliable method; however, it should be used along with rating scales to better attest and diagnose neuro-sensorimotor disorders.

Another relevant item for the assessment of the palmar grasp behavior is the postnatal physiological adaptation. The characteristics of the postnatal palmar grasp behavior are unknown in the literature. It is believed that effects such as mechanical stress, hemodynamic changes, onset of diuresis and changes in environmental and body temperatures, as well as the action of gravity, are responsible for a relative state of disorganization and weight loss in the first days of life. The impact of the extra-uterine environment can affect neural differentiation and myelination of glial cells in full-term newborns [19].

With the use of equipment capable of responding to new evidence about the palmar grasp behavior as well as the need to understand it in early life, this work is justified by the need to understand the changes and influences that occur in the neonatal period on the palmar grasp behavior.

Therefore, the objective of this study was to describe the palmar grasp behavior in full-term newborns in the first 72 h of life.

The hypotheses to be tested are: the palmar grasp behavior characteristics will modify the first 72 h of life, the existence of differences in palmar grasp strength and time between right and left hands and differences in the palmar grasp behavior characteristics between genders.

2. Method

A nonrandomized cross-sectional developmental study was carried out and previously approved by the Ethics Committee for Analysis of Research Projects — CAPPesq (Protocol No. 1250/2009).

The study included 219 newborns of both genders considered healthy in the routine nursery examination. The following inclusion criteria were adopted: newborns' parents or guardians must have signed the Informed Consent Form, newborns must have had grades 4 and 5 seconds of the Prechtl and Beintema behavioral scale [20], Apgar score equal to or higher than seven at 5 min of life; gestational age between 37 and $41^{6/7}$ weeks (assessed by early ultrasound and date of the last menstrual period according to Naegele's rule) and absence of clinical complications.

Newborns undergoing phototherapy and those with congenital malformations, genetic syndromes, neurological disorders, metabolic disorders, as well as children from mothers using tranquilizers or illicit drugs were excluded. Infants showing dysfunction during routine clinical examination in the nursery and those who had abnormal ultrasound skull examination were also excluded.

Neonates were divided into three groups: Group 1: 46 infants with mean age of 22 h and 41 min (± 0.25), Group 2: 106 infants with mean age of 44 h and 35 min (± 0.22) and Group 3: 67 infants with mean age of 67 h and 13 min (± 0.23) of postnatal life.

3. General procedures

Collections were held at the nursery in the morning period in the interval between two feedings. For all newborns, two forms were filled: identification — birth conditions, maternal, and perinatal data and clinical conditions, and evaluation of behavioral state.

For the proper maintenance of environmental conditions in the nursery, the temperature was maintained between 25° and 26 °C (measured by a digital thermometer), with adequate lighting and minimum noise.

Newborns were weighed using a digital pediatric scale and total body length, head circumference, size and circumference of hands were measured by anthropometric ruler and tape measure, respectively.

Palmar grasp strength and time were measured using the M-FLEX® equipment (TodMed Equipamentos e Serviços Ltda, Blumenau, SC — Brasil). The M-FLEX™, see Fig. 1, is an instrument that records the