ESCOLA DE ENFERMAGEM ALFREDO PINTO
UNIVERSIDADE FEDERAL DO ESTADO DO RIO DE JANEIRO

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

Perspectives in the nurse's evaluation of osteotendinous reflexes in malformations of the central nervous system and medullary canal

Perspectivas na avaliação do enfermeiro sobre os reflexos osteotendinosos nas malformações do sistema nervoso central e canal medular

Perspectivas en la evaluación del enfermero de los reflejos osteotendinosos en malformaciones del sistema nervioso central y del canal medular

Sarah Miranda Rodrigues[1]

Objetivos: os objetivos do estudo são de caracterizar fatores risco maternos, obstétricos, perinatais e aqueles intrínsecos ao do recém-nascido, que estão relacionadas às condições que podem favorecer as características de risco materno e obstétrico, tais como cuidados pré-natais inadequados. **Método:** estudos de revisão integrativa da literatura. A força muscular pode ser avaliada por meio da movimentação voluntária das articulações, ou por meio das deformidades em crianças, uma vez que elas ocorrem por desequilíbrio entre músculos agonistas e antagonistas. **Resultados:** a determinação do nível neurológico nas mielomeningoceles tem importância para determinar o grau de desequilíbrio muscular em torno das grandes articulações, visando orientar sua prevenção e o tratamento, tanto por meio do uso de órteses e fisioterapia, quanto de cirurgias ortopédicas corretivas; e avaliar função da bexiga e dos intestinos. **Conclusão:** o cuidado deve ser entendido no contexto de um acompanhamento multidisciplinar dos pacientes com diagnóstico intrauterino de mielomeningocele por ultrassom.

DESCRITORES: Espinha bífida; Mielomeningoceles; Cuidados em enfermagem.

ABSTRACT:

Objectives: the objectives of the study are to characterize maternal, obstetric, perinatal and those intrinsic to the newborn risk factors, which are related to conditions that may favor maternal and obstetric risk characteristics, such as inadequate prenatal care. **Method:** integrative literature review studies. Muscle strength can be assessed through voluntary movement of the joints, or through deformities in children, since they occur due to imbalance between agonist and antagonist muscles. **Results:** the determination of the neurological level in myelomeningoceles is important to determine the degree of muscle imbalance around the large joints, aiming to guide their prevention and treatment, both through the use of orthoses and physiotherapy, as well as corrective orthopedic surgeries; and evaluate bladder and bowel function. **Conclusion:** care should be understood in the context of a multidisciplinary follow-up of patients with intrauterine diagnosis of myelomeningocele by ultrasound.

DESCRIPTORS: Spina bifida; Myelomeningoceles; Nursing care.

[1] Enfermeira, em Saúde e Tecnologia no Espaço Hospitalar. Prefeitura Municipal de Itatiaia, Itatiaia, Rio de Janeiro - BR.

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

RESUMEM:

Objetivos: los objetivos del estudio son caracterizar los factores de riesgo maternos, obstétricos, perinatales e intrínsecos al recién nacido, que están relacionados con condiciones que pueden favorecer las características de riesgo materno y obstétrico, como la atención prenatal inadecuada. **Método:** estudios integradores de revisión bibliográfica. La fuerza muscular se puede evaluar a través del movimiento voluntario de las articulaciones, o a través de deformidades en los niños, ya que ocurren debido al desequilibrio entre los músculos agonistas y antagonistas. **Resultados:** la determinación del nivel neurológico en mielomeningoceles es importante para determinar el grado de desequilibrio muscular alrededor de las grandes articulaciones, con el objetivo de orientar su prevención y tratamiento, tanto mediante el uso de órtesis y fisioterapia, como cirugías ortopédicas correctivas; y evaluar la función de la vejiga y el intestino. **Conclusión:** la atención debe entenderse en el contexto de un seguimiento multidisciplinario de pacientes con diagnóstico intrauterino de mielomeningocele por ultrasonido.

DESCRIPTORES: Espina bífida; Mielomeningoceles; Cuidados de enfermería.

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

INTRODUCTION

During the formation of the nervous system in the embryo, disorders may occur that lead to defects in the closure of the neural everything (DFTN). Among them, open spina bifida (EBA) is the most complex of the congenital abnormalities of the Central Nervous System, compatible with a long survival: there are reports of patients with 20 to 25 years of survival. EAB affects approximately 0.5/1,000 live births, and incidences of up to 8/1,000 can be found in certain regions in places such as Northern Ireland, South Wales and Scotland.[1,2]

The preferred location of EBA, meningoceles and/or myelomeningoceles is the lumbosacral region, suggesting a particular susceptibility to the point of closure of the posterior neuropore and also that the teratogenic effect, whatever it may be, is limited in time and mechanism of action. The low lumbar or sacral forms would be due to excessive vacuolization during the channeling process.[1,2]

The occurrence of spina bifida in a population is determined by genetic load, associated with environmental factors and conditions, among them: maternal hyperthermia in the first trimester of pregnancy evoking a viral infection; zinc deficiency and also the use of anticonvulsant drugs, especially sodium valproate.[1,3-4]

The main characteristics of EBA, also called, in Brazil, spina bifida cystica, are: spinal anomalies, with the absence of closure of the posterior spinal arches promoting the exteriorization of the neural plate or placodium, usually at inferior, lumbar and sacral thoracic levels; cerebrospinal fluid cysts (LCV) consisting in part of a thin arachnoid membrane, which is medially confused with the neural plate or placodium, and exceeds the limits of the spinal canal; the coexistence of Chiari malformation type II (MCh II), and the extremely frequent association with hydrocephalus: about 4 out of 5 children with myelomeningocele.[1,2]

Myelomeningocele represents the most common congenital alteration among those classified as open spina bifida, characterized by the presence of the placodum not covered by meningeal tissue and, therefore, exposed to external agents. The more caudal the lesion, the smaller the neurological deficit. At birth, the child presents, in the dorsal region, the classic cystic malformation, which can be closed (with no exit of cerebrospinal fluid from the meningeal sac) or open (with cerebrospinal fluid output from the dural space); and, as a consequence of the deficit of the muscles of the anterior lodge of the leg, the newborn may present clubfoot.[1,3]

Surgical treatment of myelomeningocele consists of closing the neural plate and covering the nervous tissue with dural, muscular and cutaneous tissue planes, to provide adequate protection to the malformed spinal cord. This should be early, and it has been shown that when correction occurs within the first 24 hours after birth, there is a good chance of improvement in motor prognosis. Thus, an early intervention and an active therapeutic attitude allow, in up to 75% of cases, the child to be able to walk with the help of devices and, in 80%, an acceptable or

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

very good intellectual development, allowing the monitoring of normal schools.[1,2,6]

The main objectives of early surgical intervention are the preservation of the nervous functions still present and, eventually, the recovery, at least partial, of those lost; the prevention of secondary infections that may reach the intrathecal space through malformation; obtaining a better anatomical relationship between nerve and bone structures, thus safeguarding a greater possibility of normal spinal development over the years.[1,2]

The objectives of the study are to characterize maternal, obstetric, perinatal and those intrinsic to those of the newborn, which are related to conditions that may favor maternal and obstetric risk characteristics, such as inadequate prenatal care.

METHOD

This is a literature review study, through the main online databases and indexed searches in the Virtual Health Library (VHL), articles were read and a description form was used, containing the information: title, authors, main objective, type of methodology, sample, subjects, main results and conclusions. The following inclusion criteria were applied for the selection: articles published in the period from 2019 to 2023, in Portuguese, English and Spanish. The choice of key words occurred by selecting the terms inserted in the Health Sciences Descriptors (Decs), using the following descriptors: "Spina bifida", "Myelomeningoceles", "Nursing care".

The following databases were consulted through an electronic address: Latin American and Caribbean Literature in Health Sciences (Lilacs) and Medical Literature Analysis and Retrieval System Online (MEDLINE). This research was concluded through books and manuals of neonatology; The approach sought to integrate nursing orientations with care in enteral feeding, importance of breastfeeding and nutritional care with the newborn. A descriptive approach was performed on the evaluation of muscle strength, through voluntary movement of the joints, or through deformities in children, since they occur due to imbalance between agonist and antagonist muscles, and description of the main osteotendinous reflexes.

The findings of the activities carried out during the professional master's course in Health and Technology in the Hospital Space by the Federal University of the State of Rio de Janeiro/RJ; were integrated into the study design. The interest in performing the bibliographic search was the work developed in a small Municipal Hospital and Maternity in the National Registry of Health Establishments (CNES); actions developed for the Better at Home Program. Home Care (HC) is a form of health care, offered in the patient's home and characterized by a set of actions of health promotion, prevention and treatment of diseases and rehabilitation, with guarantee of continuity of care and integrated into the Health Care Network.

With different approaches, this type of service is available in the Unified Health System (SUS). According to the patient's need, this care at home can be performed by different teams. When the patient needs to be visited in a more

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

spaced way, for example, once a month, and is already more stable, this care can be performed by the Family Health/Primary Care team of their reference. On the other hand, the most complex cases are monitored by the Multiprofessional Home Care Teams (EMAD) and Support Teams (EMAP), of the Home Care Services (SAD) – Better at Home.[8]

Home care provides the patient with care directly linked to aspects related to the family structure, the infrastructure of the home and the structure offered by the services for this type of care. In this way, unnecessary hospitalizations are avoided and the risk of infections is reduced. In addition, it improves the management of hospital beds and the use of resources, as well as reduces the overcrowding of urgent and emergency services.[8]

RESULTS AND DISCUSSION

Sequence suggested for neonatal neurological examination: observation of movement of the 4 limbs and facial expression; Evaluation of the skull and circumference; Evaluation of lower limbs; Clone of feet; Cutaneous plantar reflex in plantar extension; Passive movement of the feet (flexion – extension); Evaluation of the flexion angle of the feet; Passive movement of lower limbs; Knee flexion-extension and hip abduction and adduction; Evaluation of the popliteal angle and heel-ear; Lower limb liabilities; rejection of lower limbs; Cutaneal abdominal reflex research; Evaluation of upper limbs; palmar grip; Passive movement of upper limbs; Elbow flexion extension and shoulder elevation; Scarf maneuver and arm retraction; Balance of liabilities of upper limbs; Traction test to evaluate cervical tone; Galant's reflex; Reflex of plantar support and gait; Leakage and propulsion reflex; Osteotendon reflex research; Suction search reflex; Cochleopalpebral reflex; Visual assessment and photomotor reflex.[1,3]

Treatment of associated hydrocephalus is followed by better mental development in almost all patients; on the other hand, lesions of the urinary and locomotor systems require constant specialized control and specific treatments. One third of patients with myelomeningocele can reach, in the follow-up of therapy, competitive living conditions regarding the world of work, with a large percentage of these cases presenting autonomous life. However, most patients are in situations of severe locomotion deficit, severe urinary disorders and damage to intellectual development, accompanied by repeated episodes of leptomeningeal infections.[1,5]

The local preparation of the lesion, from birth to the transport of the NB, is a very important point. The cleaning of the neural plate with alcoholic solution leads to a worsening of nerve lesions and the placement of gauze with petroleum fluids ends up hindering the surgical moment. It is best to use dressing soaked in 0.9% saline, which is well tolerated by the nervous tissue.[1,2-3,6]

More recently, intrauterine surgery has been performed with the objective not only of reducing the sequelae of hydrocephalus, by reducing complications and the need for peritoneal ventricle shunts, but also to reduce

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

the motor sequelae of the limbs. The permanence of the intrauterine medullary defect determines erosion and necrosis of the region exposed by mechanical trauma or chemical toxicity of the amniotic fluid, leading to progressive damage with advancing gestational age.[1,2,6]

The determination of the neurological level in myelomeningoceles is important to determine the degree of muscle imbalance around the large joints, aiming to guide their prevention and treatment, both through the use of orthoses and physiotherapy, as well as corrective orthopedic surgeries; and assess bladder and bowel function.

In many cases, there is total loss of innervation below the lesional level, but this may not happen. There may be partial innervation below the most affected follow-up, as well as partial impairment of levels above. The level of impairment can be determined, in addition to the anamnesis data in adults, by examining muscle strength, sensitivity, osteotendon reflexes, anal sphincter function and bladder functional capacity. Electroneuromyography can also be very useful in assessing the lesional level.[1,3,5]

Muscle strength can be assessed through voluntary movement of the joints, or through deformities in children, since they occur due to imbalance between agonist and antagonist muscles. The main osteotendon reflexes to be investigated are the patellar reflex (L2, L3 and especially L4) and the aquilaeum reflex (S1). Sensitivity can be assessed by means of painful stimuli in the dermatomes corresponding to the medullary segments. The function of the anal sphincter can be assessed at digital rectal examination by voluntary control, tone and superficial reflex of the anus and anal contraction after stimulation of the skin around the anus. Bladder function can be analyzed through urodynamic evaluation.[1,3,5]

Nutritional management is based on the functional development of various organs and systems, including the nervous system, gastrointestinal tract, kidneys, and liver. In premature infants, this management can generate feeding problems: lower intestinal motor activity, with sucking/swallowing incoordination; lower lower esophageal sphincter tone delayed gastric emptying; more immature intestinal motor activity; reduced gastric capacity; deficient gastric acid secretion in the first weeks; low lactase activity; limited reserves of essential fatty acids.[1,4,7]

Limited ability to stretch essential fatty acids (C18) to longer-chain fatty acids (C20 and C22); limited digestion capacity and absorption of fats (low levels of lingual lipase, low activity of pancreatic lipase, intraluminal deficiency of bile salts); low activity of liver cystatase, which converts methionine into cysteine; limited conversion of the enzyme that converts cysteine into taurine; limitation in the conversion of phenylalanine to tyrosine; increased calcium and phosphorus needs; lower reserves of trace elements; limits renal function, which does not allow for water, electrolyte or protein overloads; greater loss of insensitive water; increased risk of necrotizing enterocolitis.[1,4,7]

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

Nutritional needs vary according to weight, gestational age, form of nutrition and clinical picture. For the full-term newborn (NB), their needs are proportional through breastfeeding. For preterm newborns, there is still a lot of uncertainty in the literature about the real nutritional needs that guarantee intrauterine growth rates without causing stress and overload to metabolism and excretory functions. Full-term NB needs 85-100 kcal/kg/day in the first 4 months of life. In most premature newborns, the enteral caloric supply of 120-130 kcal/kg/day is sufficient to provide adequate growth rates, which can typically be achieved at 1 to 2 weeks of life.[1,4,7]

Proper nutrition is critical for brain development. The dry weight of the human brain is predominantly lipid, and 25% of the white matter is made up of the arachidonic and docohexanoic acids, which are essential for brain growth, function and integrity. Deficiency of essential fatty acids during early brain development is associated with hypomyelination and motor and cognitive retardation. Neurodevelopmental abnormalities may be more pronounced in the presence of micronutrient deficiency, such as zinc. Intolerance to enteral feeding complicates the evolution of preterm infants, when early parenteral nutrition with adequate supply of amino acids is not introduced.[1,2,9-11]

The arterial supplement of the cerebral white matter is carried out basically through the short and long perforating arteries, branches of the pial arteries. The focal area of necrosis occurs mainly at the ends of the long perforations, and the end of these vessels is only completed in the last 16 weeks of gestation. Thus, even a small decrease in cerebral blood flow (CBF) would lead to severe ischemia. The diffuse lesion occurs in two locations: in the bordering zones between each long perforating artery and in the terminal zones of the short arteries. In this region, decreased CBF would lead to moderate ischemia and specific loss of oligodendrocyte precursors. The advance of gestational age promotes better vascularization of the white matter and the ischemic risk decreases.[1,2,9-11]

In addition to the anatomical characteristics described studies of regulation of cerebral blood flow have shown that PTNB, especially those on artificial ventilation, have cerebral blood circulation of the pressure-passive type, that is, when the pressure falls, there is also a drop in the CBF with consequent risk of ischemia. Clinically stable preterm newborns would tend not to present this abnormality in the CBF response to blood pressure changes.[1,2,9-11]

Among the life support measures used in all very low birth weight preterm infants with early respiratory distress and/or ventilatory insufficiency, with mechanical ventilation support, and high risk for the occurrence of severe cerebral hemorrhage. Careful monitoring, coupled with supportive measures, prevents the area of bleeding from increasing in size. Maintaining stable cerebral perfusion through care to obtain normal circulating volume and systemic blood pressure is critical. The main measures of life support are: maintenance of oxygenation and perfusion, homeostasis of body

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

temperature, metabolic (glucose) and hydroelectrolytic balance (mainly of calcium, sodium and potassium ions) and acid-base balance, in addition to early parenteral nutrition and treatment of seizures, when present.[1,2,9-11]

It is important to maintain cerebral perfusion pressure (CPP), which is the differential between mean systemic arterial pressure (MAP) and intracerebral pressure (ICP). That is, PPC = PAM-PIC. The loss of cerebrovascular self-regulation makes CPP a direct reflection of MAP, and maintenance of CPP requires a MAP of at least 45-50 mmHg. The use of volume expanders and blood products should be judicious. It is important to avoid large variations in blood and venous pressures. The judicious use of invasive procedures and the minimal handling of the newborn help to avoid pneumothorax and pulmonary hypertension, situations that lead to a greater need for positive pressure ventilation and imminent risk of severe cerebral hemorrhage for the extreme preterm.[1,2,9-11]

It means obtaining PaO2 levels in the range of 50-70 mmHg and PaCO2 between 35-50 mmHg. Hyperoxia can promote a reduction in CBF or potentiate the damage caused by free radicals. The use of xanthines (aminophylline and derivatives) may reduce CSF and is not recommended in the initial treatment of apneas in asphyxiated preterm newborns. Hyperventilation is also contraindicated, as excessive hypocapnia (CO < 25 mmHg) can reduce CBF.[1,2,9-11]

Maintaining body temperature within a physiological range (36.5-37.2 °C) is a basic measure of life support. At birth, it is common for the extreme preterm to maintain a temperature below 35 °C for hours, even with the incubator regulated for maximum heat supply. Blood glucose should be maintained at physiological levels, i.e., 75-100 mg/dl. Hyperglycemia is just as harmful to extreme preterm as hypoglycemia. The use of tape is a practical and effective method of monitoring capillary glycemia.[1,2,9-11]

Attention should be paid to the maintenance of the hydroelectrolyte and acid-base balance. Nonoliguric hyperkalemia in the first 72 hours of life is frequent in very low birth weight newborns, due to inadequate functioning of the cellular sodium-potassium pump. Excessive urinary loss of sodium and bicarbonate causes hyponatremia and metabolic acidosis in preterm newborns with birth weight less than 1,250 g.[1,2,9]

Another component is a lesion that diffusely affects the deep gray, white matter, with diffuse lesion of the precursors of oligodendrocytes, whose mature derivatives are responsible for the formation of myelin in the cerebral white matter. It is associated with increased number of astrocytes at the site and proliferation of microglia (diffuse gliosis). At 32 weeks of gestational age, about 90% of oligodendrocytes are in the early stages of development and are called pre-oligodendrocytes or precursors.[1,2,9-11]

The anatomopathological findings of PVL are linked to the occurrence of cerebral ischemia and the susceptibility of oligodendrocyte precursors to the ischemic phenomenon, and in a

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

correlated way, but not yet fully clarified, to the occurrence of maternal-fetal-neonatal inflammation. These two mechanisms activate excitotoxicity and free radical attack, especially to young forms of oligodendrocytes.[1,2,9-11]

Preterm newborns may present over the years of life some cognitive and learning difficulties, in addition to motor deficit at varying levels, when they had coexistence of hemorrhagic lesions and periventricular white matter in the neonatal period. This association is relatively frequent, since the perinatal risk factors are the same. Newborns who have had localized and unilateral periventricular leukomalacia (PVL) may develop spastic hemiparesis, involving upper and lower limbs, with mild cognitive delay.[1,2,9-11]

The diagnosis of ischemic brain lesions involves determining the factors associated with cystic PVL. In cystic PVL, the presence of cysts can be observed from birth, due to the occurrence of an intrauterine lesion, or arise after birth, usually at 2 to 3 weeks of life. The perinatal events that can cause intrauterine injury are: clinical or subclinical maternal chorioamnionitis (histological diagnosis), premature rupture of amniotic membranes, and other maternal infectious conditions at the time of peripartum.[1,2,9-11]

Periventricular leukomalacia (PVL) is an important cause of permanent neurological injury, including cerebral palsy, its incidence has not decreased in recent decades. The incidence ranges from 3 to 15% of PTNs younger than 1500g. About 10% of low-birth-weight preterm infants (PTNB) have cerebral palsy and in 90% of cases the cause can be attributed to PVL. It was first described by Banker and Larroche in 1962, who instituted the term "periventricular leukomalacia" and described the sequence of histological changes in the white matter of PTNB.[1,2,9-11]

PVL has a component characterized by focal coagulative necrosis of all cellular elements in the subventricular region adjacent to the lateral ventricle, especially in the area near the trine and around the foramen of Monro. As a result, there is formation of cysts, with size ranging between 0.2-0.6 cm in diameter. After 1 week, the necrotic focus is organized, with infiltration of macrophages and glial reaction in the periphery (astrocytes and microglia).[1,2,9-11]

The risk of cerebral palsy is influenced by the extent and site of cyst formation. Extensive parieto-occipital cystic lesions have a worse prognosis, and this is better when there is an isolated frontal lesion. Prevention consists of avoiding prematurity, use of antibiotics in preterm labor, maintaining adequate cerebral perfusion. Avoid factors that could lead to cerebral ischemia: severe hypotension, hypocarbia and/or significant hypercarbia, and hypoxemia.[1,2,9-11]

Clinically, a relationship between the abnormality of the CBF and the occurrence of PVL is supported by clinical studies that relate the lesion to neonatal events capable of provoking cerebral ischemia. Among them: severe hypotension, significant hypocarbia, patent ductus arteriosus with retrograde diastolic flow and severe respiratory diseases requiring extracorporeal oxygenation, apnea

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

with hypoxia and bradycardia, intrauterine growth retardation and preeclampsia. In addition, maternal urinary tract infection or chorioamnionitis with or without ruptured membranes has also been included as risk factors for PVL.[1,2,9-11]

The neonatal factors frequently associated with the diagnosis of leukoencephalopathy are perinatal asphyxia, hypovolemia, sepsis, hypocarbia, symptomatic patent ductus arteriosus, and recurrent apnea with bradycardia. Many of these factors cause a reduction in systemic blood pressure. Immaturity is the most considerable factor in the diagnostic suspicion, and the greater the complications during the period of preterm hospitalization.[1,2,9-11]

The most common sequela of the cystic form is the motor, especially spastic diplegia, because the motor fibers of the corticospinal tract responsible for the motricity of the lower limbs pass through the region most frequently affected by the lesion. The diffuse PVL is related to greater motor impairment, including spastic quadriplegia, and cognitive and behavioral deficit, resembling the picture of sequelae associated with extensive and bilateral peri-intentraventricular hemorrhage or in the association of both.[1,2,9-11]

Another mechanism involved in the genesis of PVL is related to maternal fetal infection/inflammation. The incidence of PVL and cerebral palsy has been found to increase in the presence of maternal, placental, or fetal infection and elevated levels of pro-inflammatory cytokines such as interleukin (IL) 1 and 6 in the umbilical cord, amniotic fluid, and newborn blood. It should be noted that pro-inflammatory cytokines are also produced in response to hypoxia-ischemia.[1,2,9-11]

The diagnosis of fetal inflammatory response syndrome can be obtained by measuring cytokines in umbilical cord blood by performing cordocentesis. There is a causal interrelationship between ascending intrauterine infection, with local cytokine production, and preterm labor. The most described pro-inflammatory cytokines in intrauterine infection are TNF-α, IL-1ß, IL-6 and IL-8. IL-6 is the most well-known mediator of acute inflammatory response, released rapidly after a bacterial invasion. It is secreted by monocytes, macrophages, endothelial cells, and fibroblasts in response to other inflammatory mediators such as TNF-α and IL-1ß. IL-6 is also synthesized within neurons and neuroglia, and its expression is increased in a wide variety of Central Nervous System (CNS) disorders.[1,2,9-11]

The levels of IL-6 in the uterine cervix of patients with premature rupture of membranes, comparing with IL-6 values in the amniotic fluid, and concluded that determinations of IL-6 in cervical secretion have excellent diagnostic value for bacterial invasion of the amniotic cavity and prognostic value for infectious complications in the neonatal period, although this difference was only found in cases with very high levels of IL-6, above 350 pg/ml. The adoption of IL-6 measurements in the uterine cervix as a routine procedure in most services may reduce the need for amniocentesis to identify maternal infection. These cytokines induce the expression of adhesion molecules,

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

such as the vascular cell adhesion molecule (VCAM-1) within the CNS, both in the parenchyma and in the vascular endothelium, which can compromise the activation of microglia and lead to demyelination.[1,2,9-11]

Preventive strategies involve prenatal and perinatal care in order to reduce preterm birth rates and provide quality survival. Early postnatal screening for brain injuries in very low birth weight preterm infants, the most vulnerable population, is of fundamental importance. In the prenatal period, it is important to adequately manage high-risk pregnancies, such as in situations in which the pregnant woman presents with diabetes, previous arterial hypertension and pregnancy-specific hypertensive disease, nephropathies of different etiologies, rheumatic disease, uterine malformation, among other serious situations that require specialized prenatal care and specific clinical and laboratory follow-up.[1,2,9-11]

The production of breast milk in the gestational period, pregnancy is endogenous and after birth is exogenous. The fluid that is secreted in the last few days or weeks before delivery is called colostrum; it contains essentially protein and lactose concentrations.[1] The descent of milk occurs by the action of the hormone oxycyte by the neugorenic reflexes in the posterior pituitary, stimulate the myoepithelial cells that surround the outer walls of the alveoli into the ducts at a positive pressure of 10 to 20mmHg. Prolactin promotes the secretion of breast milk.[1,4,7]

Anaerobic energy refers to the energy that can be obtained from food without the simultaneous use of oxygen; aerobic energy means that it can only be obtained from food by oxidative metabolism. Carbohydrates are the only foods that can be used to provide energy without the use of oxygen. Glucose phosphorylation is almost totally irreversible, except in liver cells, renal tubular epithelium, and intestinal epithelial cells. Due to its almost instantaneous binding with phosphate, glucose does not undergo diffusion outwards, except in liver cells, which have phosphatase.[1,4,7]

In the gastrointestinal membrane or through the epithelium of the renal tubules, glucose is transported by the sodium-glucose mechanism, in which the transport of sodium provides the energy necessary for the absorption of glucose against a difference in concentration. About 50 grams of breast milk is made up of fat and about 100 grams of lactose, if it is to be derived from glucose, are lost by the mother each day during breastfeeding.[1,4,7]

The power gain of weight after birth are 30 grams daily, being common weight loss in the first days of life by the elimination of meconium and extra adaptation - uterine. The monthly weight gain varies from 500 to 700 grams, when exclusive breastfeeding, feedings should last 10 to 15 minutes be free and spontaneous, minimum of 3 hours between feedings with alternation, cracks may occur and the breasts may be painful.[1,4,7]

Breastfeeding in one of the breasts causes the flow of milk not only in her, but also in the opposite breast, attention to avoid breast engorgement. Breast milk contains bifid factors making the intestinal lumen more acidic and

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

preventing diarrheal complications, the intestine of the newborn is sterile at birth. Vitamin K for the most part is formed by bacterial action in the colon, the newborn does not have adequate source during the first week of life until the normal bacterial flora of the colon is established.[1,4,7]

The fetus gets almost all of its energy from glucose from breast milk. Immediately after birth, the amount of glucose stored in the child's body in the form of liver and muscle glycogen is sufficient to meet the child's needs for a few hours, and the newborn's liver is far from functionally suitable for birth, which prevents significant gluconeogenesis.[1,4,7]

The fetus primarily uses glucose for energy and has a high rate of fat and protein storage, with much of the fat being synthesized from glucose rather than being absorbed from maternal blood. After the neonatal and puerperal period, care with energy metabolism becomes the responsibility of home care, primary health care and specialized outpatient follow-up.[1,4,7]

CONCLUSION

The care with NTD should be understood in the context of a multidisciplinary follow-up of patients with intrauterine diagnosis of myelomeningocele by ultrasound, through the participation of the neurosurgeon, the obstetrician, the pediatric surgeon, the sonographer, the psychologist, the social worker and the nurse. The pregnant woman should be followed up in the prenatal period at the fetal neurosurgery outpatient clinic, where she should receive all possible information about the fetus with myelomeningocele. The greater the maternal knowledge about the pathology in this period, the easier it becomes to treat the newborn with myelomeningocele. After birth, this multidisciplinary work expands, integrating neonatologists, nurses and physiotherapists into the team.

REFERENCES

1. Marba STM, Filho FM. Manual de neonatologia. Centro de Atenção Integral à Saúde da Mulher (CAISM). Universidade Estadual de Campinas (UNICAMP). 2º ed.- Rio de Janeiro: Revinter, 2009. ISBN: 978-85-372-0248-7.

2. Rizzo G, Pavjola M, Pietrolucci, ME. Expert ultrasonographic evaluation in fetuses with spina bifida: An essential prerequisite to select candidate to fetal surgery. J Clin Ultrasound; 51(3): 415-416, 2023 Mar. Artigo em Inglês | MEDLINE | ID: mdl-36893036.

3. Tang HS, Li DZ. Fetoscopic repair of spina bifida: continued refinement of the procedure is needed. Am J Obstet Gynecol MFM ; 5(4): 100894, 2023 04. Artigo em Inglês | MEDLINE | ID: mdl-36758678.

4. Rodrigues VB, Silva EN, Santos AM, Santos LMP. Prevented cases of neural tube defects and cost savings after folic acid fortification of flour in Brazil. PLoS One ; 18(2): e0281077, 2023. Artigo em Inglês | MEDLINE | ID: mdl-36812183

5. Planta D, Gerwinn T, Salemi S, Horst M. Neurogenic Lower Urinary Tract Dysfunction in Spinal Dysraphism: Morphological and Molecular Evidence in Children. Int J Mol Sci; 24(4)2023

RECTIS – ISSN: 2675-4932. V4/2023
http://dx.doi/10.9789/2675-4932.rectis.v4.12893
Integrative Review

Feb 12. Artigo em Inglês | MEDLINE | ID: mdl-36835106

6. Chmait RH, Manson MA, Chon AH. Advances in Fetal Surgical Repair of Open Spina Bifida. Obstet Gynecol; 141(3): 505-521, 2023 03 01. Artigo em Inglês | MEDLINE | ID: mdl-36735401.

7. Shlobin NA, Ghotme K, Caceres A, Ocal E, Pattisapu JV, Rosseau G, Blount JP, Boop FA. Neurosurgeon-Led Advocacy for Folic Acid Fortification to Prevent Spina Bifida. World Neurosurg ; 172: 96-97, 2023 Apr.Artigo em Inglês | MEDLINE | ID: mdl-36758793.

8. BRASIl. Ministério da Saúde. Serviço de Atenção Domiciliar - Melhor em Casa.Acesso à informação. Ações e Programas. Disponível em: https://www.gov.br/saude/pt-br/acesso-a-informacao/acoes-e-programas/atencao-domiciliar/servico-de-atencao-domiciliar-melhor-em-casa

9. Silveira RC , Procianoy RS. Lesões isquêmicas cerebrais no recém-nascido pré-termo de muito baixo peso. Jornal de Pediatria - Vol. 81, Nº1(Supl), 2005.

10.Gaiva MAM, Rodrigues EC, Toso BRGO, Mandetta MA. Cuidado integral ao recém-nascido pré-termo e à família [livro eletrônico] / [organização Sociedade Brasileira dos Enfermeiros Pediatras]. -- São Paulo, SP : Sociedade Brasileira dos Enfermeiros Pediatras, 2021. PDF ISBN 978-65-996078-0-6

11.Neto BRS. Frente diagnóstica e terapêutica na neurologia / Organizador Benedito Rodrigues da Silva Neto. – Ponta Grossa - PR: Atena, 2021. Formato: PDF Requisitos de sistema: Adobe Acrobat Reader Modo de acesso: World Wide Web Inclui bibliografia ISBN 978-65-5706-715-4 DOI 10.22533/at.ed.154211301

Submitted on: 2023/05/05
Accepted on: 2023/06/02
Published online on: 2023/08/10
Corresponding Author: Sarah Miranda Rodrigues
Email: sarah_miranda.ro@hotmail.com