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CLINICAL FEATURES OF THE MAIN TRAUMATIC INJURIES IN CHILDREN OF THE FIRST YEAR OF LIFE

ABSTRACT

The main types of traumatic injuries among children of the first year of life are birth and burn injury. Since the small age of the patients, inability of verbalizing complaints, the lack of precise staging of traumatic shock, low specificity of some symptoms of shock (for example, symptom of «white spots»), there is needing for an objective criteria's of the severity condition, which proved an appointment of the fluid therapy, analgesia.

The **purpose** of this study is to improve the quality of treatments children with a birth and a burn injury through comprehensive examination, taking into account not only the nature of the injury (type, location, area, depth of the lesion), but the degree of pain, clinical indicators of central hemodynamics, parameters of electrocardiogram (ECG). We examined 67 children with birth injuries at the age of 28 days of life (kefalogematoma, fractures of clavicles, humerus and femur) and 30 children with burn injury at the age of 1-12 months, were respectively treated at the Department of surgery for newborns and the burn unit Voronezh hospitals №1, №2. So, the children of the first year of life with traumatic injuries, in addition to the changes in special status, hemodynamic (decrease in blood pressure, tachycardia or bradycardia), had changes of ECG (shortening of RR intervals, QT, the increase in SP), NIPS scale, ultrasound of the brain and internal organs due to birth injury (periventricular edema and hypoxia; diffuse changes of kidneys, hemorrhage in the adrenal glands) and laboratory data (anemia, leukocytosis, compensated metabolic acidosis).

The presence of detected changes points to the need for a comprehensive examination of children first year of life with traumatic injuries. Treatment must be not only of special surgical treatment (puncture of cephalhaematoma removed, immobilization; dressing, necrectomy and autografting for burns), and the designation of analgesia, infusion therapy.

Keywords: birth injury, burn injury, newborn, cardiovascular system, hemodynamics, electrocardiography, intensive care.

INTRODUCTION

According to Rosstat, in Russia there is a growth in the number of patients within the first year of life with injuries of different genesis (from 16.6 thousand in 2000 to 26.4 million in the late 2008) [1]. The main types of traumatic injuries in children of first year of life are birth and burn injury. Along with the special clinical manifestations of injury (local status), there is a need for objective criteria of severity, depending primarily on the functioning of the cardiovascular system. They can serve as indicators of blood pressure (BP), heart rate (HR), severity of pain, the data of instrumental examination of the cardiovascular system. One of the public methods of investigation of cardiovascular system in children the first year of life is electrocardiography. Intervals, complexes, segments of the ECG correspond to the phases of the cardiac

cycle: atrial systole (tooth P); the systole of the ventricles (QRST complex); ventricular diastole (segment T-P) [2].

The research objective - to improve the efficiency of diagnosis and treatment of traumatic injuries in children of first year of life.

MATERIAL AND METHODS

In the clinic of pediatric surgery (Voronezh hospitals №1,№2,) for the last 2 years we observed 67 children (29 girls and 38 boys) with birth injuries at the age of 28 days of life (group 1) and 30 children with burn injury (13 girls and 17 boys) aged 1 to 12 months (group 2). Upon admission to the surgical hospital, and within 3 days after hospitalization, was conducted by dynamic inspection systems, was measured blood pressure

(using a mechanical sphygmomanometer with cuffs of appropriate diameters), heart rate, hourly urine output was evaluated in the peripheral microcirculation, sonority and rhythm of heart sounds. Determined indicators for the NIPS scale (pain scale for newborns) [10], indicators of the general analysis of blood and urine, acid-base status, evaluated the results of ultrasound, radiography examinations. Then the recorded ECG in three standard leads, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6 (ECG recording was carried out upon admission to the hospital). Analysis of the data of central hemodynamics was carried out using descriptive statistics with the use of histograms [7].

THE RESULTS AND DISCUSSION

Group 1. Structure of birth trauma are presented by us to the following units [2, 5,12]: a) cephalhaematoma removed parietal areas and bilateral - 67%; b) closed fractures of the humerus -12; c) closed fractures of the clavicle - 18; d) closed fractures of the femur - 3%.

When assessing the local status of children with cephalohematoma, the amount of subperiosteal hemorrhage 10 -20 ml was observed in 16%, volumes 21-40 ml - 19%, volume more than 40 ml of 32%. All patients with fractures of the clavicle, humerus, femur, had the prevalent symptom of the limitations of movements; local edema in 3% of cases with fracture of the humerus, 3% of cases with femoral fracture; bone crepitus – 18% of children with fractures of the clavicle. Analysis of radiographs showed predominant localization of the fracture in the diaphysis of long bones and mixed. On spondylograms patients with birth trauma – 22% had concomitant dislocation of CII or CIII of the vertebral bodies.

According to ultrasound of the brain there were signs of hypoxia, periventricular edema, and 12 % - intraventricular hemorrhage. In one case, diagnosed the signs of periventricular leukomalacia. According to the ultrasound of the internal organs in 42% of cases showed diffuse changes of the kidneys and liver, 6% hemorrhage in the adrenal glands.

Analysis of the results of the scale NIPS showed that 22% of infants with trauma had experienced the pain of medium intensity (the values from 4 to 6 points), 8 % - severe pain (values from 7 to 10 points) and 70% mild pain (values from 0 to 3 points). In the group experiencing moderate to severe pain included patients with long bone fractures due to the strong and very strong nociceptive afferent impulses, the characteristic of this type of fracture [6,14].

Analysis of laboratory data revealed the presence of a distribution of leukocytes in 52% of cases, 4.5% - anemia mild. Proteinuria in 6% of patients may be related to traumatic damage to the muscle tissue and with the physiological condition of the neonatal period [3]. Compensated metabolic acidosis was observed in 11% of patients with long bone fractures and 6% with extensive cefalogematoma. Central hemodynamic parameters of patients were compared with accepted standards [3, 8, 9], which is shown in histogram 1.

As can be seen from the histogram 1, in 42% of infants with a birth injury, a decrease AD systolic (standard 60-80 mm Hg); deviations of AD diastolic was not (the norm of 30-50 mm Hg). The decrease in the heart rate less than 120 beats per minute (bradycardia) was observed in 4%, more than 160 beats per minute (tachycardia) in 33% of patients.

Reduction in hourly urine output and daily diuresis in newborns with trauma were noted. 37% of children showed pallor of the skin, combined with the «marbling», of which 14% with long bone fractures, 15% of fractures of the clavicles and 8% with cefalogematoma large volumes. 20% of patients auscultation was determined muted heart tones, of them all 15% with long bone fractures. Analysis of electrocardiograms revealed substantial changes, indicated in table 1. The figures obtained were compared with the standards proposed by some authors [1, 11, 13].

Group 2. The structure of burn injuries among children in the first year of life are presented: thermal burn boiling water – 67% of them I degree – 6 %, II degree – 43%, III degree – 18%; contact burn (stove, iron) – 33%, second degree – 23 %, III degree - 10%. The area of damage in thermal burns with boiling water up to 5% - 75% of patients, 6-10% - 15%, over 10 % - 10% of children. The area of damage with contact burns in all patients of this group did not exceed 5%. The preferential localization of thermal burns by boiling water – the area of the foot (50%), brush (40%); the localized contact burns – the area of the hands (90%). Analysis of laboratory data showed the presence of mild anemia in 40%, leukocytosis in 20% of patients. A case of severe anemia (hemoglobin 65 g/l) was in one patient with a large area of destruction with boiling water (of the III degree burns, the area of 18%). Proteinuria was noted in two patients with great depth and affected area with boiling water (burns III degree, squares, 14% and 18%). The distribution of values of AD in children the first year of life with burn injury is illustrated in histogram 2.

As can be seen from the histogram 2., 20% of children with burn injury, a decrease AD systolic (standard of 85-100 mm Hg); AD diastolic deviation was registered only in one case (the norm of 40-60 mm Hg). Tachycardia exceeding 130 beats per minute was observed in 63%, bradycardia was not.

Reduction of hourly diuresis was observed in 6% of patients with III degree thermal burn with boiling water. The marked symptom of «white spots» for more than 3 seconds – 10% of patients; pallor of the skin in 23%. The change in the ECG of children first year of life with burn injury were shown in table 2.

Treatment of children the first year of life with a birth and a burn injury was

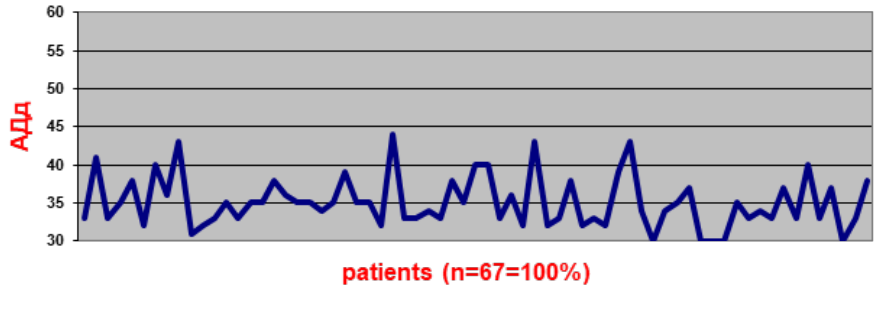

Fig. 1. The distribution of values of AD among newborns with birth trauma

Table 1

The change in the ECG of newborns with birth injury, %

Number of patients n=67 (100%)	ECG indicator							
	Deviation of EOS sharply to the right	↓ QRS	↑ QRS	↓ RR	↑ RR	↓ QT	↑ QT	Increase of systolic index
	21	12	46	50	11	55	12	92

Note: the symbol ↓ is a shortening, the symbol ↑ is the extension of the complex, intervals.

complex, given the diagnosed disorders of the cardiovascular system: special (surgical) and medication.

So, when cephalohematoma were performed puncture at 10-11 days of life; broken collarbone – immobilization by bandage for 7 days; in fractures of the femur and humerus – plaster traction for 3 and 4 weeks. With burns of I degree was carried out the toilet of the wound, then applied wet-drying bandage with an antiseptic dressings. When II degree burns – primary surgical treatment of burn wounds under general anesthesia, then wet-drying dressings with antiseptics. Burns III degree – tangential necrectomy with subsequent autodermoplastic.

All newborns were diagnosed with hemodynamic disorders and pain syndrome, performed intravenous anesthesia (25% solution of metamizol natrii 0.1 ml. twice a day), infusion therapy (5% glucose, given the daily volume of fluid based on the patients ' age in days) [3,15]. At small cephalohematoma, mild pain syndrome, the proposed treatment was up to 2 days. When cephalohematoma more than 40 ml, and, when long bone fractures, duration of intravenous analgesia and fluid therapy up to 5

days. At the burn injury, the volume of infusion therapy is determined by the formula of Evans. Composition: predominantly crystalloids (10% glucose, ringer solution, 0.9% NaCl solution); colloids (10% solution aminoven) was administered in children with II degree with an area of more than 10% and III degree. Intravenous analgesia: a 50% solution of metamizol natrii 0.1 ml. x 2 p/ day, for 2-3 days with burns of I degree, up to 5 days with burns II and III degree. Due to birth trauma normalization of heart rate, blood pressure and relief of pain was noted by the beginning of the second day of hospitalization; when a burn injury to the beginning of the third day with burns of I degree, the beginning of 5 days with burns II and III degrees.

CONCLUSIONS

1. In children the first year of life with traumatic injuries, there is the changes in special status, hemodynamic (decrease in blood pressure, tachycardia or bradycardia), pain, changes of ECG (shortening of RR intervals, QT, the increase in SP), ultrasound of the brain and internal organs due to birth injury (periventricular edema and hypoxia; diffuse changes of kidneys, hemorrhage in the adrenal glands) and laboratory data (anemia, leukocytosis, compensated metabolic acidosis).

2. The algorithm of examination of children first year of life trauma needs to be added: assessment of pain scale, determine clinical parameters of central hemodynamic, ECG, ultrasound of internal organs.

3. The results of a comprehensive survey to objectively justify the appropriateness of the appointment of analgesia, intravenous infusion in the treatment of injuries in children of first year of life.

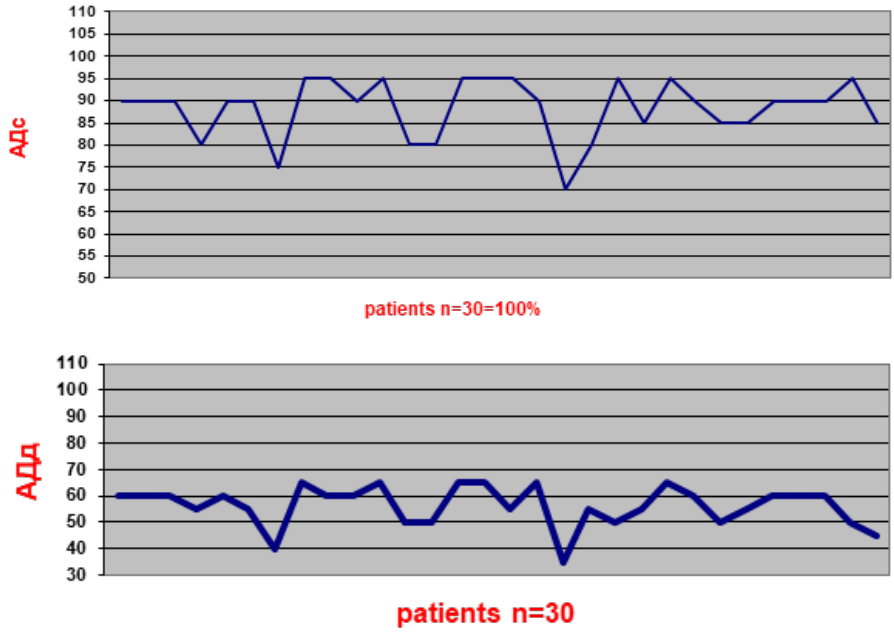

Fig. 2. The distribution of values of AD among children with burn injury

Table 2

The change in the ECG among children with the burn injury, %

Number of patients n=30	ECG indicator							
	Deviation of EOS sharply to the right	↓ QRS	↑ QRS	↓ RR	↑ RR	↓ QT	↑ QT	Increase of systolic index
	10	10	-	83	-	70	13	62

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EARLY DYAGNOSIS OF NECROTIZING ENTEROCOLITIS IN THE NEWBORNS

ABSTRACT

Necrotizing enterocolitis (NEC) today hasn't objective reliable laboratory markers for early diagnosis. The article presents the results of studying structural and functional properties of erythrocyte membranes (structural-functional state - SFS) using original method for automatic registration of acidic and osmotic erythrogram (ARAOE) in 50 healthy newborns and 90 suffering from NEC. The study highlighted two laboratory markers, significantly changing their values depending on the stage of the disease.

Keywords: necrotizing enterocolitis, NEC, newborns, hemolysis, erythrocytes.

Objective: to identify the dependence of erythrocyte membranes structural-functional properties from clinical stages of NEC in newborns and to assess their diagnostic value.

Tasks

1. To evaluate structural-functional state of erythrocyte membranes in healthy newborns and NEK newborns with the help of automatic registration of acidic and osmotic erythrogram method.

2. To identify significantly changing of SFS in neonates with NEC depending on the stages of the disease.

MATERIAL AND METHODS

The study included 140 infants. The control group consisted of 50 healthy children (group A) and a group of 90 infants with NEC at different stages (group B).

Group A included 50 healthy newborns with a gestational age of 38-40 weeks, weighing 3500-3850g.

In group B 70% of the newborns were premature. Among concomitant pathology dominated brain ischemia of different severity (100% of cases). Intrauterine infection and septic state was accompanied by the incidence in 93.3% of cases. 74.4% of infants in group B had a weight less 2500 g., including at least 1000g. – 10%.

The study of the SFS method (ARAOE) was carried out according to the method developed at the Department of biophysics and biology faculty FGBOU VPO «Voronezh state University». Equipment: 56M FEK with integrated differential amplifier, two-coordinate recorder 4 LKD – 003, digital voltmeter

Table 1

Distribution on disease stages in the group "B" (n 90)

	Стадии НЭК, по Walsh и Kliegman					
NEC stages (Walsh & Kliegman)	IA	IB	IIA	IIB	IIIA	IIIB
Total (n 90)	22	20	18	10	12	8

Table 2

Distribution on gestational age in the group "B" (n=90)

Gestational age, (weeks)	Value, %
26-30	24
31-36	46
37-42	30

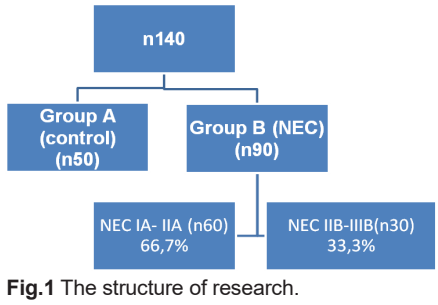

Fig.1 The structure of research.

Table 3

Distribution of newborns on weight in the group "B"

Weight	Value, %
< 1 кг (n9)	10,0
1-2,4 кг (n58)	64,40
2,5-3,2 кг (n23)	25,60