

MEDICAL CARE DURING THE FIRST MONTHS OF LIFE FOR CHILDREN WITH A FACIAL NERVE BIRTH INJURY

© I.A. Kriukova¹, G.A. Ikoeva^{1,2}, E.I. Saidasheva^{1,3}, A.G. Baindurashvili^{1,2}, Yu.V. Stepanova¹

¹ North-Western State Medical University n.a. I.I. Mechnikov, Saint Petersburg, Russia;

² The Turner Scientific and Research Institute for Childrens Orthopedics, Saint Petersburg, Russia;

³ Children City Hospital No 1, Saint Petersburg, Russia

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Background. Among all cranial nerves, the facial nerve is the most exposed to birth injuries. Difficulties with medical assistance during the first months of life for children with a facial nerve birth injury is known and debated. According to the literature data, the scope of diagnostic and treatment activities varies, and these treatments have not always demonstrated effectiveness.

Aim. We discuss the protocol of medical assistance for newborns and children during the first months of life with a facial nerve birth trauma.

Materials and methods. We analyzed domestic and foreign literature dedicated to facial nerve birth trauma.

Results. The results showed the necessity of a multidisciplinary approach for patients with facial nerve birth trauma involving neurologists, ophthalmologists, otolaryngologists, audiologists, maxillofacial surgeons, geneticists, doctors for rehabilitation medicine, and microsurgeons. Key directions of medical assistance during the first months of life include the prevention of the development of ophthalmologic complications; topical and etiological differential diagnosis; and dynamic observation to timely resolve whether surgical treatment is necessary.

Conclusion. The integration of developed protocols in clinical practice is essential for understanding the etiology, pathogenesis, natural history, differential diagnostics, and prior treatment by medical doctors of different specialties to improve the quantity of medical assistance.

Keywords: facial nerve palsy; birth injury to facial nerve; newborn; birth trauma; Mobius syndrome; congenital facial palsy.

К ВОПРОСУ О МЕДИЦИНСКОЙ ПОМОЩИ ДЕТЯМ ПЕРВЫХ МЕСЯЦЕВ ЖИЗНИ С ПОВРЕЖДЕНИЕМ ЛИЦЕВОГО НЕРВА В РЕЗУЛЬТАТЕ РОДОВОЙ ТРАВМЫ

© И.А. Крюкова¹, Г.А. Икоева^{1,2}, Э.И. Сайдашева^{1,3}, А.Г. Баиндурашвили^{1,2}, Ю.В. Степанова²

¹ ФГБОУ ВО «СЗГМУ им. И.И. Мечникова» Минздрава России, Санкт-Петербург;

² ФГБУ «НИДОИ им. Г.И. Турнера» Минздрава России, Санкт-Петербург;

³ СПбГБУЗ «Детская городская больница № 1», Санкт-Петербург

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Актуальность. Из всех черепных нервов лицевой нерв наиболее подвержен травмированию в родах. Проблема медицинской помощи детям первых месяцев жизни при родовой травме лицевого нерва является актуальной и дискуссионной. Согласно литературным данным объем рекомендуемых лечебно-диагностических мероприятий варьирует, а их эффективность не всегда доказана.

Цель. На обсуждение выносятся разработанный нами протокол медицинской помощи новорожденным и детям первых месяцев жизни с родовой травмой лицевого нерва.

Материалы и методы. Проанализированы данные отечественной и зарубежной литературы, посвященной проблеме родовой травмы лицевого нерва.

Результаты. Показана необходимость мультидисциплинарного подхода к пациентам с родовой травмой лицевого нерва с участием невролога, офтальмолога, отоларинголога, сурдолога, челюстно-лицевого хирурга, генетика, специалиста по восстановительной медицине, лечебной физкультуре и физиотерапии, микрохирурга. Определены ключевые направления медицинской помощи в первые месяцы жизни: профилактика развития офтальмологических осложнений; тщательная топическая и этиологическая дифференциальная диагностика; динамическое наблюдение с целью своевременного решения вопроса о необходимости проведения хирургического лечения.

Заключение. Использование предложенного протокола в клинической практике необходимо для формирования четкого понимания врачами разных специальностей вопросов этиологии, патогенеза, особенностей течения заболевания, дифференциальной диагностики и приоритетного лечения с целью повышения качества оказываемой помощи.

Ключевые слова: паралич лицевого нерва; родовая травма лицевого нерва; новорожденные; родовая травма; синдром Мебиуса; врожденный паралич лицевого нерва.

Birth injury to the facial nerve (FN) is registered at an approximate frequency of 0.3–1 per 1000 live births with a great prevalence in large newborns [1–3]. It is manifested by peripheral paresis of varying severity (from subtle to gross) of the facial muscles, often unilateral [2, 4–6]. According to the literature, injuries prevail at the site where the FN exits the skull via the stylomastoid foramen or its terminal branches anteriorly from the external auditory canal [4–9]. The marginal mandibular branch of the FN may be injured as a result of pressure on the edge of the lower jaw with developing paresis only of the lower (perioral) facial muscles. In these cases, the safety of the functions of the frontal and orbital branches of the FN creates a false impression of the central origin of paresis [9, 10].

Differential diagnosis of identified facial asymmetry in newborns is conducted for various reasons, including birth trauma of the facial skull (e.g., mandibular fracture), intracranial pathology (hemorrhage, tumor, etc.), congenital malformations (CMF) (FN and its nuclei, temporal bone, facial skull, facial muscles), neuromuscular diseases, congenital infections, and genetic syndromes [1, 2, 4, 11–21].

In 90% of cases, spontaneous restoration of facial muscle function occurs during the first months of life. Neuropraxia of the FN predominates and does not require special treatment. Surgical treatment is considered if spontaneous recovery has not occurred by the second month of life [2–5, 8, 9, 22].

Children with birth injury of the FN require a multidisciplinary approach with collaboration between a neurologist, ophthalmologist, otolaryngologist, audiologist, maxillofacial surgeon, geneticist, restorative medicine specialist, exercise and physical therapist, and a microsurgeon, if

necessary. The primary areas of medical care in the first months of life include preventing the development of ophthalmologic complications, careful topical and etiological differential diagnosis, and case monitoring to determine the need for timely surgical treatment [4, 23].

ICD-10

P11.3 Injury of the facial nerve due to birth trauma

Causes

1. Injury to the nerve after it exits the skull from the stylomastoid foramen or its terminal branches in the parotid or buccal region (compression with bony protrusions of the mother's pelvis, the shoulder of the fetus, obstetrical forceps, with the facial presentation of the fetus)
2. Injury to the nerve bony canal within the temporal bone (fracture of the temporal bone).

Pathomorphology

Injury of varying severity to the nerve or its branches, namely compression, swelling, ischemia, perineural hemorrhage in the nerve, sprain, tearing, or complete rupture.

Pathological variants of FN injury include neuropraxia (nerve integrity is intact, transient impulse conduction block, fully reversible state); axonotmesis (impaired axonal integrity, intact membrane, complete spontaneous recovery is possible); neurotmesis (axonal membrane injury, spontaneous recovery is impossible).

Clinical manifestations

1. Unilateral peripheral paresis/paralysis of varying severity to the facial muscles (House–Brackmann scale, Table 1).

Table 1

Severity scale for mimic muscle paresis (according to House J.W. and Brackmann D.E., 1985)

Severity level	Face in rest	Movements		
		Forehead	Palpebral fissure	Mouth
I (norm)	Symmetric	Norm	Norm	Norm
II (mild): paresis is detected with a thorough examination	Symmetric	Moderately reduced	Full closure with minimal effort	Mild asymmetry
III (moderate): noticeable paresis	Symmetric	Minimal	Full closure with maximum effort	Mild asymmetry with maximum effort
IV (moderate-severe): obvious paresis	Symmetric	None	Incomplete closure	Asymmetry with maximum effort
V (severe): stealthy movements	Asymmetry	None	No closure	Minimum
VI (complete paralysis)	Asymmetry	None	None	None

2. Depending on the level of FN injury:
 - complete paresis of the facial muscles (upper and lower) before they are divided into the terminal branches;
 - partial (only the upper or lower facial muscles) in case of injury to the individual terminal branches of the FN.
3. Facial asymmetry (especially noticeable with vagitus).
4. Possible swelling, ecchymosis, shoulder dystocia of forceps anteriorly from the ear canal, in the cheeks, lower jaw.
5. In case of temporal bone fracture, edema, soft tissue hematoma, palpatory tenderness in the temporal bone, hemotympanum, otorrhea.
6. With full injury of the FN (in the area of the stylomastoid foramen, before dividing into the terminal branches):
 - at rest, smoothness of the folds of the forehead, nasolabial fold, wide palpebral fissure, eye closure is incomplete, the angle of the mouth is lowered;
 - search and sucking reflexes are weakened;
 - leakage of milk from the affected corner of the mouth when feeding;
- when screaming or grimacing, there are uneven folds in the forehead, incomplete closure of the palpebral fissure, and the angle of the mouth is pulled to the healthy side;
- the palpebral reflex and corneal reflex are weakened.
7. In case of partial FN injury (lower branches of the FN in the parotid or buccal region):
 - upper facial muscles are intact (complete closure of the palpebral fissure, forehead wrinkles);
 - paresis of the lower facial muscles;
 - at rest, the nasolabial fold is smoothed, angle of mouth is lowered;
 - search reflex inhibition;
 - leakage of milk from the affected corner of the mouth when feeding;
 - when screaming or grimacing, the angle of the mouth is pulled to the healthy side.

Differential diagnostics

A key element in providing medical care to newborns and children in the first months of life with suspected birth injury of the FN is a thorough topical and etiological differential diagnosis of the identified facial asymmetry (Table 2).

Table 2

Differential diagnosis of birth injury to the facial nerve

Pathology	Characteristic signs
Central paresis of mimic muscles (supranuclear injury — the lower sections of the precentral gyrus, the inner capsule, trunk)	<ul style="list-style-type: none"> • unilateral paresis of the lower facial muscles: smoothness of the nasolabial fold, distortion of the mouth to the healthy side when crying; • preservation of the function of the upper facial muscles (<i>m. frontalis</i>, <i>m. orbicularis oculi</i>); • enhanced palpebral reflex; • ± homolateral: XII pair of cranial nerves (CN) (deviation of the tongue in the direction of FN paresis), spastic arm paresis, or hemiparesis

Окончание табл. 2

Pathology	Characteristic signs
Injury to the FN nuclei in the area of the pons (heart attack, hemorrhage, tumor, etc.)	<ul style="list-style-type: none"> • Millard–Gubler syndrome: peripheral paresis of the facial muscles on the side of the injury (FN nidus) + spastic hemiparesis on the opposite side (pyramidal tract); • Foville syndrome: peripheral paresis of the facial muscles on the side of the injury (FN nidus) and paresis of the external eye muscle (abducens nucleus, convergent squint) + spastic hemiparesis on the opposite side (pyramidal tract)
Injury to the intracranial part of the FN in the area of the cerebellopontine angle (infratentorial hemorrhage, tumor)	<ul style="list-style-type: none"> • + symptoms of dysfunction of the adjacent CN: trifacial (decreased corneal reflex, non-parallel arrangement of the upper and lower jaw), abducens (convergent squint), auditory, hypoglossal (tongue deviation to the side)
Isolated aplasia/hypoplasia of the FN	<ul style="list-style-type: none"> • perinatal history is not burdened (normal delivery, small fetus); • complete unilateral paresis of the facial muscles, otherwise no abnormalities in neurological status; • irreversibility (no tendency to recovery); • ± abnormalities of the auditory organ; • MRI — aplasia/hypoplasia of the FN
Isolated dysplasia of FN nuclei	<ul style="list-style-type: none"> • full unilateral/bilateral paresis of facial muscles without a tendency to recovery
Moebius symptom	<ul style="list-style-type: none"> • nuclear hypoplasia VIIth pair of CN (bilateral/unilateral paresis of the facial muscles); • ± VI (convergent squint), XII CN; • no tendency to recovery
Genetically caused FN paralysis	<ul style="list-style-type: none"> • chromosomal microdeletions; • isolated unilateral/bilateral paresis of the facial muscles without a tendency to recovery
Unilateral hypoplasia of the depressor muscle of the angle of the mouth and lower lip (<i>m. depressor anguli oris</i> , <i>m. depressor labii inferioris</i>) (in English lit. congenital unilateral lower lip palsy, neonatal asymmetric crying facies)	<ul style="list-style-type: none"> • at rest, symmetrical face or unilateral narrowing of the lower lip; • asymmetry of the lower lip with a smile and crying: on the affected side, the lower lip, the angle of mouth does not lower (they remain horizontal); • hearing is intact; • perinatal history, no abnormalities in physical and neurological status; • MRI of the temporal bones is within the normal range; • Echocardiogram (risk of heart CMF).
First and second branchial arch syndromes	<ul style="list-style-type: none"> • hemifacial microsomia, Goldenhar syndrome, oculoauriculovertebral dysplasia; • underdevelopment (often unilateral) of facial tissues formed from the visceral arch (lower and upper jaw, zygomatic bone, facial muscles) → facial asymmetry (from subtle to coarse); • CMF of the auditory organ (auricles, external auditory canals, middle ear, parotid fistula, etc.); • ± other CMF: organ of vision, cleft lip and palate, heart, kidney, skeletal system, cervical spine; • mental retardation in 25% of cases
Cardiofacial syndrome	<ul style="list-style-type: none"> • DiGeorge syndrome, deletion of chromosome 22q11.2; • facial dysmorphism; • CMF (heart, etc.); • immunodeficiency (thymus hypoplasia); • hypocalcemia and hypomagnesemia
Mandibular fracture	<ul style="list-style-type: none"> • soft tissue swelling, subcutaneous hematoma of the maxillofacial area; • traces from forceps on the side areas of the face are possible; • facial asymmetry, chin deposition; • crying during sucking, rejection of the breast; • restricted mouth opening; • pain with palpation anterior to the antilobium

Note: FN — facial nerve; CN — cranial nerves; CMF — congenital malformations.

Possible complications

1. Corneconjunctival xerosis (dry eye syndrome).
2. Conjunctivitis, keratitis (with secondary infection).
3. In severe paresis, contractures and synkinesia of the paretic muscles.

Medical approaches in a maternity hospital

1. Analysis of intranatal history (large fetus/contracted pelvis, prolonged labor, facial/pelvic presentation, obstetrical forceps).
2. Photo and video documentation of mimic muscle paresis (at rest, when crying, when sleeping).
3. Psychological and informational support for the mother regarding the most likely reversibility of paresis (with traumatic neuropathy, a full recovery occurs during the first weeks or months of life in 90% of cases) and the need for preventive treatment of the anterior segment of the eye in case of incomplete closure of the palpebral fissure.
4. Examination by a neurologist (if on staff at the maternity hospital) (differential diagnosis of paresis — central/peripheral; traumatic/congenital).
5. Transcranial-transfontanelar ultrasonography (zones of interest are the pons, cerebellopontine angle on the affected side, posterior cranial fossa structures, cerebellar tentorium, frontoparietal zone) [24, 25].
6. Consultation with an ophthalmologist if it is not possible to fully close the palpebral fissure (personally/at a distance).
7. Audio screening.
8. Consultation with an otolaryngologist (if indicated, hemotympanum is ruled out).
9. Echocardiogram (if a specialist is on staff at the maternity hospital).
10. Clinical analysis of blood, C-reactive protein.
11. Screening for TORCH infections (as indicated).
12. Find the best way to attach the baby to the breast or feed with expressed breast milk.
13. With full paresis, avoid sharp sounds, follow the protective regimen.
14. If it is impossible to completely close the palpebral fissure (when sleeping, when crying), the neonatologist will immediately begin a comprehensive prevention initiative:
 - in case of inflammatory anterior segment diseases, use antiseptic (Vitabact*) at an instillation of 1 drop 2–3 times a day for 5 days; if necessary, a second course is performed;
 - in case of corneconjunctival xerosis, use keratoprotectors (Corneregel) and/or artificial tear medications (Oftagel**, Khilabak**, etc.) at instillations of 1–2 drops 4–6 times a day***; until full restoration of eyelid closure***.
15. With the development of conjunctivitis, use antiseptic (Vitabact*) at an instillation of 1 drop 4 times a day for 7 days.
16. With the development of keratitis (diagnosis made by an ophthalmologist): antibacterial drugs are used, namely macrolides (Azidrop*) at instillations of 1 drop 2 times a day for 3 days in combination with keratoprotectors (Corneregel**) at instillations of 1 drop 2 times a day until disease symptoms disappear***.
17. Routing of newborns with traumatic facial nerve is determined by the child's general condition, the severity of facial muscle paresis, comorbidities, and examination data.
18. Discharge from the maternity hospital in a primary care facility is possible if neurological exam reveals isolated mild facial muscle paresis and satisfactory somatic status, blood test is normal, pathology is absent according to ultrasound (brain, heart) and audiometry, and there are no signs of temporal bone or lower jaw fracture or ophthalmic infection.
19. Recommendations for discharge of the child from the maternity hospital:
 - monitoring by a neurologist, exercise therapy, and physiotherapy specialist;
 - in case of incomplete palpebral fissure closure, monitoring by an ophthalmologist (examination soon after discharge) is recommended, with continued prevention of corneconjunctival xerosis using keratoprotectors (Corneregel) and/or artificial tear medications (Oftagel**, Khilabak**, etc.) at instillations of 1–2 drops 4–6 times a day***; these activities are performed

Note: * drugs approved for use from birth (according to the instructions); ** drugs that do not have age restrictions for use (according to the instructions); *** if it is necessary to instill several drugs into the conjunctival cavity, they should be applied separately with an interval of at least 15 min.

- until arbitrary closing of the eye becomes possible and blink reflex is restored;
 - application of eye dressing during the day or at night is not recommended;
 - examination by an otolaryngologist and audiologist;
 - exercise therapy from day 7 of life in the form of mimic gymnastics based on the reflexes of the newborn (causing palmar-oral, snout, searching reflexes for 5 min before feeding up to 10 times a day, sucking reflex using a pacifier), visual and speech contact with the child — stimulation of oral attention;
 - in the absence of restoration of facial muscle function during the first months of life, FN electroneuromyography and consultation of the maxillofacial surgeon and microsurgeon are required.
20. In other cases, the child should be transferred to the neonatal pathology department.

Medical approaches in the hospital

1. Anamnesis (large fetus/contracted pelvis, prolonged labor, facial/pelvic presentation, obstetrical forceps, swelling and ecchymosis in the temporal bone area, anteriorly from the external auditory canal in the first days of life).
2. Photo and video documentation of mimic muscle paresis (at rest, when crying, when sleeping) compared with the early neonatal period.
3. Monitoring by a neurologist (differential diagnosis of paresis — central/peripheral; traumatic/congenital).
4. Monitoring by an ophthalmologist (if it is impossible to completely close the palpebral fissure when sleeping or crying).
5. Consultation with an otolaryngologist, otoscopy exam (to rule out of hemotympanum).
6. Audiometry.
7. Consultation with an audiologist.
8. Consultation with a neurosurgeon (if indicated, with temporal bone fracture, etc.).
9. Consultation with a maxillofacial surgeon.
10. Consultation with a geneticist (if indicated).
11. Clinical blood analysis.
12. Examination for congenital infections (if indicated).
13. Transcranial-transfontanelar ultrasound.
14. Heart ultrasound.
15. Parotid gland ultrasound (if indicated).
16. Brain magnetic resonance imaging (MRI) of the brain (if indicated).
17. Temporal bone radiography (in case of suspected temporal bone fracture).
18. Multispiral computed tomography (CT) of the temporal bone (in case of suspected temporal bone fracture or CMF of the fallopian canal).
19. Facial nerve MRI (if indicated).
20. Find the best way to attach the baby to the breast or feed with expressed breast milk.
21. Sleep on the affected side.
22. In case of full paresis, avoid sharp sounds, follow the protective regimen.
23. If it is impossible to fully close the palpebral fissure, complex prevention initiatives should be started immediately or continued:
 - in case of inflammatory diseases of the anterior segment of the eye, use antiseptic (Vitabact*) at an instillation of 1 drop 2–3 times a day for 5 days; if necessary, a second course is performed;
 - in case of corneoconjunctival xerosis, use keratoprotectors (Corneregel) and/or artificial tear medications (Oftagel**, Khilabak**, etc.) at instillations of 1–2 drops 4–6 times a day until complete restoration of eyelid closure***;
 - application of eye dressing during the day or at night is not recommended.
24. With the development of conjunctivitis, use antiseptic (Vitabact*) at an instillation of 1 drop 4 times a day for 7 days.
25. With the development of keratitis, use antibacterial drugs, namely macrolides (Azidrop*) at instillations of 1 drop 2 times a day for 3 days in combination with keratoprotectors (Corneregel**) at instillations of 1 drop 2 times a day until the symptoms of the disease disappear***;
26. Exercise therapy from day 7 of life in the form of mimic gymnastics based on the reflexes of the newborn (causing palmar-oral, snout, searching reflexes for 5 min before feeding up to 10 times a day, sucking reflex using a pacifier), visual and speech contact with the child — stimulation of oral attention);
27. Massage (start on the healthy side, then the affected side from week 2 in the form of stroking; from month 1 — differentiated, acupuncture);
28. Physiotherapy (auxiliary value, efficacy is not

- proven): ultrahigh frequencies, ultraviolet irradiation, photochromotherapy, magnetic therapy; from month 1, thermal procedures (dry heat, paraffin, or ozokerite applications), electrophoresis with prozerin, lydazum.
29. Drug therapy (efficacy and safety in the neonatal period is not proven): decongestants and vasoactive agents, B vitamins (cyanocobalamin**).
 30. In the absence of restoration of facial muscle function within 1–2 months of life — electroneuromyography of the facial nerves and consultation with a microsurgeon.

Medical approaches in outpatient-polyclinic settings

1. Anamnesis (large fetus/contracted pelvis, prolonged labor, facial/pelvic presentation, obstetrical forceps, swelling and ecchymosis in the temporal bone area, anteriorly from the external auditory canal in the first days of life).
2. Photo and video follow-up documentation of mimic muscle paresis (at rest, when crying, when sleeping).
3. Monitoring by a neurologist (differential diagnosis of paresis — central/peripheral; traumatic/congenital).
4. Monitoring by an ophthalmologist (if it is impossible to completely close the palpebral fissure).
5. Consultation with an otolaryngologist, audiologist.
6. Consultation with a maxillofacial surgeon.
7. Consultation with a geneticist (if indicated).
8. Clinical blood analysis.
9. Examination for congenital infections (if indicated).
10. Transcranial-transfontanelar ultrasound.
11. Heart ultrasound.
12. Parotid gland ultrasound (if indicated).
13. In case of incomplete closure of the palpebral fissure (during crying and sleeping):
 - for prevention of inflammatory diseases of the anterior segment of the eye, use antiseptic (Vitabact*) at instillations of 1 drop 2 times a day for 5 days; if necessary, a second course is performed;
 - for prevention of corneconjunctival xerosis, use keratoprotectors (Corneregel) and/or artificial tear medications (Oftagel**, Khilabak**, etc.) at instillations of 1–2 drops 4–6 times per day until full restoration of eyelid closure***;
- with the development of conjunctivitis, use antiseptic (Vitabact*) at an instillation of 1 drop 4 times a day for 7 days;
- with the development of keratitis, use antibacterial drugs, namely macrolides (Azidrop*) at instillations of 1 drop 2 times a day for 3 days in combination with keratoprotectors (Corneregel**) at instillations of 1 drop 2 times a day until the symptoms of the disease disappear***;
- application of eye dressing during the day or at night is not recommended.
14. Monitoring by a specialist in restorative medicine, exercise therapy, and physiotherapy.
15. Sleep on the affected side.
16. Exercise therapy from day 7 of life in the form of mimic gymnastics based on the reflexes of the newborn (causing palmar-oral, snout, searching reflexes for 5 min before feeding up to 10 times a day, sucking reflex using a pacifier), visual and speech contact with the child — stimulation of oral attention.
17. Massage (start on the healthy side, then on the affected side from week 2 in the form of stroking; from month 1 — differentiated, acupuncture).
18. Physiotherapy (auxiliary value, efficacy is not proven): ultrahigh frequencies, ultraviolet irradiation, photochromotherapy, magnetic therapy; from month 1, thermal procedures (dry heat, paraffin, or ozokerite applications), electrophoresis with prozerin, lydazum.
19. Drug therapy (efficacy and safety in the neonatal period is not proven): decongestants and vasoactive agents, B vitamins (cyanocobalamin**).
30. In the absence of restoration of facial muscle function within the first months of life, electroneuromyography of the facial nerves, consultation with a microsurgeon, if necessary, facial nerve MRI, multispiral CT of the temporal bone (with suspected CMF of the fallopian canal) are recommended.

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Contribution of the authors

I.A. Kryukova — collected information, processed the material, wrote the basic text of the article,

G.A. Ikoeva — collected information, processed the material, performed stepwise and final editing of the article text,

E.I. Saydasheva — collected information, processed the material, wrote the text of the article devoted to the ophthalmological aspects of birth trauma to the facial nerve, edited the text of the article,

A.G. Baindurashvili — Developed the concept and design of the scientific work, performed stepwise and final editing of the article text,

Yu.V. Stepanova — edited the text of the article devoted to the differential diagnosis and medical approaches in case of birth trauma to the facial nerve.

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Information about the authors

Irina A. Kriukova — MD, PhD, Neurologist, Assistant Professor of the Chair of Pediatric Traumatology and Orthopedics of North-Western State Medical University n.a. I.I. Mechnikov, Saint Petersburg, Russia. E-mail: i_krukova@mail.ru.

Galina A. Ikoeva — MD, PhD, Neurologist, Assistant Professor of the Chair of Pediatric Neurology and Neurosurgery of North-Western State Medical University n.a. I.I. Mechnikov. Chief of the Department of Motor Rehabilitation. The Turner Scientific and Research Institute for Children's Orthopedics, Saint Petersburg, Russia. ORCID: <https://orcid.org/0000-0001-9186-5568>. E-mail: ikoeva@inbox.ru.

Elvira I. Saidasheva — MD, PhD, Ophthalmologist, Professor of the Chair of Ophthalmology of North-Western State Medical University n.a. I.I. Mechnikov, Saint Petersburg, Russia. ORCID: <https://orcid.org/0000-0003-4012-7324>. E-mail: esaidasheva@mail.ru.

Alexei G. Baindurashvili — MD, PhD, Professor, Member of RAS, Honored Doctor of the Russian Federation, Director of The Turner Scientific Research Institute for Children's Orthopedics; Head of the Chair of Pediatric Traumatology and Orthopedics of North-Western State Medical University n.a. I.I. Mechnikov, Saint Petersburg, Russia. ORCID: <https://orcid.org/0000-0001-8123-6944>. E-mail: turner01@mail.ru.

Yulia V. Stepanova — MD, PhD, Chief of the Department of Maxillofacial Surgery. The Turner Scientific Research Institute for Children's Orthopedics, Saint Petersburg, Russia. ORCID: <https://orcid.org/0000-0001-7064-3069>. E-mail: turner8ord@gmail.com.

Ирина Александровна Крюкова — канд. мед. наук, невролог, доцент кафедры детской травматологии и ортопедии ГБОУ ВО «СЗГМУ им. И.И. Мечникова» Минздрава России. E-mail: i_krukova@mail.ru.

Галина Александровна Икоева — канд. мед. наук, невролог, доцент кафедры детской невропатологии и нейрохирургии ФГБОУ ВО «СЗГМУ им. И.И. Мечникова» Минздрава России; заведующая отделением двигательной реабилитации ФГБУ «НИДОИ им. Г.И. Турнера» Минздрава России, Санкт-Петербург. ORCID: <https://orcid.org/0000-0001-9186-5568>. E-mail: ikoeva@inbox.ru.

Эльвира Ирековна Сайдашева — д-р мед. наук, доцент, офтальмолог, профессор кафедры офтальмологии ФГБОУ ВО «СЗГМУ им. И.И. Мечникова» Минздрава России. ORCID: <https://orcid.org/0000-0003-4012-7324>. E-mail: esaidasheva@mail.ru.

Алексей Георгиевич Баиндурашвили — д-р мед. наук, профессор, академик РАН, заслуженный врач РФ, директор ФГБУ «НИДОИ им. Г.И. Турнера» Минздрава России; заведующий кафедрой детской травматологии и ортопедии ГБОУ ВО «СЗГМУ им. И.И. Мечникова» Минздрава России. ORCID: <https://orcid.org/0000-0001-8123-6944>. E-mail: turner01@mail.ru.

Юлия Владимировна Степанова — канд. мед. наук, доцент, заведующая отделением детской челюстно-лицевой хирургии ФГБУ «НИДОИ им. Г.И. Турнера» Минздрава России, Санкт-Петербург. ORCID: <https://orcid.org/0000-0001-7064-3069>. E-mail: turner8ord@gmail.com.