

The Clinical Course and Diagnostics Peculiarities of Combined Cranio-Facial Traumas in Children

Margar Martirosyan

The children's Emergency Hospital, Yerevan, Armenia

ABSTRACT

The case histories of 430 children with combined cranio-cerebral traumas (CCT) were studied. Combinations of CCT with facial lesions (cranio-facial traumas) were observed in 104 children (24,2%). The age of the patients varied from 2 to 15 years, boys - 74 (71,2%) and girls - 30 (28,8%). The following peculiarities of the clinical course of cranio-facial traumas were observed: 1. Expressed edema of soft tissue of the face and head (in 1/3 of the patients), which made difficult checking and adequate assessment of the craniocerebral nerves and detection of eye injuries. 2. Hemorrhage from injured parts of the face, massive sensitive innervation of the facial region causing development of traumatic-hemorrhagic shock in 47,1% of the injured. 3. Frequent (in 1/3 of the patients) development of respiratory disorders needing urgent interventions, and making difficult the assessment of CCT gravity. 4. Quite often - in 14,4% development of rhinorrhea and threat of intracranial infections complications. 5. Difficulties connected with the treatment and care in the acute period of the trauma, due to psychic disorders caused by frequent injury of the frontal lobes and also because of the young age.

KEYWORDS: *children's traumatism, combined cranio-cerebral traumas, cranio-facial injuries, neurological diagnostics*

Among all types of combined cranio-cerebral traumas (CCT) the cranio-facial injuries range from 25% to 33,9%. Thus, it is the most frequently developed type of combination in both period, is it peace- or war-time [1,5,13,17]. The authors of the above-mentioned statistics justly consider that such frequent manifestations of cerebro-facial traumas are conditioned and could be explained by anatomical closeness of these parts of the head and by increased numbers of accidents and various types of catastrophes, in which situations the head is the most vulnerable part of the body. To such kind of disorders several clinical peculiarities are common and characteristic that contribute to difficulties in cranio-cerebral and facial diagnostics and increase the percentage of early and delayed complications with different genesis (meningitis, osteomyelitis, sinusitis, pseudarthrosis) [6,7,18,19]. In children, due to age peculiarities, the cranio-facial injuries are characterized by additional difficulties in diagnostics and high mortality rate that increases problem actuality [9,16,22].

MATERIAL AND METHODS

The case histories of 430 children with combined cranio-cerebral traumas (CCT) during the period from 1994 to 2001 years being hospitalized in special departments of Erevan hospitals and regional hospitals of the republic were studied.

The cranio-facial injuries were detected in 104 patients (24,27%). The age of the patients varied from 2 to 15 years, boys - 74 (71,2%) and girls - 30 (28,8%).

In 86 (82,7%) children the reason of disorders was car accidents and falls from high altitudes (catatrauma). In 6 children the reason of traumas was hors-hoof strike; 5

were crushed with metal door; The 4 children were with penetrating cranio-cerebral wounds, through the orbital cavity by metal thing (knife, screw-driver, welding electrodes, sharp end of the ski-stick).

The distribution of patients by clinical forms of CCT, location and nature of cranio-facial disorders are presented in *Tab.1*.

As it has shown, in case of cranio-facial injuries most frequently develop fractures of the lower jaw (in 24 children -23,1%) and fractures of the nasal bones (in 22 children - 21,2%). The mentioned data coincides with, and is confirmed by the data of other authors. The high frequency of such kind of disorders is explained by the prominent location of these parts of the head [2,3,21]. Noteworthy, that facial bone fractures in overwhelming majority (approximately 85%) were detected in children after 6 years, which is explained by elasticity and relatively small sizes of these structures before this age [9,16].

In most cases the complex examinations of patients were carried out using the modern diagnostic methods. Along with surgical, neurological, X-ray, and laboratory methods, the echoencephalography (EES), neuroophthalmological examination, the lumbar puncture in case of necessity, the computed tomography (CT) in case of uncertain combined traumas of the brain, and the electroencephalography (EEG) in sub-acute period of trauma, were used. The maxillofacial surgeon was involved in the process of diagnostics and treatment, and oculist and otorhinolaryngologist (ORL) in case of necessity. In some cases the hole was applied for diagnostics.

CLINICAL FORMS OF CCT		Number of observations	LOCATION AND CHARACTER OF CRANIO-FACIAL DISORDERS						
			Fractures of upper jaw	Fractures of zygomatic bones	Fractures of nasal bones	Fractures of lower jaw	Fronto-basal injuries	Eyeball and visual pathways	Multiple fractures of facial skeleton
Concussion		24	3	1	12	7	-	1	-
Contusion	Light	19	4	1	4	5	5		-
	Moderate	21	2	-	2	6	8	1	2
	Severe	14	2	2	2	1	4	2	1
Compression of the brain	Crush by broken skull fragments	18	1	-	1	2	10	2	2
	Intra cranial hematoma	5	1	-	1	2	-	-	1
Accident, road traumas		3	-	-	-	1	2	-	-
Total		104	13	4	22	24	29	6	6

Tab.1 Clinical forms of cranio-cerebral traumas, location and character of cranio-facial injuries.

RESULTS AND DISCUSSIONS

According to the location of traumas, the following cranio-facial disorders have been distinguished:

A - injury of the upper 1/3 of the face (fronto-basal and orbital fractures) - 35 patients.

B - injury of the middle 1/3 of the face (Fractures of upper jaw, zygomatic and nasal bones) - 39 patients

C - injury of the lower 1/3 of the face (Fractures of lower jaw) - 24 patients.

D - Multiple fractures of the facial skeleton - 6 patients.

The traumatic shock was detected in 49 cases (47,1%), predominantly in patients from the groups D and B, conditioned by the combined and mutual aggravating effects of cranio-cerebral and cranio-facial injuries. In our opinion, frequently developed shock in case of cranio-facial injuries to a great extent is related to reach sensitive innervations of the facial region resulting super excitation of the central nervous system (CNS) by the pain.

Another supporting condition causing the traumatic shock was bleeding from the skull and facial region integuments that were manifested in a varying degree during our observations.

Unlike the classic traumatic shock, the shock that develops as a result of the cranio-facial injuries is frequently accompanied by respiratory and consciousness disorders of a certain degree.

Respiratory disorders during cranio-facial injuries develop by following reasons: as a result of severe traumas of the brain, involving the stem structures as well leading to

unconsciousness and oppression of coughing reflexes. The fracture of facial skeleton may lead to the obstruction of respiratory passageways with blood, mucus, soft tissue debris of the mouth cavity, tongue retraction, some times with bone fragments of the jaws.

As a result of disorders of respiratory passageways' patency the serious malfunction of peripheral respiration display. The vicious circle reveals itself: inhibition of the respiratory center aggravates due to disorders of the peripheral respiration which in turn increases brain edema involving the stem structures as well. With severe disorders of respiratory function were admitted 32 patients (34,4%). Noteworthy, that after restoration of respiration via the removal of obstacles and mouth cavity clearance, 12 patients regained consciousness. Thus, it could be concluded that unconsciousness in these patients was determined not only by direct brain injuries, but also as a result of respiratory insufficiency. In this connection the primary gravity of brain disorders in case of 14 patients was revised and reevaluated.

The neurological examinations were related with serious difficulties. In 1/3 of patients (35 children) as a result of uni- or bilateral total edema of face region soft tissues, complete examination of eye was impossible thereby interfering with neurological diagnostics and leading to delayed diagnostics of visual disorders in 2 patients. In such circumstances, for diagnostics of brain disorders, asymmetry of abdominal, tendinous reflexes and muscle tonus of limbs is of great value.

In some cases the local disorders stimulated the brain injuries and/or cranio-cerebral nerves. Thus, in 2 patients developed mydriasis as a result of eyeball injury; In 3 patients - displacement of eyeball, diplopia and exophthalmos displayed after fracture and displacement of orbital walls; In 1 patient smoothed down nasolabial fold was expressed as a result of injury of the facial nerve lower branch in zygomatic region; 2 patient suffered from nausea with "coffee-grounds" that was explained by fractures of the base of the skull, however after regaining of consciousness and intubation tube removal occurred that the source of bleeding was fracture of the lower jaw being remained inconspicuous as a result of coma and presence of oral-tracheal tube.

In most patients with combined cranio-facial traumas, the origin of periorbital bleeding or so-called symptom of "glasses" needed confirmation. This question is of great importance from clinical and juridical point of view. It's generally recognized that appearance of symptom of "glasses" developed immediately after trauma, when hematoma around eyes is caused by injury of soft or underlying tissues, displays immediately after trauma; When hematoma ("Glasses") is caused due to soft tissue blood vessels injury, it always expands out of borders of eye's orbicular muscle and the color above the hematoma (throughout the hematoma presence) ranges from light-red to bluish. Along with that, intraconjunctival hematomas are expected that resolve very slowly.

When the major cause of hematoma is blood vessel injuries of base of the skull, hematoma develops later, after several hours or even after 1 to 2 days from trauma. Hematoma around eyelids always corresponds to orbicular muscles of eyes, it does not spread and the skin color above the hematoma is purple [8,13,21].

In children due to skull tissue tenderness, pervasion by blood occurs faster and symptom "glasses" develops just after 12 to 20 hour from trauma [10,16,22].

In case of combined cranio-facial disorders after simultaneous injuries of blood vessels of soft tissues and base of the skull, hematoma involves orbicular muscles of eyes and spreads over this region.

Thus, in case of combined cranio-facial disorders the date and nature of periorbital hematoma appearance separately from other signs is not reliable for diagnostics of anterior cranial fossa fractures. At the same time, the analysis of our material allows us to propose that combination of symptoms "glasses", exophthalmos, nausea with "coffee-grounds" and nose bleeding represent the characteristic syndrome for fractures of skull base.

In correctness of this conclusion we convinced several times when examined patients using the computed tomography (CT) or intra-operatively. In carried out investigations detection of rhinorrhea confirmed the diagnosis of the skull base fracture despite of negative data of X-ray (8 patients) and CT (1 patient) examinations.

According to several authors, the rhinorrhea in case of skull base fractures is manifested in 5 to 11% of cases [4,12,20]. In children the posttraumatic basal rhinorrhea develops rarely, which is explained by the bones' high elasticity consisting the skull base and by insufficiently developed frontal and clinoid sinuses in childhood [11,16]. Some times the rhinorrhea is masked due to bleeding as a result of nasal bone and soft tissues and external auditory meatus injuries [8,20].

In our patients with combined cranio-facial traumas the rhinorrhea was detected in 15 children (14,4%); In 5 of 15 children rhinorrhea was detected in first days by lightened nasal bleeding, in rest of children - on 2-6 days after trauma; In 3 children the rhinorrhea was combined with the ear liquorrhea.

In children subcutaneous emphysema (as well as pneumocephalia) in case of fractures of anterior cranial fossa region develops rarely due to slightly developed accessory nasal sinuses. More characteristic is exophthalmos and face puffiness due to subcutaneous liquorrhea.

The fronto-facial injuries might be accompanied by direct injuries of visual organs and nerves as well. According to literature [7,13,17], the frequency of such disorders is 0,5-5% of all cases of cranio-facial injuries. In our study, among 104 children with combined cranio-facial traumas such kind of disorders was detected in 6 children (6,4%): the one child had penetrating wound of eyeball, 2 children had the eyeball injury, and 3 - optic nerve injury.

If diagnosis of eyes' open injuries is easy detectable, to reveal the closed injuries of optic nerves is much more problematic.

In acute period of combined cranio-cerebral traumas the state of unconsciousness, inadequate behavior and contact impossibility make difficult to state the rate of vision loss especially the field of vision. It must be mentioned that in case of optic nerve injury there is no direct dependence between the rates of vision function loss and gravity of cranio-cerebral traumas. The blindness is expected even in case of light form of CCT. It's of especial importance in children as far as in children development of so-called "benign cortical blindness" revealed by bilateral homonymous hemianopsia, bilateral blindness with saved pupillary reaction is common.

According to K. Digre [14], in children the above-mentioned phenomenon may develop even in case of occipital region's light injury. Usually blindness disappears in a few minutes or hour and does not represent the subject for anxiety. However, when visual disorders display in one eye, despite of CCT light form and maintained pupillary reaction, it may be sign of the prime injury of the optic nerve that eventually may lead to complete blindness.

Thus, according to the results of investigations it could be concluded that in case of cranio-facial injuries in children the following peculiarities are revealed:

1.Expressed edema of soft tissue of the face and head (in 1/3 of the patients) especially in case of the frontal and upper jaw bones' fractures, that make problems in checking and adequate assessment of the cranio-cerebral nerves and eye injuries, which is necessary for detection of eye's direct injury and vision saving.

2.The massive bleeding that accompanies facial bone fractures. Along with that the rich sympathetic innervations of the facial region contribute to development of the traumatic-hemorrhagic shock in 1/2 of patients.

3.The combined fractures of frontal (basilar and vault), upper jaw and nasal bones results in liquorrhea and threat of complications for CNS infections.

4.Possibilities for development of peripheral respiratory disorders, determined by occlusions and obturational processes due to blood, mucus, liquor, emesis and fragments of mouth cavity soft tissue aspiration.

5.Difficulties connected with the treatment and care in the acute period of the trauma due to mood and behavioral changes caused by frequent injury of the frontal lobes and also, because of the young age.

REFERENCES:

1. Арутюнян Б.Н.,Погосян Ю.М., Эбоян К.А и др. Оказания мед. помощи раненым челюстно-лицевой области в сочетании с черепно-мозговой травмой на этапах медицинской эвакуации. (методические рекомендации) Ереван1996. 33с.
2. Бернадский Ю.И. Травматология и восстановительная хирургия челюстно-лицевой области. 1985; 392с.
3. Заусаев В.И. Травма челюстно-лицевой области. -В кн.: Хирургическая стоматология М., 1981, с. 323-368,.
4. Бова Е.А. Хирургическое лечение носовой и ушной ликвореи. Автореф. дис. докт. мед. наук. М..1970; 1969,42с.
5. Гайдар Б.В., Парфенов В.Е., Щербук Ю.А, Мартынов Б.В. В. кн.: Сборник учебных пособий по актуальным вопросам нейрохирургии. СПб. 2002; с.105-133,
6. Гельман Ю.Е. , Трошин В.М., Шишкин А.В. Черепно-лицевая травма. В.кн.: Сочетанная нейротравма. 1989; с.22-34
7. Еолчиян С.А. Черепно-мозговая травма сопровождающаяся повреждением зрительного нерва. Авторефю дис. канд. мед. наук. М. 1996, 32с.
8. Зограбян С. Г Черепно-мозговая травма М., 1965; 248 с.
9. Колесов А.А. Стоматология детского возраста.- М., 1978, 503 с.
10. Ормантаев К. С. Тяжелая черепно-мозговая травма у детей. Л. 1982; 288 с.
11. Bales C.R., Randall P.Lehr Hb. Fractures of the facial bones in children. J Trauma 1972, 12:56-66.
12. Cooper PR. Skull fracture and traumatic cerebrospinal fluid fistulas. In: Cooper PR, eds. Head injury. 2nd ed. Baltimore: Williams & Wilkins, 1987:103.
13. Gruss JS. Fronto-naso-orbital trauma. Clin Plast Surg 1982;9:577
14. Digre K. Trauma to the brain with attention to the occipital lobe. North american neuro-ophthalmology society meeting 1993.
15. Luce EA. Maxillofacial trauma. Curr Probl Surg 1984; 11:1
16. Kaban L.B. , Mulliken J.B.Murray J.E. Facial fractures in children. Plast. Reconstr. Surg. 1977;59:15-207.
17. Horowitz J, Persing , Winn H. Edgerton M. The late treatment of vertical orbital dystopia resulting from an orbital roof fracture. Ann Plast Surg 1984; 13:519-524.
18. Merville L.C , Derome P., et al. Fronto-orbito-nasal dislocation: secondary treatment of sequelae. J. Maxillofac. Surg. 1983; 11:71.
19. Munro IR. Craniofacial surgical techniques for aesthetic result in congenital and acute traumatic deformities. Clin. Plast. Surg. 1981; 8:303.
20. Park J.L. , Strelzov V.V. , Friedman W.H. Current management of cerebrospinal fluid rhinorrhea. Laryngoscope 1983, 93: 1294-1300.
21. Pollock R. A., Gruss J.S. Complex facial fractures. In: Foster C.A. Sherman J.E. eds. Surgery of facial bone fractures. New York: Churchill Livingstone, 1985
22. Schultz R.C., Pediatric facial fractures. In: Kernahan et al. Symposium on pediatric plastic surgery. St. Louis: CV Mosby,1982:249.

Особенности клинического течения и диагностики сочетанных черепно-лицевых повреждений у детей

Маргар Мартиросян

Детская клиническая больница скорой помощи г. Еревана, Армения

Р Е З Ю М Е

Изучены истории более 430 детей с черепно-мозговыми травмами (ЧМТ). Сочетания ЧМТ с лицевыми повреждениями (черепно-лицевая травма) наблюдались у 104 детей (24,2%). Возраст больных от 2 до 15 лет, мальчиков – 74 (71,2%), девочек – 30 (28,8%). Основной причиной повреждения (у 86 детей - 81,7%) явились дорожно-транспортные происшествия (ДТП) и падение с высоты (катктравма). Отмечаются следующие особенности клиники и течения черепно-лицевых повреждений: 1. Выраженный отек мягких тканей лица и головы (у 1/3 больных), который затрудняет проверку или адекватную оценку функций черепно-мозговых нервов, выявление повреждений глаз; 2. Кровотечение из поврежденных отделов лица, обильная иннервация лицевой области обуславливают развитие травматического-геморрагического шока у 47,1% пострадавших; 3. Частое развитие (у 1/3 больных) дыхательных расстройств, которые требуют оказания немедленной помощи, затрудняют, вместе с тем, оценку тяжести ЧМТ; 4. Нередко (14,4%) развитие назальной ликвореи и угроза внутричерепных инфекционных осложнений; 5. Трудности ухода и лечения в остром периоде травмы, вследствие психических нарушений из-за частого повреждения лобных долей, а также детского возраста.

КЛЮЧЕВЫЕ СЛОВА: *детский травматизм, сочетанная черепно-мозговая травма, черепно-лицевые повреждения, особенности течения, неврологическая диагностика*