



Four Traumatic Asphyxial Cases with an “Masque Ecchymotique” in Pediatric Emergency Department

Çocuk Acil Serviste “Ekimoz Maske” olan Dört Travmatik Asfiksi Olgusu

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Abstract

Traumatic asphyxia is a rare and serious clinical syndrome, which is identified by subconjunctival haemorrhage, facial oedema, craniocervical cyanosis and petechiae on the upper chest and the face regions. It occurs when the chest and/or upper abdomen regions are subjected to blunt trauma due to sudden compressions. This syndrome may develop if there is an occurrence of Valsalva manoeuvre during thoracic compression. Although patients appear to be very clinically ill, they can still have a very good prognosis with effective and timely treatment. However, long-term thoracic compressions may cause cerebral anoxia and neurological sequelae. Its treatment is usually conservative, and the course depends on the accompanying injuries. Herein, we report four cases of traumatic asphyxia that can be recognised by the physicians working in the paediatric emergency department if they are aware of the diagnosis.

Keywords: Asphyxia, ecchymotic masque, traumatic asphyxia

Öz

Travmatik asfiksi nadir, fakat ciddi bir klinik sendromdur. Bu sendrom, subkonjonktival kanama, fasiyal ödem, kraniyoservikal siyanoz, üst göğüs ve yüzdeki peteşiler ile karakterizedir. Göğüs ve/veya üst karın bölgesine künt travma sırasında meydana gelen ani baskı sonrası ortaya çıkar. Torasik kompresyon sırasında valsalva manevrası meydana gelirse, bu sendrom gelişebilir. Hastalar klinik olarak çok kötü görünmesine rağmen, etkili ve zamanında tedavi ile oldukça iyi bir sonlanıma sahiptir. Ancak, uzun süreli torasik kompresyon, serebral anoksi ve nörolojik sekellere neden olabilir. Tedavi genellikle konservatiftir ve hastalığın seyri eşlik eden yaralanmalara bağlıdır. Burada çocuk acil serviste çalışan hekimlerin tanıyı bildikleri takdirde tanıyabilecekleri dört travmatik asfiksi olgusu sunulmuştur.

Anahtar Kelimeler: Asfiksi, ekimoz maskesi, travmatik asfiksi

Introduction

Traumatic asphyxia is a rare and severe clinical syndrome or a type of mechanical asphyxia that requires close observation in pediatric emergency department (PED). This syndrome is distinguished by the presence of subconjunctival haemorrhage, facial oedema, craniocervical cyanosis, and petechiae on the upper chest and face regions along with neurologic symptoms. It appears because of sudden compressive blunt chest and/or upper abdomen traumas.¹⁻³ Blunt trauma is commonly observed in forensic practice, especially in traumatic crush injury,⁴ which is responsible for all of the cases presented for the upper chest injuries. After the trauma, there are so many petechiae on the face and neck regions, subsequently causing

the faces of these patients to appear livid. Terminologically, it is known as “ecchymotic mask”. Patient with ecchymosis mask looks unpleasant; however, the conditions of patients are not as adverse as they appear.

The purpose of this study is to report four cases of traumatic asphyxia that can be recognised by the physicians working in PED if they are aware of its diagnosis.

Case Reports

Case 1 is a previously healthy two-year-old male patient who was brought to PED because of a car accident. He was ejected from the car and had thoraco-abdominal trauma after hitting the ground. He had a heart rate of 130 beats/min, a

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respiratory rate of 36 breaths/min and an oxygen saturation (SO_2) of 98% during his admission to PED. He was conscious, cooperative and oriented with Glasgow Coma score (GCS) of 15. There were too many petechiae on the head, face, neck and upper chest wall regions. Bilateral eyelids had oedematous, bulbar conjunctival haemorrhage and oedema in the right eye. There was a soft tissue swelling of about 5x5 cm in the frontal region (Figure 1). There was no petechiae, purpura or ecchymosis on the other body areas. The airway was intact with no evidence of respiratory distress. Other system examination results were normal.

The results of bedside ultrasonography (E-FAST) and chest radiography were normal. The results of computed tomography of the cranial, thorax and abdomen regions performed for suspected thoracic and abdominal compressions due to high-energy trauma were reported as normal. During the patient's follow-up in the PED, there was an increase in oedema in the eyelids. His vital signs and clinical status did not show any change. He was referred to another centre for follow-up in terms of possible clinical state changes. Information about the clinical condition after the referral could not be obtained.

Case 2 is a healthy 13-year-old male patient who was brought to PED because of blunt trauma. He fell to the ground after being pushed by his friend at school, following which other friends jumped on the top of him. This incident happened one hour before hospital admission. The patient was breathless at the bottom of his friends. Unconsciousness, seizures, amnesia and vomiting were not reported in the patient; however, there was an occurrence of urine incontinence. He had a heart rate of 110 beats/min, a respiratory rate of 24 breaths/min, and a SO_2 of 99% during his admission to PED. His GCS was 15. A physical examination revealed that there were bilateral subconjunctival haemorrhage, facial oedema



Figure 1. Case 1 with multiple petechiae on the face and facial oedema

and facial petechiae. Other system examination results were normal.

Laboratory test results were normal except for creatinine kinase (CK), aspartate aminotransferase (AST) and alanine aminotransferase (ALT). The test results are shown as follows: CK level of 380 U/L (normal range: 0-171 U/L), AST level of 65 U/L (normal range: 0-50 U/L) and ALT level of 80 U/L (normal range: 0-50 U/L). His urinalysis revealed the presence of proteinuria and haematuria, and urine microscopy revealed 8-10 erythrocytes at each site.

Electrocardiographic evaluation was normal. Chest X-ray, abdominal ultrasound, computed brain tomography and eyes examination were also normal. Appropriate fluid treatment was started for the patient. The patient was discharged 24 hours after admission.

Case 3 is a healthy three-year-old male patient. He was brought to our hospital from kindergarten. In kindergarten, the patient squeezed his head into the lid of the toy toilet bowl made of wood. The patient stayed in this way for 3-4 minutes. No change in consciousness was observed for the patient. The patient had good general appearance, cooperation and orientation. He was admitted with a heart rate of 120 beats/min, a respiratory rate of 30 breaths/min, and an SO_2 of 98% in the PED. His GCS was 15. His physical examination revealed that there were multiple petechiae on his face and neck along with a well-circumscribed erythematous area of approximately 10 cm in size on his neck (Figure 2). Other system examination results were normal.

The results of cervical radiography, computed cranial tomography and laboratory tests were reported as normal. There were no complications during follow-up, and the patient was discharged 12 hours after admission.

Case 4 is a healthy 11-year-old male patient who was brought to PED because of blunt trauma. Similar to case 2, three friends jumped on the top of him and his friend dropped him to the hospital one hour after the incident. The patient had headache, bleeding in the eye and lower back pain upon his



Figure 2. Case 3 with multiple petechiae on the face and neck regions, and a well-circumscribed erythematous area of approximately 10 cm in size on his neck (black arrow)

arrival at the PED. He was conscious, cooperative and oriented during the first evaluation. He had a heart rate of 114 beats/min, a respiratory rate of 24 breaths/min, a blood pressure of 110/60 mmHg and an SO_2 of 98% during his admission to PED. His GCS was 15. The physical examination revealed that there were multiple petechiae on his face, neck and back of the ear, facial oedema, bilateral bulbar conjunctival haemorrhage, bilateral exophthalmos, bilateral eyelid oedema and periorbital ecchymosis on his right eye (Figure 3). There was no tenderness and crepitation in the face bones by palpation. Moreover, no petechiae, purpura or ecchymosis was observed on the other body areas. The airway was intact with no evidence of respiratory distress. Ophthalmological examination revealed bilateral light reflex. The right eye movements were restricted to the superior. There was diplopia on the right eye. Anterior segment examination revealed a subconjunctival haemorrhage on the right side. The cornea and the lens were normal. Additionally, the fundus examination revealed that the optic disc and macula were normal. The examination results of other systems were also normal.



Figure 3. Case 4 with multiple petechiae on his face, neck and back of the ear, facial oedema, bilateral bulbar conjunctival haemorrhage, bilateral exophthalmos, bilateral eyelids oedema, periorbital ecchymosis on his right eye

The results of bedside ultrasonography (E-FAST) and chest radiography were normal. Pneumothorax and rib fracture were not observed at his chest radiography. Orbital and maxillofacial tomography observed “Nondeplase fracture lines” in the anterior wall of both maxillary sinuses that were adjacent to the orbital inferior wall. Additionally, soft tissue increments with hyper-dense secondary to possible haemorrhage were observed in both maxillary sinuses. Soft tissue increases were observed in the ethmoid cells, sphenoid sinus and frontal sinus. Lightweight, hyper-dense soft tissue constructions were observed in both orbital superior walls, 32x29x8 mm on the right and 31x27x6 mm on the left (anterior-posterior x TR x KK), thereby filling the retrobulbar oil plan in this area, with a well-spaced and orbital superior wall. Hematoma was not clearly excluded in the patient who had a history of trauma. The differential diagnosis considered the intra-orbital mass. Retrobulbar fat plans did not show any bleeding or haematoma in other sections and vitreous bodies. Extraocular muscles were natural. There was no retraction of

the optic nerves. The optic nerve had natural integrity. Lens and bulbus school integrity were intact on both sides.

Cranial magnetic resonance imaging was performed to make a differential diagnosis of retro-orbital structure described in tomography and is reported to be similar with orbital and maxillofacial tomography.

Laboratory test results were normal except for the cardiac marker. The findings are as follows: CK of 3743 U/L (0-171 U/L), CK-MB of 39.6 ng/mL (normal range: 0.9-3.6 ng/mL) and highly sensitive troponin I (hs-troponin I) levels of 290 ng/L (normal range: 0-19.8 ng/mL). Electrocardiographic examination was normal. Six hours later, CK, CK-MB and hs-troponin I levels decreased to 3051 U/L, 21.1 ng/mL (normal range: 0.9-3.6 ng/mL), and 27 ng/L (normal range: 0-19.8 ng/mL), respectively.

The administration of appropriate fluid treatment, proton pump inhibitors (1 mg/kg/day, 2 days) and methylprednisolone (2 mg/kg/day, 2 days) were started for the patient. On the third day, CK, CK-MB and hs-troponin I levels were normal. There were no any complications during follow-up, and the patient was discharged three days after admission.

Table 1 shows the clinical features of four cases.

Discussion

The most common cause of traumatic asphyxia in children is motor vehicle injuries (i.e., traffic accidents). Traumatic asphyxia may develop because of being trapped under heavy machinery or furniture and/or by an individual squeezing between two objects.⁵ Epileptic seizures, serious vomiting, pertussis and asthma exacerbations have been reported as they are similar clinical conditions.^{6,8} The main mechanism in these diseases is not related to trauma; however, there are similar clinical conditions caused by disease-induced asphyxia. In adults, the incidence of reported traumatic asphyxia is 1 case per 18.500 accidents. It is a very rare case in children, and its true incidence is unknown.^{1,3,7,8} The actual incidence of traumatic asphyxia in children is unknown because paediatricians do not know or report the incidence of traumatic asphyxia. The four cases reported by us have blunt trauma secondary to different mechanisms.

The severity and duration of compressions determine the course of treatment after traumatic asphyxia. Heavy weights can be tolerated for a short time, but prolonged exposure to more moderate weights may result in death.^{8,9}

The characteristic features of traumatic asphyxia are petechiae, craniocervical cyanosis, subconjunctival haemorrhage and facial oedema of the upper body, neck and face.^{6,7} Petechiae often occurs 2-3 hours after the accident and is more pronounced in the conjunctiva and oral mucosa.^{6,7,10} But,

after the trauma, there are so many petechiae on the face and neck regions, thereby making the faces of these patients appear livid. This clinical situation is terminologically called as "ecchymotique mask". The diagnoses of our first and third patients were found to be consistent with this definition.

The most basic mechanism in the manifestation of these clinical findings is the attack of blood from the right atrium to the valveless innominate and jugular veins in the head and neck regions because of the positive pressure in the mediastinum caused by blunt trauma to the thorax and upper abdominal region. Because of the sudden pressure increase in the vein bed, there is a manifestation of small haemorrhages, that is, petechiae.¹¹ Petechiae does not occur in the lower part of the body because the valves in the lower extremity veins keep the increased venous pressure under control. Another reason is that the increased airway pressure can protect the lower part of the body when the inferior vena cava is compressed or obliterated.^{12,13}

Rib fractures, pulmonary contusion, pneumothorax, haemothorax, solid organ lacerations and neurological sequelae can be observed based on the severity of the trauma. A study conducted in adults proposed computed tomography scans for cranial, abdominal and pelvic regions and doppler ultrasonography and echocardiography for the neck and upper extremity veins to determine these lesions.^{6,7} However, there is no specific recommendation in the paediatric literature.⁶ Given the anatomical and physiological differences between children and adults, it may not be necessary to perform all of these tests in children. However, the evaluation of the patient should include determination of the severity of the trauma, the patient's GCS, and paediatric trauma score. Additionally, the patient should be examined thoroughly, and necessary examinations should be planned accordingly. In our cases, the first, second and fourth patients were evaluated as high-energy trauma; therefore, all the radiological examinations were performed. In our third patient, cranial injury was not considered because of the mechanism of the event and physical examination. Therefore, only cranial tomography was performed. There were no pathological radiological findings in cases 1, 2 and 3. However, cranial tomography and MRI showed sub-periosteal hematoma in case 4.

Vena cava syndrome, conjunctival haemorrhage and skull base fractures accompanied by periorbital ecchymosis should be considered in the differential diagnosis of traumatic asphyxia.^{6,7} Because of the history of trauma in our four cases, we excluded the superior vena cava syndrome. We also excluded the possibility of skull base fracture with radiological examinations.

The prognosis of traumatic asphyxia is quite promising with effective and timely treatment. The severity of the disease determines the accompanying injuries such as pulmonary contusion, haemothorax and pneumothorax.² A prolonged thoracic compression could lead to cerebral anoxia and neurological sequelae. The resulting damage and prognosis depend on the duration and severity of compressions.⁸ Therefore, detailed history should be evaluated in the cases with blunt thoracoabdominal trauma brought to PED. Trauma examination should be performed properly, and treatment should be determined accordingly.

The treatment is generally conservative, and patient recovery is related to the generally associated injuries. In uncomplicated cases, bedside should be increased by 30 degrees and oxygen therapy should be administered to reduce the intracranial pressure.^{6,7,14} In cases where there are other complicated organ injuries, according to the clinical status of the patient, there should be an application of basic advanced life support steps, administration of cervical vertebral immobilisation and treatment of hypotension/haemorrhage.⁶ In our fourth case, bilateral orbital sub-periosteal haematoma was developed after trauma, which is a rare clinical condition. Blunt trauma to the head and neck regions is the primary cause of traumatic orbital sub-periosteal hematoma. The risks of compressive optic neuropathy may be higher in patient with bilateral hematoma; therefore, it should be treated early. Its treatment involves aspiration and surgical drainage.¹⁵ Because our patient had bilateral hematoma, we did not perform any surgical procedure. The patient's clinical condition improved by the end of the third day with clinical follow-up and steroid treatment.

Almost all these patients have a very good prognosis.^{7,8} In our cases, the patients were discharged after a short follow-up period. There were no new clinical findings in the follow-up period. There is no clear information about the follow-up period of these cases in the literature. Because the course of the disease depends on the severity of the trauma and accompanying additional injuries, it is appropriate to determine the follow-up period for each patient.

Ecchymotique mask occurring due to traumatic asphyxia has a dramatic presentation that requires careful management. The clinical presentation of some cases is very severe; therefore, it should be kept in mind that the prognosis must be good, the clinical condition is related to the severity of the event, and the cure is supportive treatment. When the physician finds the ecchymotique mask both on physical examination of the patient and on corpse in death investigation, traumatic asphyxia should always be considered as a possible complication of blunt injuries to the chest and abdomen.

Ethics

Informed Consent: Informed consents were obtained from patients' family.

Peer-review: Internally and externally peer reviewed.

Authorship Contributions

Concept: O.D.G., T.A., Y.M.A., Design: O.D.G., T.A., Data Collection or Processing: Y.M.A., Analysis or Interpretation: O.D.G., T.A., Literature Search: O.D.G., T.A., Y.M.A. Written: O.D.G., T.A.

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