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FLUID AND ANALGESIC MANAGEMENT IN A TRAUMATIZED CHILD

NADOKNADA TEČNOSTI I ANALGEZIJA KOD POLITRAUMATIZOVANOG DETETA

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Summary: Every traumatized child requires the identification as high-risk pediatric patients, prompt transport to the appropriate regional pediatric trauma center and the provision of basic or advanced reanimation procedures. Optimum for the duration of prehospital city transport is approximately 31 minutes, for a rural area it is up to 43 minutes. Regional trauma centers are very important, because there are enough resources to adequately define patients at increased risk of death. It is still debated whether to start the advanced or basic resuscitation in traumatized children in the prehospital conditions.The analgesic administration is important in the treatment of injured children. They are given in smaller doses to children than to adults and the most common dose is 50% smaller than it is needed according to the degree of pain. In the initial phase of trauma children better compensate hemodynamic instability and hypotension may therefore be a late sign of hemorrhage. Serious problem is establishing IV line on times, due to the physiological specificity as well as the presence of hypovolemia. Children are particularly prone to heat loss due to the disproportion of their body surface area and weight and because of immature of thermoregulation mechanisms. Compensation of liquid should begin with isotonic crystalloid fluids. The aim is to achieve replacement fluid hemodynamic stability and tissue perfusion, as soon as possible.

Keywords: Multiple trauma, children, analgesia, fluid resuscitation

INTRODUCTION

Traffic accidents are still the main cause of death in children. Traumatic head injury, uncontrolled bleeding and hemorrhagic shock play a significant role in increasing mortality of traumatized children. Timely and adequate transport to an appropriate institution, first aid in such clinical conditions are reflected in an early reimbursement of lost blood and pain relief have great importance [1]. Fluid resuscitation must be critically applied only in traumatic head injury. Sometimes rapid fluid resuscitation can cause early coagulopathy in the traumatized children as well as increased incidence of Multi Organ Dysfunction (MOF) and mortality [2]. Every traumatized child requires rapid transport to an appropriate regional pediatric trauma center, providing basic and advanced reanimation procedures, identification of high-risk pediatric patients, maintaining a patent airway, ensuring intravenous or intra-osseous line, immobilization of the cervical spine, the optimal treatment of traumatic head injuries and evaluation intensity of pain in these patients.

OBJECTIVE

The review, recommendations and controversies about access to care of poly-traumatized child.

MATERIALS AND METHODS

A retrospective analysis of databases PubMed and Kobson using the keywords: poly-trauma, children, pre-hospital transport, fluid resuscitation and analgesia.

PRE-HOSPITAL TRANSPORT

The duration of prehospital transport, which is for the city estimated that it may take around 31 minutes, while in the rural area transportation to the hospital takes approximately 43 minutes is particularly important [3]. Regional trauma centers are very important in the survival of children with trauma, especially because of the opportunity to adequately define patients at the increased risk of death. Engum et al. [4] defined five criteria to determine poor outcome in patients, such as: systolic blood pressure <90 mm Hg, Glasgow Coma Score (GCS) <12, respiratory frequency <10/min or> 29/min, burns more than 15% of the total body surface of second or third degree. Newgard et al. [5] analyzed the 6-year period of traumatized children in the United States, Oregon, and found that high-risk patients are patients with: high GCS, high respiratory and heart rate, low systolic blood pressure and cardiac index.. It is also believed that there is a need for assisted ventilation or intubation, low GCS, hypoxia and hypertension (especially head injury) indicate poor children outcome [6]. It is still debated whether to start the advanced or basic resuscitation in prehospital in traumatized children and is considered that advanced resuscitation reduce mortality rates, but also increase the costs of treatment of patients [7]. It is also observed problem of difficult intubation in the pre-hospital care of traumatized children (in children 69.2% versus 21.2% of adults), difficulty in securing of IV line (in children successfully establish of venous line in 65.7% versus 85.9% of adults), which is why the success in the treatment of children is lower than in adults It is necessary to provide better educated staff who deal with poly-traumatized children [8].

SALVE THE PAIN IN TRAUMATIZED CHILDREN

Giving analgesic to traumatized children is important to cure these patients. During the last 3 decades it has been observed that the administration of analgesics is less common in children than in adults in similar clinical

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conditions and that usually the administered dose is 50% lower than it is needed in regard to weight regardless of the intensity of pain [9].

In a retrospective study of 696 patients, the pain has been detected pain in 81% of children in the prehospital setting, where 64% of children had a documented pain, while 15% of the children had some kind of intervention, which was the reason for the occurrence of pain. Given that the pain does not correlate with the extent of injuries in children, pain relief is applied to all children in the pre-hospital trauma. Analgesics are best given intravenously. Rectal administration of analgesics is not safe due to the different absorption of analgesics. Intramuscular administration of analgesics is not recommended in emergency situations, because it causes pain, reabsorption is unpredictable, onset of action of the drug is delayed with hypovolemic patients due to peripheral vasoconstriction and reduction of flow through the muscle, much of the drug will not be reabsorbed. Acetaminophen and paracetamol are commonly used analgesics; the recommended dose for both the analgesic is 10-15 mg / kg i.v. every 4-6 hours. Ibuprofen is more effective than acetaminophen in the treatment of pain in musculoskeletal damage. When you need a stronger analgesia, carefully give morphine or opioids especially in younger children, infants 3 to 6 months, because it causes respiratory depression, although a similar percentage of respiratory depression occurs in adults. As a result, administration of opioids should not be avoided, if necessary treat traumatized child [10].

REIMBURSE FLUID - SPECIFICITIES IN CHILDREN

Physiologically, children better compensate hemodynamic instability in the initial phase of trauma; hypotension may therefore be a late sign of hemorrhage in children, when they are already have the blood loss of 25 to 35% of circulating volume [11]. Tachycardia is the first sign of hypovolemia in children and is important to note, given that children have little overall circulating volume (80 ml / kg for infants ages 1 to 3 months, while children older than 3 months have circulating volume of 70 ml / kg). Metabolic acidosis due to hypoperfusion and oliguria or concentrated urine are additional indicators of hypovolemia. If the fluids are not given timely, the signs of hypovolemia are then quickly observed [12].

Major problem with traumatized children is to establish venous access, due to the physiological specificity (veins small diameter, increased range of adipose tissue) and the presence of hypovolemia. In adult for setting of IV line it is enough 7.8 minutes, while in children it can take 10 minutes [13]. The current standard in traumatic shock is an early and rapid fluid resuscitation with the placement of 2 venous line [14]. Some studies show that the majority of children come into the regional trauma center with set venous line, although others suggest that 59% of children come to the hospital with non-functional i.v. cannula [15]. Fluid is usually given with 2 larges intravenous cannula in the upper extremities. If venous access is impossible, it is proposed to set intraosseous cannula in children younger than 6 years of age, cannulation of v. saphenous-e or setting up a central vein [16]. Children are particularly prone to heat loss due to the disproportion of their body surface area and weight and immature thermoregulation mechanisms. Hypothermia in children is defined with a drop in body temperature below 35°C, and its most significant effects are vasoconstriction, acidosis and coagulopathy. The control of body temperature in the traumatized children is very important. Ambient air is an important factor affecting the loss of heat, which is sure to warm air, then warming the patient with warm blankets, and i.v. fluids, which are

administered to patients [17, 18]. Reimbursement of fluids begins with isotonic crystalloid fluids such elections (Ringer's lactate or saline) in the 3 repeated bolus dose of 20 ml / kg. The main objective of replacement fluid is achieved hemodynamic stability and tissue perfusion, as soon as possible. The key moment in these patients is the normalization of heart rate and achieving diuresis greater than> 1 ml / kg / h. Some studies oppose the large volume of crystalloid administered in patients with uncontrolled bleeding.

Side effects are manifested in the form of hemodilution, hypothermia, applying larger amounts of blood derivatives thereafter, the deterioration of the coagulation system (prolonged prothrombin time) and the increase of death in traumatized children [19]. However, the early application of larger amounts of isotonic crystalloid quickly corrects hypotension in children and it is proposed for achieving hemodynamic stability [20]. Hypertonic solutions enhance hemodynamic stability among adults and reduce the overall amount of liquid for initial compensation, without the effect to the final outcome of the patients [21]. The use of hypertonic saline in children with closed head injury has not shown positive effects on child survival, and there is the need for new studies [22]. Hydroxyethyl starch and albumin can also be used for fluid resuscitation in children without significant side effects [23]. Other studies indicate that colloids do not show advantages compared to crystalloid, as shows in the studies that have been done on adults. Colloids are much more expensive and cause side effects therefore cannot be considered essential in the treatment of children with trauma [24]. Glucose is usually avoided because hypotonic solutions can cause edema of the brain and increase the risk of hyperglycemia, which exacerbates the ultimate outcome of children with head injury. Hypoglycaemia should also be avoided in head injuries [25]. In the meta-analysis Boluyt et al. has shown the following clinical recommendations for all states in hypovolaemic children: 1.For newborns and children it is recommended to use isotonic solution, 2.When using a large amount of fluid synthetic colloids can also be used due to their prolonged retention in the circulation 3. Initial doses of fluids should be 10-20 ml/kg, and repeated doses of fluids will depend on the clinical response of the individual patient [26].What should the reimbursement of circulating volume be started with - clear fluids or blood products? In injured child it is recommended to administer crystalloids 20 ml/kg as a bolus injection, and if there is no haemodynamic stability of the patient, to administer the blood derivatives, or erythrocytes (Er) at a dose of 10 ml/kg [27]. With the existence of hemodynamic instability after giving Er, it should be suspected that there is continuous bleeding in patients. In the traumatized children with hemorrhagic shock heavier than 30 kg, the administration of not only Er, but also fresh frozen plasma (SSP) and platelet (PLT) in the ratio 1: 1: 1 are proposed. For children weighing less than 30 kg, derivatives of blood Er: SSP PLT are dosed in relation 30: 20: 20 ml / kg [28]

Conclusion: Each of the stages in the management of multiple trauma is still controversial in the pediatric population, and it is necessary to consult the literature data to determine local protocol for the management of these patients. Prehospital care of children have great importance for their survival since this period also constitutes a period of "golden hour". The current findings suggest that early identification of high-risk patients, adequate prehospital transport, their treatment of blood derivatives such as administration of erythrocytes, fresh frozen plasma and platelets in the ratio of 1: 1: 1, limited use of crystalloid, correction of hypothermia, acidosis and adequate analgesia, can improve survival of children with polytrauma.

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NADOKNADA TEČNOSTI I ANALGEZIJA KOD POLITRAUMATIZOVANOG DETETA

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Sažetak: Svako traumatizirano dete zahteva identifikaciju visoko-rizičnih pedijatrijskih pacijenata, brz transport do odgovarajućeg regionalnog pedijatrijskog trauma centra i pružanje osnovnih ili naprednih reanimacionih mera. Trajanje prehospitalnog transporta, optimalno za gradsku sredinu je oko 31 minut a za ruralnu sredinu do 43 minuta. Regionalni trauma centri su jako važni, jer se u njima mogu adekvatno definisati bolesnici sa visokim smrtnim rizikom. Još uvek se vode debate da li treba započeti napredne ili osnovne mere reanimacije u prehospitalnim uslovima kod traumatizirane dece. Davanje analgetika je važno u tretmanu dece. Oni se daju ređe nego kod odraslih i najčešće doza je za 50% manja od odgovarajuće za stepen bola. Deca bolje kompenzuju hemodinamsku nestabilnost u početnoj fazi traume, te hipotenzija zbog toga može biti kasni znak hemoragije.Veliki problem kod traumatizirane dece je nalaženje venskog puta, zbog fizioloških specifičnosti kao i zbog prisustva hipovolemije. Deca su posebno sklona gubitku toplote s obzirom na nesrazmernost njihove telesne površine i težine kao i nezrelih termoregulacionih mehanizama. Nadoknada tečnosti se započinje izotonim kristaloidima kao tečnostima izbora. Cilj nadoknade tečnosti je ostvariti hemodinamsku stabilnosti i tkivnu perfuziju, što je pre moguće.

Ključne reči: Politrauma,deca, analgezija, nadoknada tečnosti

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