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REVIEW ARTICLE

Epidural hematoma in newborn: literature review

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Abstract

Introduction: Newborn represent a population at high risk for brain damage. Intracranial hemorrhages in newborn are uncommon, and epidural hematoma (EH) is rare.
Material and methods: The authors present a literature review about EH in newborn.
Results: EH in newborn occurs in only 2% and is frequently associated with the type of delivery. The clinical presentation is asymptomatic or heterogeneous. The diagnosis is made from anamnesis and imaging exams, and the treatment depends on the size of the EH.
Conclusion: The knowledge of neurosurgeons, obstetricians and pediatricians about the occurrence of EH in newborn is extremely important. The rapid identification and management of the case is of paramount importance, to reduce neurological sequelae.

Key words: Cranial Epidural Hematoma; Neuroimaging; Newborn.

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Introduction

Epidural hematoma (EH) consists of the accumulation of blood between the dura and the skull [1], due to a traumatic brain injury (TBI) at any age, however, it infrequently occurs in newborn [2,3,5,6,7,8,9,10,11,12], with an incidence of 0.06% to 2% in this population [13]. They are due to birth injury [7,11,14,15,16,17,18,19], accidental fall, traffic accident, mistreatment and alterations in blood clotting. Usually associated with cephalohematomas, trauma and/or fracture of the temporal region due to rupture of the middle meningeal artery (MMA), however, the MMA is not fully adhered to in newborn skullcap, the small venous vessels and the meningeal artery are often the source for the formation of EH [20].

Newborn represent a high-risk population for clinically important brain injuries [21]. Newborn intracranial hemorrhage is uncommon [22], EH is rare in this period, and the most common cause being labor [23].

Method

The authors present a literature review using the following bases: PubMed, Google Scholar, Lilacs, Scielo, TripDataBase, Sciencedirect using the terms: “epidural hematoma” AND “newborn”, and “extradural hematoma” AND “newborn”. Articles in the period from 1951 to 2018 were selected, resulting in a total of 162 articles related to intracranial EH in newborn, withdrawal of duplicate papers, and in the languages english, portuguese, spanish and french (Figure 1, tables 1 and 2). And, 2 book chapters and 11 papers were selected without this method due to the correspondence found with the theme.

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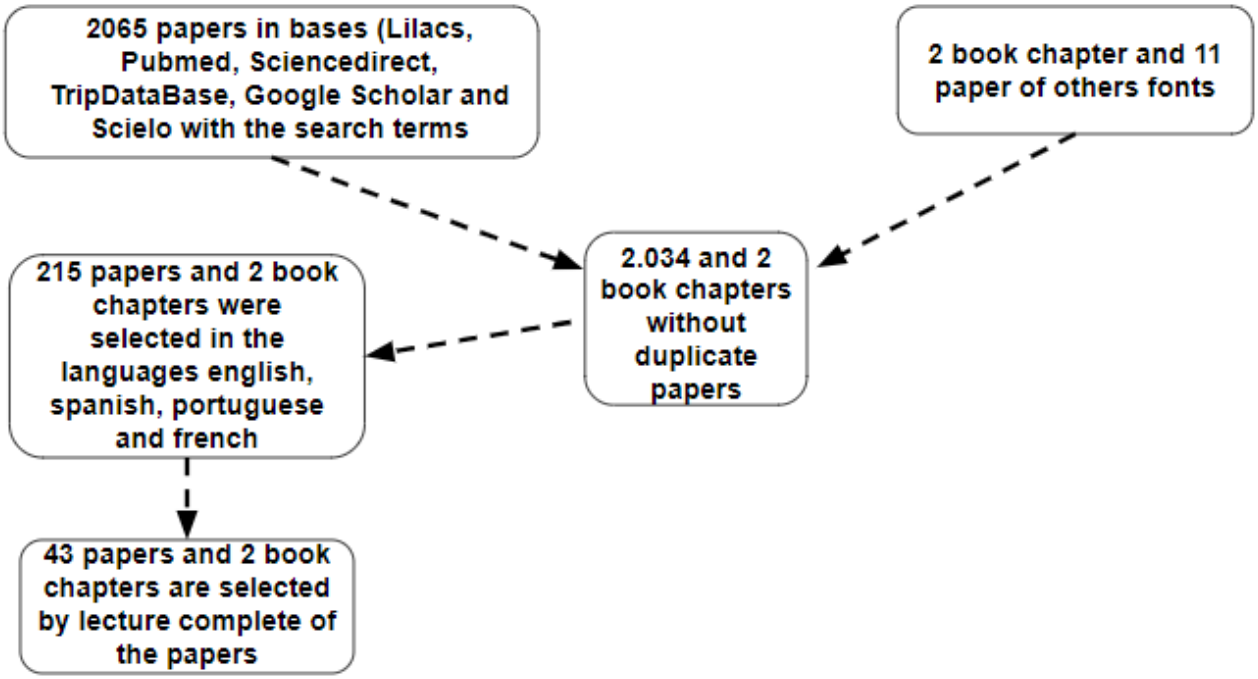

Figure 1. Flowchart of the literature systematic review

Table 1. Results with the term “Epidural Hematoma” AND “Newborn”

"Epidural Hematoma" AND "newborn"			
Plataform	**Results (Articles)**	**Results (English, Portuguese, Spanish, French)**	**Final Results (Related Assunt)**
PubMed	192	162	46
Google Scholar	980	945	54
Scielo	2	-	1
TripDataBase	76	-	1
Sciencedirect	518	517	13
LILACS	1	-	0
Cochrane	1	-	0
Articles Total	**1770**	**1624**	**111**

Table 2. Results with the term “Extradural Hematoma” AND “Newborn”

"Extradural Hematoma" AND "newborn"			
Plataform	**Results (Articles)**	**Results (English, Portuguese, Spanish, French)**	**Final Results (Related Assunt)**
PubMed	20	-	11
Google Scholar	306	295	68
TripDataBase	13	-	1
Sciencedirect	90	-	12
LILACS	2	-	1
Articles Total	**431**	**295**	**93**

Results

Epidemiology and causes

Intracranial injuries sustained during delivery are rare but significant causes of neonatal morbidity and mortality [24]. The injury that occurs during birth is divided into two categories: injuries produced by the normal force of labor, and the second group, due to obstetric intervention [19]. The most frequent causes are mechanical assistance during delivery, such as the use of forceps and vacuum extraction, precipitated delivery and TBI after delivery [12]. Falls are the most common cause of unintentional injuries in children 0-3 months of age [25]. The neonates with the highest risk group for head trauma are male, born at term to primiparous mothers, with difficult births due to cephalopelvic disproportion or abnormal presentation [14].

Pollina et al [26] described the following traumatic intracranial injuries due to birth injury: subdural hemorrhage (73%), subarachnoid hemorrhage (20%), intracerebral hemorrhage (20%), intraventricular hemorrhage and EH, the latter two are less frequent. EH occurs in 2% of all cranioencephalic hemorrhages in this population [1]. In neonates, there are less than 80 reported cases, often associated with the type of delivery and accidental falls, and for this reason it is considered a rare event [27]. Spontaneous subdural or cerebral hemorrhage occurs in 2.9 out of 10,000 vaginal deliveries, increasing to 21.3 when vacuum or forceps are used [23].

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Neonatal cranial anatomy and pathophysiology of EH

The skull of newborn is soft, deformable, elastic and its sutures are not consolidated; associated with the presence of fontanelles, allows cranial deformation without the occurrence of bone fracture [4,8,10]. Laceration of the dura mater and blood vessels is rare, due to the adhesion of the meninges to the skullcap internal bone plate, mainly at the level of the sutures, especially in the coronal suture; this adhesion, however, is reduced in the center of the skull [7,10,28].

The rarity of EH in newborn compared to children or adults is explained by the absence of the cranial sulcus of MMA, making the latter less susceptible to injuries [29], since in older children and young adults arterial rupture is frequently observed in TBI [10]. The preferred location of EH is in the temporoparietal region, being rare in frontal region, due to the adhesion of the dura mater in the membranous portion of the coronal suture, being more infrequent in the posterior fossa [30,31,32], and commonly occurring unilaterally [32]. In newborn, MMA is not fixed in grooves in the skull, freely moving between the dura and the skull, so EH is often constituted by bleeding from ruptured dural sinuses [14], such as the superior sagittal sinus, confluence of the sinuses and transverse sinuses [11], however, in some cases the source of the bleeding is unknown. The vascular richness of cranial bones, as well as the dura mater in newborn, is more pronounced in relation to older children, explaining the higher frequency of EH in lactating and younger children. The time of EH formation in neonates is ambiguous and does not have an established period [22], since the size of the hematoma and the speed formation depend on the length of the dura detached in the internal cranial bone plate and affected vessel caliber.

One of the bleeding mechanisms is local stress due to excessive molding or contusions during delivery, such as the use of forceps or vacuum fetal extraction, causing the dura to detach from the skullcap internal surface, with consequent destruction of the vascular connection between the skull and the internal periosteum [2,33]. During vaginal deliveries, significant changes in fetal cephalic geometry occur, such as the overlap between the frontal and parietal bones. Bleeding from the bridging brain veins and the Galen vein at the junction with the rectal sinus can lead to intracranial hemorrhage. Therefore, a rapid delivery can accelerate the changes in the head of the newborn, developing intracranial hemorrhage [24]. The proposed mechanism for this form of EH development is due to the pressure of the pregnant ischial tuberosity on the newborn skull, resulting in flexion of the fetus head [19].

Symptomatology

The patient may be asymptomatic or present with heterogeneous symptoms [34]. The latter, when present, includes: muscle hypotonia, apnea, seizures, macrocephaly, bulging of the anterior fontanelle, anemia, bradycardia [7,35], irritability and persistent crying [34]. Anemia associated with pallor is an important finding in neonates with EH [10,32,36,37]. The occurrence of focal neurological symptoms is relatively delayed in relation to the EH formation event [29]. The presence of anisocoria and contralateral motor deficit are rare in neonates [7]. Due to the good tolerance to the presence of EH presented by the newborn, a long lucid interval is observed in relation to older children and young adults, since the open fontanelles and the non-consolidation of the sutures allow the compensation of the elevated intracranial pressure, often associated with intracranial hematoma [7,10]. Convulsive seizures and muscle hypotonia are commonly associated with neonates with EH [8]. Depending of the trauma intensity, the presence of cerebral contusion, intracerebral hemorrhage, subdural hematoma and cerebral edema may occur simultaneously with EH. Calcification or ossification of EH in neonates is rare, and often results from the excessive production of repair tissue, synthesized after trauma [28,38,39,40,41].

Diagnosis

The diagnosis is made in association with imaging tests, and anamnesis with legal guardians. A simple skull radiograph shows a linear fracture trace in about 70% of the cases, however, its absence does not eliminate the presence of EH [8,29]. The CT is the gold standard diagnostic tool, which is a simple, fast and efficient method for diagnosis accuracy, presenting the presence of the clot, location, size, shape, associated lesions, assisting in therapeutic planning and post-operative follow-up [27,42,43]. The CT indications in newborn suspected of intracranial hemorrhage are: seizures with normal serum biochemistry (hypoglycemia or hypocalcemia), seizures with hemorrhagic problems in neonates, lethargy and progressive neurological deterioration [19].

The EH on CT shows high density, not differentiating from other age groups [22]. However, EH has a rounded and circumscribed shape as a clinical feature, due to the anatomical limitation of the intimate relationship between meninges, periosteum and cranial sutures [24], so blood accumulates in this space due to the dripping of ruptured vessels [21]. Cephalohematoma is frequently found in communicating EH with skull fracture [21], being found in 16% to 75% of cases [8,12,13,22,26,29,44].

There are reports on the use of transfontanellar ultrasound and magnetic resonance imaging as a means of confirming the diagnosis because they do not expose the patient to radiation [33], since they are sensitive to the adverse effects of ionizing radiation [21].

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Treatment

The therapeutic attitude faces variables that can modify the treatment, such as symptoms, progression of the case and the size of the epidural collection. In most cases, EH is well delimited and has small volume, not requiring surgical intervention, associated with spontaneous resolution, performing only neurological surveillance associated with CT scan [8,13,19,29,34], in case of deterioration of the level of consciousness or increase in volume of the lesion, the surgical intervention is indicated. Conservative treatment is performed in cases of small EH, isolated hematoma (less than 1 cm thick and less than 4 cm along the anteroposterior plane), with no neurological deterioration [42].

Conservative treatment is recommended for the rare presence of intracranial hypertension [24]. Percutaneous EH aspiration is widely used [22,29], as it is a safer alternative to craniotomy, especially when there is a bone fracture [45], the success of the technique being associated with the communication of EH to cephalohematoma [1]. The aspiration of a recent hematoma can cause new bleeding, and it is strictly necessary to perform the technique in a sterile way for the non-development of cranial osteomyelitis, meningitis and septic shock, due to the introduction of infection during the procedure [24].

Lesions larger than 3 cm, with deviation from the midline [42], neurological deficits or compression of the adjacent brain parenchyma [45], uncontrollable seizures, progressive neurological deterioration and insufficient response to conservative treatment require surgical intervention to drain the hematoma [19]. Yu et al [41] suggest that early surgical treatment can prevent neurological deterioration and ossification of EH, especially in bulky cases and with mass effect. The main indications for craniotomy are thickness of the brain mantle, increased head circumference in subsequent neurological exams, bulging anterior fontanelle and possible cranial sinking or associated hydrocephalus [2,8,14]. Osteoplastic craniotomy is the most commonly used surgical technique associated with drainage of the hematoma and hemostasis of the lacerated vessel.

Discussion

The frequency of the presence of EH in neonates represents 2% of all intracranial hemorrhages [1]. The delivery model is a risk factor for neonatal EH, such as the use of forceps and vacuum extraction [12]. Thus, the in-hospital environment proved to be recurrent in the analysis of case reports due to obstetric traumas and those generated in postpartum care with the newborn, a fact that corroborates the case described here.

Thus, the rapid recognition of the disease by the medical team based on the analysis of the clinical condition, which can be masked by the patient's anatomy and pathophysiology, and its evolution by the semiological findings leads to the clinical diagnosis and its confirmation by exams. image [8.43]. The low frequency of occurrence of EH in neonates is related to the intracranial anatomy of this population, related to the middle meningeal artery not adhering to the skull [29], as occurs in older pediatric patients.

Expansion of studies on the effectiveness of the other tests cited other than the gold standard is clearly necessary. Finally, the low incidence of cases in the literature, highlighted by the long bibliographic time frame necessary to establish an adequate method for the review, results in the lack of a protocol for therapeutic procedures, however the history of the pathology has become a guide for treatment for pediatricians, obstetricians and neurosurgeons.

Conclusion

The knowledge of neurosurgeons, obstetricians and pediatricians about the occurrence of EH in newborn is extremely important. Because, the rapid identification and management of the case is important, since the newborn presents rapid recovery with the absence of neurological sequelae, and efficient treatment significantly reduces the rates of morbidity and mortality.

There must be insistence on prophylaxis of EH in this population, making mothers aware of the care for the newborn on their lap, bed and use of toys inappropriate for their age, as well as the non-practice of mistreatment against the newborn. And for obstetricians, it is necessary to reduce the use of forceps or vacuum extraction during labor.

Disclosure Statement

The authors have no conflicts of interest to declare.

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