Adrenal hemorrhage in newborns: a retrospective study

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Background: **Adrenal hemorrhage (AH) is a relatively uncommon condition in neonates. This study aimed to review the clinical, laboratory and ultrasonographic findings of AH in newborns.**

Methods: **The medical records of 13 newborns with AH who had been admitted to our neonatal intensive care unit were retrospectively reviewed.**

Results: **Of the 13 newborns with AH, 8 (62%) were term and 10 (77%) were male babies. Clinical presentations included neonatal jaundice (85%), paleness and/or flank mass (38%), discoloration of the scrotum (15%), and hypotonia/lethargy or hypotension (8%). Five newborns had anemia and four had adrenal insufficiency. Adrenal insufficiency was observed in 80% of the premature infants with AH. AH occurred on the right side in 9 patients (69%). The most predisposing cause of AH was disseminated intravascular coagulation secondary to sepsis or perinatal hypoxia in preterm infants, and large for gestational age in term infants. Ultrasonography (USG) revealed a hypoechoic mass in 7 newborns (54%), a mixed solid-liquid mass in 5 (38%), and an echogenic mass (8%) in 1. Hemorrhage disappeared within 8.6±4.5 (4-16) weeks.**

Conclusions: **AH occurs in the newborns with unexplained jaundice. Adrenal insufficiency is more frequent in preterm than in mature infants. Abdominal USG is required to determine AH in a newborn with swelling and bluish discoloration of the scrotum. Serial USG is the best modality for monitoring AH to prevent unnecessary surgery.**

World J Pediatr 2011;7(4):355-357

Key words: **adrenal hemorrhage;**
newborn;
ultrasonography

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doi: 10.1007/s12519-011-0259-7

Introduction

The adrenal gland is vulnerable to hemorrhage because of its large size and high vascularity. Adrenal hemorrhage (AH) is a relatively uncommon condition (0.2%-0.55%) during the neonatal period.[1,2] Clinical features of AH are variable and nonspecific, but it may be accompanied by anemia, persistent jaundice, abdominal mass, painful swelling or bluish discoloration of the scrotum, acute adrenal crisis or shock.[3-6] AH rarely leads to adrenal insufficiency in term newborns.[7] Probable predisposing causes of AH are birth trauma, large birth weight, hypoxia or asphyxia, septicemia and bleeding diathesis.[6-9] Ultrasonography (USG) is a useful and effective imaging modality both in the diagnosis and follow-up of AH.[1] The aim of this study was to review the risk factors and clinical, laboratory and ultrasonographic features of AH patients treated in our neonatal intensive care unit (NICU).

Methods

This retrospective study was carried out in newborns with AH at the Karadeniz Technical University NICU in Turkey between 2003 and 2010. We reviewed the medical records of patients with AH admitted to the NICU. All the patients were diagnosed using USG. Recorded reasons for primary hospitalization, birth weight, gestational age, gender, delivery type, postnatal age, presenting symptoms, predisposing causes, signs of adrenal insufficiency, site of AH, levels of hemoglobin, peak bilirubin, glucose, sodium, potassium, coagulation test results, urine vanillyl mandelic acid (VMA) and USG findings. Adrenocorticotropic hormone (ACTH) and cortisol levels were measured, and the ACTH provocative test was performed in patients with adrenal insufficiency. Cortisol was determined by electrochemiluminescence assay on a Roche E170 Modular Analytics autoanalyzer using commercial kits (Roche, Mannheim, Germany). ACTH was determined by chemiluminescence assay on an Immulite 2000 analyzer (Siemens, Los Angeles, USA). USG was performed at two-week intervals in 10 infants during the follow-up in order to determine the resolution time.

Results

Of the 13 newborns with AH identified in the study period, 10 (77%) were male. Ten newborns (77%) were delivered vaginally and 8 (62%) were term babies. The mean birth weight, gestational age and postnatal age were 3227±1550 (990-6170) g, 36.1±4.7 (26-41) weeks, and 11.2±8.8 (2-29) days, respectively.

Clinical presentations of the newborns were jaundice (85%, 11 newborns), paleness (38%, 5), flank mass (38%, 5), discoloration of the scrotum (15%, 2), hypotension (8%, 1) and hypotonia and lethargy (8%, 1). In newborns with hyperbilirubinemia, other potential causes of this condition were ruled out before diagnosis of AH.

Four newborns (31%) were large for gestational age, and 5 had perinatal hypoxia and/or sepsis. Four premature neonates (31%) showed signs of adrenal insufficiency and were treated with glucocorticoids and mineralocorticoids. Newborns with adrenal insufficiency had disseminated intravascular coagulation (DIC), and 3 of them died. All newborns had normal levels of VMA in urinary excretion.

Nine newborns (69%) had AH on the right side, and 2 (15%) had bilateral AH. USG revealed a hypoechoic mass in 7 newborns (54%), a mixed solid-liquid mass in 5 (38%), and an echogenic mass (8%) in 1. Mean hemorrhage resolution time was 8.6±4.5 (4-16) weeks. Demographic characteristics, presenting symptoms, predisposing causes, laboratory and USG findings and resolution times are shown in the Table.

Discussion

AH is a relatively uncommon condition frequently seen in term male infants delivered vaginally.[3,5,7,10] Of the 13 newborns with AH in our study, 8 (62%) were term babies and 10 (77%) were males and delivered vaginally. Birth trauma, prolonged labor, intrauterine infection, perinatal asphyxia or hypoxia, large birth weight, septicemia, hemorrhagic disorder and hypothrombinemia are the most common predisposing causes of AH.[6-9] The most important predisposing causes of AH in our study were DIC secondary to sepsis and/or perinatal hypoxia in preterm infants and large for gestational age in term neonates.

The most common clinical presentations are persistent jaundice and flank mass.[3,4,7,8,10] However, AH may also present with scrotal hematoma, anemia, adrenal insufficiency or shock,[3,5-7,11] and may be diagnosed incidentally.[2] The most common presentations in our series were jaundice, paleness and flank mass. Breakdown of the red blood cells in hematoma causes jaundice, which was the most common presentation (85%) in our newborns.

AH is most commonly observed in term infants,

Table. Demographic characteristics, presenting symptoms, predisposing causes, laboratory and USG findings of the newborns with AH

Case	GA (wk)	Sex	BW (g)	Types of delivery	PA (d)	AI	Presenting symptoms	Predisposing causes	Laboratory findings	Site	Hb (g/dL)	Peak bilirubin (mg/dL)	USG findings	HRT (wk)
1	32	M	1200	C/S	3	Yes	Hypotension, paleness, jaundice	PH, DIC	Hyponatremia, hyperkalemia, anemia, NHB	R	8.4	7.4	9.2×6.5 mm HM	Death due to IVH
2	32	F	1310	C/S	23	Yes	Paleness	Sepsis, DIC	Hyponatremia, hyperkalemia, hypoglycemia, anemia	R	8.6	2.0	18×10 mm MS-LM	Death due to sepsis
3	35	M	2800	VD	10	Yes	Paleness, jaundice	PH, DIC, Candidial sepsis	Hyponatremia, hyperkalemia, anemia, NHB	L	9.0	10.4	33×22 mm MS-LM	Death due to İVH
4	40	F	4200	VD	5	No	Jaundice	LGA	NHB	R	19.4	30.0	28×25 mm HM	8
5	40	M	4000	VD	6	No	Jaundice, flank mass	-	NHB	R	14.1	14.3	35×25 mm MS-LM	12
6	38	M	3800	VD	11	No	Jaundice, bluish discoloration of scrotum	-	NHB	R	13.8	16.8	11×7 mm HM	6
7	41	M	6170	VD	2	No	Flank mass, jaundice	LGA	NHB	B	17.0	18.9	48×43 mm (R), 59×50 mm (L) MS-LM	16
8	39	M	4200	VD	4	No	Jaundice, flank mass	LGA	NHB	R	16.0	24.7	46×38 mm MS-LM	16
9	38	M	4100	VD	16	No	Discoloration of scrotum, flank mass, jaundice	LGA	NHB	R	14.6	18.3	28×40 mm HM	6
10	38	M	3700	VD	11	No	Jaundice, paleness, flank mass	-	Anemia, NHB	R	10.6	19.3	35×25 mm HM	8
11	40	F	3950	VD	22	No	Jaundice	-	NHB	L	15.3	18.9	27×14 mm HM	6
12	30	M	1530	C/S	3	Yes	Hypotonia, lethargy	PH, DIC	Hyponatremia, hyperkalemia, hypoglycemia	R	13.9	4.6	22×15 echogenic mass	4
13	26	M	990	VD	29	No	Jaundice, paleness	Sepsis	Anemia, NHB	B	11.4	19.6	9×5.5 mm (R), 7×4 mm (L) HM	4

AH: adrenal hemorrhage; USG: ultrasonography; GA: gestational age; M: male; F: female; BW: birth weight; VD: vaginal delivery; C/S: Caesarean section; PA: postnatal age; AI: adrenal insufficiency; PH: perinatal hypoxia; DIC: disseminated intravascular coagulation; LGA: large for gestational age; NHB: neonatal hyperbilirubinemia; R: right; L: left; B: bilateral; Hb: hemoglobin; MS-LM: mixed solid-liquid mass; HM: hypoechoic mass; HRT: hemorrhage resolution time; IVH: intraventricular hemorrhage.

while adrenal insufficiency due to AH is rare.[2,3,7,8,10] Rumińska et al[7] reported adrenal insufficiency in a term infant with bilateral AH and stated that supplementation with glyco- and mineralocorticoids was required. The adrenal gland has considerable regenerative capacity, and most AH is not associated with significant adrenal insufficiency. In addition to AH, prematurity and severe underlying diseases such as sepsis, DIC, perinatal hypoxia and intraventricular hemorrhage are also potential causes of adrenal insufficiency in these patients. Cytokine-related suppression of ACTH or cortisol synthesis, inadequate perfusion of the adrenal gland, a limited adrenocortical reserve or immaturity of the hypothalamic-pituitary-adrenal axis may also contribute to the development of adrenal insufficiency.[12]

AH may present with swelling and bluish discoloration of the scrotum.[3,5-7,11] If AH occurs and the adrenal gland capsule is ruptured, blood easily reaches the scrotum via the patent processus vaginalis or by dissecting along the retroperitoneum, and swelling and bluish discoloration of the scrotum are observed.[5,11] This situation was observed in 2 of our newborns. Swelling and/or discoloration of the scrotum in newborns may arise from several disorders, including torsion of the testis, orchitis, scrotal or testicular edema, hydrocele, inguinal hernia or AH. USG of the abdomen and scrotum should be performed in infants with scrotal swelling or ecchymosis in order to determine AH.[11] If differential diagnosis between AH and torsion of the testis cannot be established, nuclear scanning or color Doppler analysis is required to exclude whichever does not apply.[11]

The right adrenal gland is the frequent (38%-100%) site of AH.[2,3,5,7-10] Frequencies of 8%-38% for bilateral AH have been reported.[7,9] In our study, 10 newborns had AH on the right side (77%) and 2 had bilateral AH (15%).

Differential diagnosis of AH should be performed with neonatal neuroblastoma, adrenal abscess, cystic neuroblastoma, cortical renal cyst, and obstructed upper cortical renal cyst and an obstructed upper excretory tract in the duplicated kidney.[1] Measurement of urinary VMA levels assists in the differentiation of AH from neuroblastoma. VMA levels were normal in all our patients. The ultrasonographic appearance of AH depends on the age of hematoma, and this gradually resolves with age.[4]

Diagnosis and follow-up of AH using USG is the most effective modality and avoids unnecessary laparotomy. Serial USG can demonstrate decreases in size and echogenity, multiloculated cystic mass, calcifications and complete resolution of AH.[5,13] Although calcification has been observed in AH, we determined none in our newborns. AH was followed up using USG at four-day to one-month intervals.[8,11] AH usually resolves between 3 weeks to 6 months.[4-7,10] In our study, it resolved between 4 and 16 weeks.

In conclusion, AH should be recognized in newborns with unexplained jaundice. Abdominal USG should be performed to determine AH in newborns with swelling and bluish discoloration of the scrotum. Serial USG is the best modality for monitoring AH and can prevent unnecessary surgery.

Funding: No funding was received for this study.
Ethical approval: Not required.
Competing interest: The authors declare no conflicts of interest.
Contributors: Mutlu M wrote the first draft of this paper. All authors contributed to the intellectual content and approved the final version.

References

1 Bergami G, Malena S, Di Mario M, Fariello G. Echography in the follow-up of neonatal AH. The presentation of 14 cases. Radiol Med 1990;79:474-478.
2 Lee MC, Lin LH. Ultrasound screening of neonatal adrenal hemorrhage. Acta Paediatr Taiwan 2000;41:327-330.
3 Velaphi SC, Perlman JM. Neonatal adrenal hemorrhage: clinical and abdominal sonographic findings. Clin Pediatr (Phila) 2001;40:545-548.
4 Katar S, Oztürkmen-Akay H, Devecioğlu C, Taşkesen M. A rare cause of hyperbilirubinemia in a newborn: bilateral adrenal hematoma. Turk J Pediatr 2008;50:485-487.
5 Miele V, Galluzzo M, Patti G, Mazzoni G, Calisti A, Valenti M. Scrotal hematoma due to neonatal adrenal hemorrhage: the value of ultrasonography in avoiding unnecessary surgery. Pediatr Radiol 1997;27:672-674.
6 Duman N, Oren H, Gülcan H, Kumral A, Olguner M, Ozkan H. Scrotal hematoma due to neonatal adrenal hemorrhage. Pediatr Int 2004;46:360-362.
7 Rumińska M, Welc-Dobies J, Lange M, Maciejewska J, Pyrzak B, Brzewski M. Adrenal hemorrhage in neonates: risk factors and diagnostic and clinical procedure. Med Wieku Rozwoj 2008;12:457-462.
8 Chang TA, Chen CH, Liao MF, Chen CH. Asymptomatic neonatal adrenal hemorrhage. Clin Neonatol 1998;5:23-26.
9 Black J, Williams DI. Natural history of adrenal haemorrhage in the newborn. Arch Dis Child 1973;48:183-190.
10 Chen CH, Chang TA. The value of ultrasound in the diagnosis and management of neonatal adrenal hemorrhage. Chin J Radiol 1999;24:107-111.
11 Huang CY, Lee YJ, Lee HC, Huang FY. Picture of the month. Neonatal adrenal hemorrhage. Arch Pediatr Adolesc Med 2000;154:417-418.
12 Watterberg KL. Adrenal insufficiency and cardiac dysfunction in the preterm infant. Pediatr Res 2002;51:422-424.
13 Wang CH, Chen SJ, Yang LY, Tang RB. Neonatal adrenal hemorrhage presenting as a multiloculated cystic mass. J Chin Med Assoc 2008;71:481-484.

Received June 23, 2010
Accepted after revision December 1, 2010