Asymptomatic Neonatal Adrenal Hemorrhage

Tzu-Ang Chang, Chao-Huei Chen*, Mei-Fen Liao, Chong-Hsin Chen**

Neonatal adrenal hemorrhage (NAH) in the newborn is not uncommon. Seven patients with NAH were found among nine hundred seventy-two neonates who had renal ultrasonography (US) screening at Han-Ming Hospital from Aug 1, 1997 to July 31, 1998. They were managed successfully by conservative measures. NAH usually shrinks rapidly in 8 to 16 weeks. US should be the first imaging modality used in infants with suspected NAH. Repeat US follow up of patients with suspected NAH is useful in monitoring their progress. Immediate surgery to exclude neuroblastoma in situ is not justifiable. Surgical intervention is reserved only for cases of uncontrollable hemorrhage or for masses which do not decrease in size to exclude the possibility of neuroblastoma.

Key words: neonatal adrenal hemorrhage (NAH), ultrasonography (US), neuroblastoma

Adrenal hemorrhages in the newborn are common, and have been discovered in 1-2% of infant post mortem examinations [1]. NAH has a varied clinical pictures. It frequently presents as a right-sided flank mass in young infants. It may also be bilateral or left sided and associated with the development of jaundice following hemolysis [2,3]. Severe intraperitoneal bleeding can cause hypovolemic shock [4] which may require emergency treatment. However NAH may be completely asymptomatic and is sometimes detected as an incidental finding on US of the newborn. The treatment of choice for NAH is still controversial. We present seven cases of asymptomatic NAH.

Subjects and Methods

After obtaining informed parental consent, newborns born at our hospital receive a renal ultrasonography (US) screening (equipment with Aloka SSD-260) on the second day after birth. From Aug 1, 1997 to July 31, 1998. A total of nine hundred seventy-two newborns had the examinations. Seven patients with NAH were noted. All were diagnosed by US and CT scan. Then they had regular follow up by color doppler US (equipment with Ving Med CFM-750) at one month intervals until the mass resolution. The seven patients' urine vanillyl mandelic acid (VMA) was assayed using the Jasco high performance liquid chromatography system (ECD, Coulochem 11, USA).

Results

The clinical presentations of the seven patients are shown in the table. Gestational ages were between 38 to 40 weeks and birth body weight between 3,200 to 4,200 gm. All patients were vaginally delivered (one with forceps, two with vacuum). No evidence of trauma was present at birth, and none had respiratory distress, cyanosis, septicemia, coagulation defects or blood group incompatibility. In all cases the hemorrhage occurred before 1 week of age. All hemorrhages occurred on the right side. None had evidence of adrenal insufficiency or hypovolemic shock. All newborns had neonatal jaundice and five patients had signs of an abdominal mass. All cases had normal urinary excretion of vanillyl mandelic acid (VMA).

In our 7 patients, early US showed a complex echo ovoid mass, displacing the kidney downward. Color doppler US showed no blood flow signals over the mass. Laterally, the US showed decreased mass size, a mixed cystic pattern, necrosis and lysis of the hemorrhages. Eventually, the US showed adrenal resolution or calcification at 8 to 16 weeks (Fig 1). The CT scan of all patients showed heterogeneous
hyperdense and hypodense mass arising from the adrenal gland, sometimes with fluid-fluid level, and indentation with downward displacement of the ipsilateral kidney. There was no enhancement after contrast medium injection (Fig 2).

Fig 1. A. Early ultrasonography shows a complex echoovoid mass (M), displacing the right kidney (K) downward. Color doppler reveals no blood flow over the mass.

Fig 1. B. At 12 weeks, US shows resolution and calcification (arrow) with posterior acoustic shadowing.

Fig 2. A. Early CT scan shows a heterogeneous hyperdense and hypodense mass (M) arising from the right adrenal gland, with downward displacement of the ipsilateral kidney. Post contrast medium shows no enhancement over the mass.

Discussion

The pathogenesis of adrenal hemorrhage of the newborn is unknown. Associated risk factors include birth trauma owing to difficult labor or delivery, asphyxia, septicemia, hemorrhagic disorders and hypoprothrombinemia [5, 6]. Massive adrenal hemorrhage is occasionally found in a large newborn following a traumatic delivery or more often in premature babies who have suffered perinatal hypoxia and have been resuscitated. These events have been linked to prolonged raised intravenous pressure [5]. None of our patients had any of these predisposing risk factors of NAH. Because our patients were asymptomatic NAH that was detected as an incidental finding on renal US screen of the newborn.

NAH frequently presents with jaundice following hemolysis. All of our patients had neonatal jaundice that was noted on the second day after birth. No patients had glucose 6 phosphatase deficiency, an abnormal Coombs’ test (direct and indirect) or signs of infection. Neonatal jaundice may be caused by NAH, but we couldn’t rule out other possibilities.

All 7 patients were born by vaginal delivery, NAH seems to occur more frequently after vaginal delivery than cesarean section.

NAH occurs during the first weeks of life, when the adrenal glands are large and rich with blood vessels [4]. NAH was noted during the first week in all of our patients. We could not rule out whether the NAH occurred prenatally. It has been reported that NAH can occur before birth [7]. The risk factors for prenatal adrenal hemorrhage include intrauterine hypoxia, septicemia and hemorrhagic disorders.

As in our patients, the right adrenal gland appears to be affected more often than the left. Bilateral massive hemorrhage has occasionally been reported [8, 9]. The usual explanations for susceptibility of the right adrenal gland that it is more likely to be compressed between the liver and spine and, the right adrenal vein usually drains directly.

Clinical Neonatology 1998 Vol.5 No.2
into the inferior vena cava, so it is prone to changes in venous pressure. The differential diagnosis of a flank mass in the suprarenal area in the newborn include adrenal hemorrhage, neuroblastoma, Wilms' tumor and renal duplication of the upper segment. Neuroblastoma is the most common solid malignant tumor in infants less than one year old. Differentiation from adrenal hemorrhage is important. Neuroblastoma screening programs using urinary biochemical markers have been instituted in Japan, Canada and England with some success [10-12]. Determination of the urinary excretion of vanillyl mandelic acid (VMA), homovanillic acid and catecholamines is relevant, since an increase in these substances, particularly VMA, is virtually diagnostic of neuroblastoma. Over 90% of children with neuroblastoma will have elevated urinary excretion of catecholamine metabolites [13, 14]. In all our patients, these levels proved to be normal before adrenal hemorrhage was diagnosed.

Differential diagnosis between neonatal adrenal hemorrhage and neuroblastoma in a neonate may occasionally be difficult. Neuroblastoma detected in the first year of life at an early stage have an excellent prognosis [15, 16]. Since congenital adrenal neuroblastoma has an excellent prognosis, we don't suggest immediate surgery to exclude the possibility of neuroblastoma in situ. Careful US monitoring of the lesion for a few weeks is warranted.

### Table. Clinical presentations of seven patients with adrenal hemorrhage

<table>
<thead>
<tr>
<th>Case NO</th>
<th>GA (weeks)</th>
<th>BBW (gms)</th>
<th>types of delivery</th>
<th>Sings of respiratory distress</th>
<th>Signs of adrenal insuficiency</th>
<th>Presentating symptoms</th>
<th>Site of adrenal hemorrhage</th>
<th>Urine VMA</th>
<th>Peak bilirubin</th>
<th>CT scan hemorrhage size (cm³)</th>
<th>Hemorrhage resolution time (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39</td>
<td>3,800</td>
<td>NSD</td>
<td>No</td>
<td>No</td>
<td>Jaundice flank mass</td>
<td>right</td>
<td>normal</td>
<td>14.5</td>
<td>2.5 × 3.5 × 6</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>3,270</td>
<td>NSD</td>
<td>No</td>
<td>No</td>
<td>Jaundice flank mass</td>
<td>right</td>
<td>normal</td>
<td>14.5</td>
<td>2.3 × 2.2 × 3</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>3,200</td>
<td>NSD</td>
<td>No</td>
<td>No</td>
<td>Jaundice</td>
<td>right</td>
<td>normal</td>
<td>12.8</td>
<td>1 × 1 × 2</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>39</td>
<td>3,240</td>
<td>VD with forceps</td>
<td>No</td>
<td>No</td>
<td>Jaundice</td>
<td>right</td>
<td>normal</td>
<td>13.0</td>
<td>1 × 2 × 2</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>39</td>
<td>4,200</td>
<td>NSD</td>
<td>No</td>
<td>No</td>
<td>Jaundice flank mass</td>
<td>right</td>
<td>normal</td>
<td>14.8</td>
<td>2.2 × 2.5 × 8</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>38</td>
<td>3,220</td>
<td>VD with vacuum</td>
<td>No</td>
<td>No</td>
<td>Jaundice flank mass</td>
<td>right</td>
<td>normal</td>
<td>13.7</td>
<td>2.5 × 3.0 × 3.5</td>
<td>16</td>
</tr>
<tr>
<td>7</td>
<td>39</td>
<td>4,230</td>
<td>VD with vacuum</td>
<td>No</td>
<td>No</td>
<td>Jaundice flank mass</td>
<td>right</td>
<td>normal</td>
<td>11.5</td>
<td>2.5 × 2 × 3</td>
<td>16</td>
</tr>
</tbody>
</table>

GA: gestational age; BBW: birth body weight; NSD: natural spontaneous delivery; VD: vaginal delivery; VMA: vanillyl mandelic acid

In general, a decision has to be taken whether to explore or to observe. Non-operative management of NAH gives excellent results [17, 18], whereas too aggressive surgery may result in the removal of non-diseased organs [19]. The radiologic findings of NAH have been described repeatedly [20-22]. We would try to make the differentiation by conservative methods, such as repeated color doppler US or CT scan. If the suprarenal mass is a purely sonolucent ovoid mass, if color doppler US reveals no blood flow signal over the mass, and if post contrast medium CT scan shows no enhancement of the mass, there probably is no blood supply to the adrenal mass. Adrenal hemorrhage is more likely. The patient should be followed with US for a change in size, and echo pattern. The mass representing the adrenal hemorrhage should decrease [20-22]. All of our patients were managed conservatively, and regularly followed up by color doppler US. Shrinkage of the mass was apparent clinically at 8 to 25 weeks.
16 weeks in all patients. If the mass has a solid component, if color doppler US reveals blood flow over mass, and if post contrast medium CT scan shows enhancement of the mass, neuroblastoma needs to be rule out. The patient should be carefully follow up with US. When the mass remains solid in appearance over time or enlarges, more invasive procedures such as US-guided fine needle aspiration or exploratory laparotomy may be needed.

We conclude that the incidence of NAH is not uncommon. It can be diagnosed accurately by regular color doppler US follow up. An immediate operation to exclude neuroblastoma in situ is not justifiable. Most cases of NAH can be managed successfully by conservative measures. Shrinkage develops over weeks, and later corresponds to the shape and size of the normal gland. An operation should only be done if the hemorrhage is uncontrollable or the mass doesn’t decrease.

References