Depressed Skull Fracture in the Newborn

A Report of 3 Cases

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SUMMARY

Three cases of depressed skull fractures in neonates are reported. Two of the fractures were related to birth trauma, but the third probably occurred antenatally. Treatment differed in all 3 cases. One baby underwent surgical elevation of the fracture, and another vacuum elevation, while the third received no treatment.

We stress the fact that non-surgical elevation of depressed skull fracture may be successful and preferable to more drastic surgical procedures.

Depressed skull fractures are rare in neonates and, in most instances, are caused by trauma during delivery. Rubin found only 1 skull fracture out of 108 birth injuries in 15 435 deliveries.

The diagnosis of a skull fracture can sometimes be difficult, and the correct management of depressed fractures in newborns is still uncertain. There is disagreement as to whether these fractures need elevation and, if so, whether surgical or non-surgical methods should be used.

We describe 3 newborn infants with depressed fractures of the skull, each of whom was treated differently.

CASE REPORTS

Case 1

The mother was 25 years old, and had a previous obstetric history of 2 spontaneous vaginal deliveries of live infants of unrecorded birth weights. Her antenatal course was uneventful, and no history of antenatal trauma was elicited.

The patient presented after 4 hours' labour with a 9-cm cervical dilatation, and the membranes were artificially ruptured. She then spontaneously delivered a full-term 4020-g male infant. Immediately after birth a shallow depression (4.5 x 3.5 cm) was visible anteriorly over the right parietal region (Fig. 1). There was no oedema or discoloration surrounding the depression, and the baby was otherwise completely normal. It would seem, therefore, that this fracture occurred in utero. No treatment was given, and the baby was discharged to be followed up as an outpatient.

Fig. 1. Case 1: (a) depression over right parietal region (arrow); (b) X-ray film of skull. Note line of increased density over right parietal region.

Case 2

The mother was 35 years old, and had a previous obstetric history of 4 spontaneous vaginal deliveries of live infants of unrecorded birth weights. Her antenatal course was uneventful, except for positive serological evidence of syphilis, which was treated. No history of antenatal trauma was elicited.

The patient presented in spontaneous labour with a 9-cm cervical dilatation. She had been in labour for 18 hours, and the membranes had ruptured spontaneously. One hour later, a forceps delivery was attempted because of fetal distress, but failed. A full-term 3530-g male infant was then delivered by caesarean section. The baby was severely asphyxiated and needed endotracheal intubation and active resuscitation. Apgar scores at 1 and 5 minutes were 2 and 6 respectively. The baby had a depressed skull fracture over the left parietal area which measured 5 x 3 x 1.5 cm (Fig. 2). There were definite signs of severe trauma to the baby, viz. marked oedema over the fracture, a left facial paralysis, bloodstained cerebrospinal fluid and subaponeurotic haemorrhage requiring blood transfusion. Clotting studies were normal.

The severe perinatal asphyxia caused renal damage, as shown by blood and protein in the urine, and cardiac damage, which resulted in cardiomegaly, tricuspid incompetence and ischaemic changes seen on an ECG.

On the first day of life the baby had twitching movements of the limbs, and recurrent apnoeic attacks.
Whether these were caused by the perinatal anoxia or the depressed fracture itself is difficult to establish. The twitches were successfully controlled with phenobarbitone, which was discontinued after 10 days without recurrence of twitching movements.

Thirteen days after birth, when scalp oedema had subsided, an attempt was made to elevate the fracture by vacuum suction. A medium cup of a vacuum extractor (more or less the size of the depression) was applied over the depressed area, and negative pressure was gradually increased by 0.2 kg/cm²/min, until a pressure of 0.6 kg/cm² was reached. This pressure was maintained for 2 minutes. When the cup was released, there was an oedematous area over the skull fracture (Fig. 3), but after the oedema had settled, it was evident that the depressed fracture was still present. Two weeks later, vacuum suction (0.8 kg/cm² for 5 minutes) was again applied to the fracture, and this time the fracture was successfully elevated.

Case 3

The mother was 26 years old, and had a previous obstetric history of 3 spontaneous vaginal deliveries, 2 of the infants having weighed more than 4 kg. Twins were diagnosed at 32 weeks’ gestation. No history of antenatal trauma was elicited.

At 38 weeks’ gestation, the patient presented in labour. Cervical dilatation was 8 cm, and one fetal foot had prolapsed. An assisted breech delivery was performed, and difficulty was experienced in delivering the arms and head. The second twin had a spontaneous vertex delivery. Twin A was a 2770-g girl and twin B a 2080-g girl.

Twin A had 1- and 5-minute Apgar scores of 2 and 10 respectively, and needed mask ventilation. Immediately after delivery a large depressed fracture was noticed over the right side of the head (Fig. 4). The depression extended from the anterior portion of the parietal bone over the coronal suture to the occipital bone. It measured 10 × 4.5 × 1.5 cm. The baby had no abnormal neurological signs or convulsions, and systemic examination was normal.

Owing to the massive size of the depression, it was surgically elevated. The posterior part of the depression was successfully elevated through a posterior burr-hole. The anterior portion was not corrected, because this would have meant pushing a blunt elevator blindly across the coronal suture. The baby had an uncomplicated postoperative course and was discharged 2 weeks after birth. When seen again 2 weeks later, the anterior portion had partially corrected itself.

DISCUSSION

The 3 infants reported above all had depressed fractures of the skull, which were obvious on clinical examination. This is usually the case, because the depressed fracture, unlike the linear fracture, is caused by inward bending of the skull surface, leading to the so-called ‘ping-pong ball’ or ‘pond’ fracture. In the neonate with a depressed fracture, there is usually no break in the surface continuity of the skull, and on an X-ray film the fracture appears as a line of increased density, compared with the linear fracture, which shows up as a line of decreased density.

The fractures usually occur in the parietal bones, occasionally in the frontal bones and, rarely, in the occipital region.
Normally the neonatal skull is very soft, and the bones are separated by membranous sutures which make the skull very pliable. Skull fractures are therefore frequently associated with considerable trauma. This trauma can be due to forceps applied to the baby's skull, or to repeated traumatic contact of the fetal skull with the maternal pelvis. Skull fractures may occur in utero unrelated to birth trauma, as illustrated by our first patient.

Management

There is some controversy as to whether depressed skull fractures in the newborn should be treated or not, and if treatment is given, whether it should be surgical or not. Chalmers' states that in his experience all depressed skull fractures in neonates have corrected themselves spontaneously. This may well be so, but since there have been no long-term follow-up studies of these infants, the eventual outcome in terms of neurological handicap is unknown.

Sequelae due to acute head injury are well recognized in older children. These include cranial nerve palsies, focal cerebral deficits, cerebral atrophy and a 2-6% incidence of post-traumatic epilepsy after closed fractures. These convulsions may be delayed for months after infancy. There is no reason to believe that these complications do not occur in the newborn. Moreover, a more serious complication seems to occur in newborn infants, viz. a tear of the dura, with outward herniation of meninges or brain forming a leptomeningeal cyst, which is epileptogenic unless removed surgically. We therefore agree with Raynor and Parsa and Jackson and Thompson that depressed skull fractures in the newborn should be elevated as soon as possible after birth, although not necessarily as an emergency, provided it is not an open fracture. The rationale for this policy is (i) to relieve local and general compression of the brain; (ii) to prevent irritation of the brain, and possibly the future development of seizures; and (iii) cosmetic.

Vacuum Extractor

The elevation may be achieved by a surgical procedure through burr-holes, but in recent years a non-surgical technique in which a breast pump or vacuum suction is used has been successful, as illustrated by one of our cases. Van Enk described the successful use of the vacuum extractor in 3 neonates and 3 infants with depressed skull fractures. He made the following recommendations regarding its use:

1. Elevation should not be attempted within 24 hours of birth.
2. Sedation or anaesthesia is not necessary.
3. Shaving the head is not necessary.
4. The size of the suction cup used should be approximately the same size as the depression.
5. In neonates, a suction time of 2 minutes at a negative pressure of 0.6 kg/cm² should be sufficient. The pressure should be raised slowly at 0.2 kg/cm²/min. Tan used a pressure of 0.5 kg/cm² for 4 minutes. In infants a pressure of 0.8 kg/cm² for 4 minutes should be applied, and this pressure may be built up rapidly.
6. Traction is not necessary, although this has been applied without ill effects.

No complications have been described, except for local oedema as a result of the use of the vacuum extractor in the treatment of depressed fractures of the skull. Elevation using the vacuum extractor would therefore seem to be the treatment of choice. However, the vacuum extractor is not without risk to the neonate, and the above guidelines should be strictly adhered to.

REFERENCES