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Case report

Spontaneous depressed skull fracture in a neonate

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Abstract

The most common cause of neonatal skull fracture is trauma from instruments used during an assisted birth. In the literature, there are limited reports of neonatal depressed skull fractures (DSF) in the absence of birth trauma. The diagnosis is based on clinical and radiological findings. We present the case of a female neonate, born full-term after a eutocic delivery. The pregnancy was unremarkable. There was no history of trauma during pregnancy or delivery. At birth, a congenital depression in the right parietal region was noted. Head computed tomography revealed a right parietal depressed fracture, without underlying brain lesion. Surgical elevation was performed with favourable outcome. There were no complications. The patient is currently 9 months old and has a normal neurodevelopment.

Keywords

Depressed skull fracture, ping pong skull fracture, skull fracture elevation, labour, neonatal, newborn.

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Introduction

Neonatal depressed skull fractures (DSF) are rare in modern perinatal medicine as a result of advances in training and techniques [1]. These fractures have a classical cup shape conformation, forming an inward buckling of the calvarium, and are commonly named "ping pong" fractures [2]. The most common cause of DSF is birth trauma related to instrumental deliveries [1-3]. These fractures may also occur spontaneously during pregnancy [2, 3]. The diagnosis is based on clinical and radiological findings. The presence of an abnormal skull depression is observed at clinical examination. Plain radiography of the skull and head computed tomography (CT) are useful in confirming the diagnosis and the degree of bone deformation. Furthermore, head CT is indicated for the assessment of the concomitant presence of intracranial injury or haemorrhage [3].

We present a case describing the finding of a DSF at birth in a neonate who was delivered without instrumentation and with no known history of perinatal trauma.

Case description

A female neonate, weighing 2,410 g, was born at 37 $^{3/7}$ weeks. The birth was eutocic and uneventful. The newborn's Apgar score was 9, 10, 10 at 1, 5 and 10 minutes, respectively. The mother was 31 years old, with unremarkable medical history, a G1P0, group AB rhesus negative. During pregnancy surveillance, the mother had three fetal ultrasounds, all with normal morphology and biophysical profiles. Immediately after birth, a depression in the right parietal region was noted. The measures were approximately 7 cm by 5 cm, with 3 cm depth. The base of the deformity was hard, without crepitus. The remaining of the skull was normally shaped, with patent fontanelles. Neurological examination showed no deficits and the head circumference was within normal limits. The skeletal examination was unremarkable. There were no dysmorphic features. The remaining examination was normal. A DSF without brain trauma was confirmed by a head CT (**Figures 1-4**). As the fracture was significantly depressed, with an important aesthetical defect, surgical elevation was performed at 6 days of age. A small linear paramedian incision was made, adjacent to the right angle of the anterior fontanelle. The dura mater was stripped from the bone, and the fracture was elevated from bellow through the access provided by the fontanelle, without need for additional burr hole. A linear breach in the external cortical layer at the base of the depression was observed intraoperatively. Immediately after surgery, there was a significant improvement of the defect, with residual deformity (**Fig. 3**). Recovery from surgery and subsequent follow-up was uneventful. Favourable cosmetic results were confirmed at follow-up. The infant is currently 9 months-of-age and has a normal neurological examination, with normal growth and development.

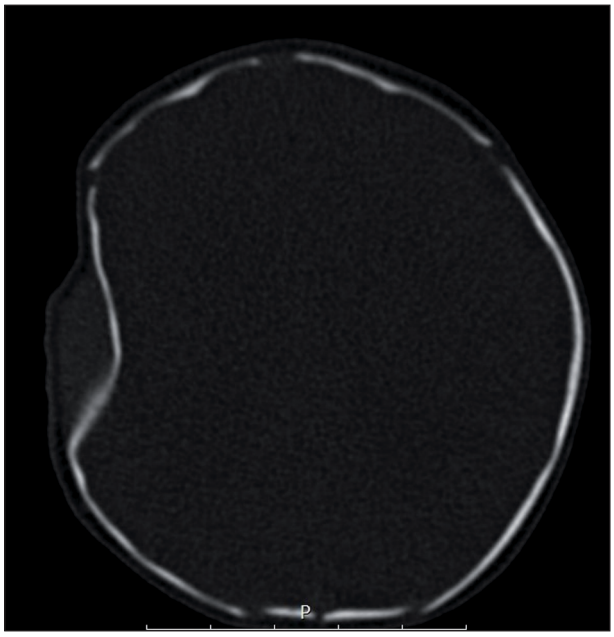

Figure 1. Preoperative computed tomography (CT) scan, axial cut showing the depressed skull fracture involving the right parietal bone.

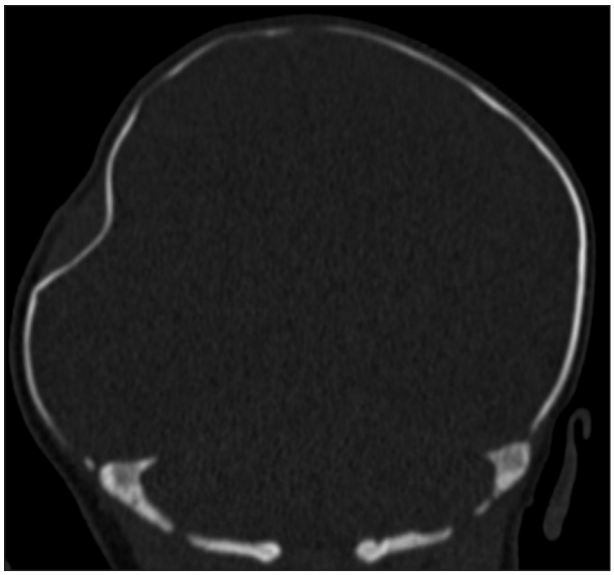

Figure 2. Preoperative computed tomography (CT) scan, coronal cut showing the depressed skull fracture involving the right parietal bone.

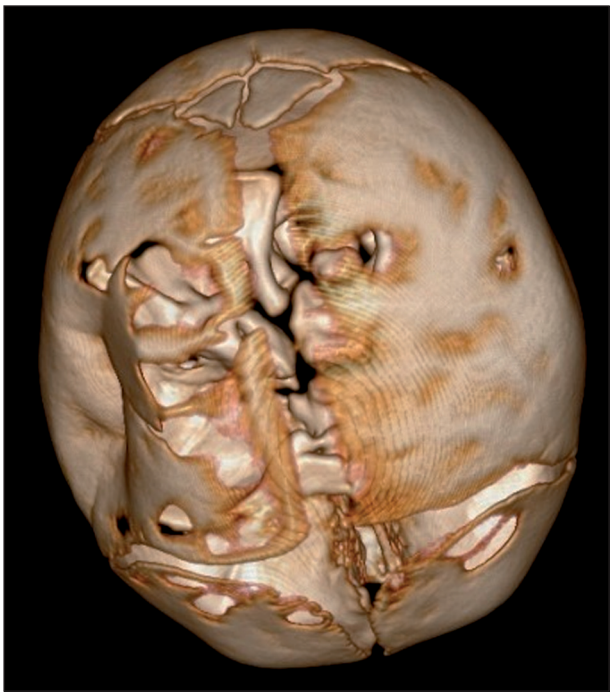

Figure 3. Preoperative computed tomography (CT) scan, 3D reconstruction showing the depressed skull fracture involving the right parietal bone.

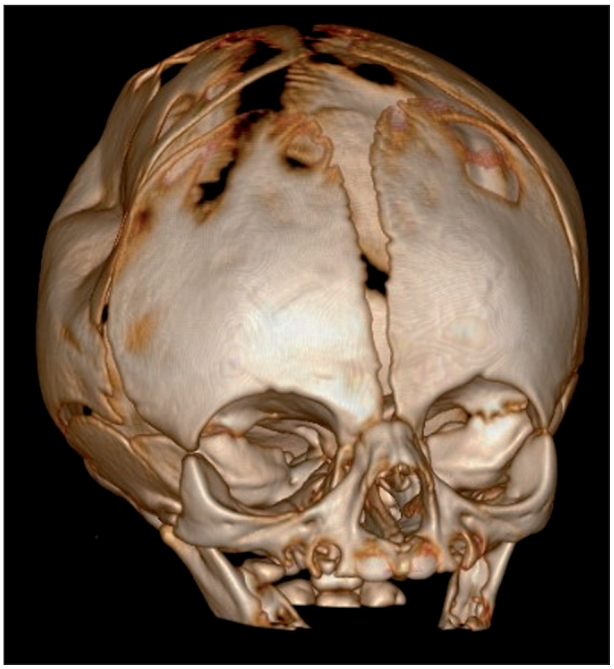

Figure 4. Preoperative computed tomography (CT) scan, 3D reconstruction showing the depressed skull fracture involving the right parietal bone.

Discussion

Newborn DSF are rare, with an incidence ranging between 1 and 2.5 per 10,000 births [1, 4]. As a result of immature mineralization and increased pliability of the fetal skull, prolonged pressure to the calvarium may result in a localized depression of the skull [3, 4]. Most of the cases are the result of a perinatal trauma, as pressure from forceps or obstetrics maneuvers during a difficult labour [1, 3, 5, 6]. Atraumatic or spontaneous skull fractures during vaginal deliveries may result from the pressure of the fetal head against the mother's pelvic bony prominences (fifth lumbar vertebrae, ischial spines, sacral promontory and symphysis pubis), uterine fibroid or the fetal hands. Other risk factors include maternal or fetal masses, macrosomia, shoulder dystocia, Ehlers-Danlos syndrome and congenital disorders of osteogenesis [1-5, 7, 8]. The main differential diagnoses are external trauma to the mother's abdomen during pregnancy and an obstetric related trauma [7, 9].

The majority of skull depressions are diagnosed at birth [4]; however, some cases described in the literature were diagnosed *in utero* [7, 10]. When a head abnormality is suspected on fetal ultrasound, fetal magnetic resonance imaging (MRI) is the method of choice to evaluate the presence of bone deformity [5].

After delivery, when suspecting a DSF, head CT is the preferred method to evaluate skull deformities and to assess the presence of underlying brain injury and haemorrhage [3-5, 8]. If findings on CT do not explain the patient's symptoms, MRI should be performed. Intracerebral haemorrhage is well seen in both head CT and MRI, but head ultrasound is useful in initial bedside evaluation. Concerning extracerebral haemorrhage and posterior fossa haemorrhage, MRI is superior to CT [8].

Most DSF are, in fact, not true fractures, but rather depressions of the skull, with the calvarium integrity preserved, without evidence of a breach in the external cortical layer [3, 5].

In our case, the bone examination during surgery allowed direct observation of a linear fracture in the external cortical layer, confirming the diagnosis of a true DSF.

Both conservative and surgical approaches to congenital skull fractures are described in the literature [3-5], and there are no clear guidelines as to when surgical intervention is indicated in the absence of brain injury [3]. The decision to surgical intervene depends on the severity of the fracture, the presence of concomitant brain lesions, clinical examination, imaging findings and the use of instruments during delivery [6]. Despite the absence of clear surgical indications, common recommendations for surgical intervention are: large defects, bone defects with

leveling of the bone, or when suspecting cerebral compression (to prevent cortical damage) [4, 11]. Some studies recommend a watchful waiting period after the diagnosis since a great number of cases are associated with a spontaneous reduction [7, 9-11]. The prognosis for non-traumatic DSF is excellent, with only very few cases of neurological anomalies reported [3].

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Declaration of interest

The Authors declare that there were no conflicts of interest in conducting this work. There were no external funding sources for the realization of this paper.

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