

A Suboccipital “Ping Pong Like” Fracture Indenting in the Posterior Fossa: A Case Report

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1. Abstract

“Ping pong” or depressed greenstick fractures of the skull are well described in newborns and infants. While the traumatic deformations are usually located in the frontal and parietal region. We present a case of a 3-year-old boy with a suboccipital ping-pong like skull fracture indenting in the posterior fossa, resulting in a complex traumatic brain injury with prolonged weaning. The fracture was elevated via a single burr hole, the patient recovered completely with no clinical sequelae.

2. Introduction

In infants and toddlers, the skull is soft and elastic with the possibility to be deformed without breaking. This kind of “cup shape” deformation is called “ping pong” fracture because of its resemblance to an indented ping-pong ball.⁵ Congenital depressions of the skull occur at an incidence of 1/10.000 births [8, 10, 12].

Most of the fractures described in literature affect the parietal bone [3, 8, 11, 12]. We present the case of a 3-year-old boy with a “ping pong like” fracture of the suboccipital bone indenting in the posterior fossa, causing a complex Traumatic Brain Injury (TBI) with an ensuing prolonged stay at pediatric ICU.

3. Case Report

A 3-year-old boy fell off a loft bed from a height of 2 meters and hit the edge of a bed frame standing below. The fall was not observed and the unconscious child was found by the parents a few minutes after the fall. He presented with an initial GCS of 4 and

dilated pupils bilaterally and was intubated on site, which caused prompt normalization of the mydriasis. Clinical examination in the emergency room revealed a cutaneous hematoma with significant swelling in the left upper neck.

Computed Tomography (CT) scan showed an impression of the left occipital bone with a maximum depth of 13 mm (Figure 1: A-C) (volume: 8.71ccm²) with minor supratentorial subarachnoid hemorrhage and brain edema. Yet, diffuse brain swelling in the posterior fossa with compressed basal cisterns and narrowing of the fourth ventricle were present (Figure 1: D).

The “ping pong like” fracture of the left occipital bone was surgically elevated via a small linear skin incision by performing a burr-hole medially to the depression. A small periosteal elevator was inserted through the burr hole, placing the tip of the instrument at the maximum depth of the depression. Repositioning was achieved with only gentle force against the inner layer of the bone resulting in an excellent reconstruction of the bone contour. In addition, according to contemporary international guidelines an intraparenchymal ICP sensor was inserted into the right frontal lobe for further monitoring and the child was transferred to the pediatric intensive care unit for standard trauma management [1]. Initially, short phases of significantly elevated ICP up to 50 mmHg occurred in the first 6 days, yet with only scarce 15-minute time intervals of ICP burdens. These were successfully treated by deepening of the analgesation by means of intravenous bolus alongside with repetitive administration of Mannitol. Approximately one week

after initial traumatic event the patient became stable and was subsequently extubated on day 13 after protracted weaning phase. At discharge he presented with mild hemiparesis. After three months

he recovered completely.

A postoperative CT scan demonstrated an excellent reconstruction of the depressed skull (Figure 2: A, B).

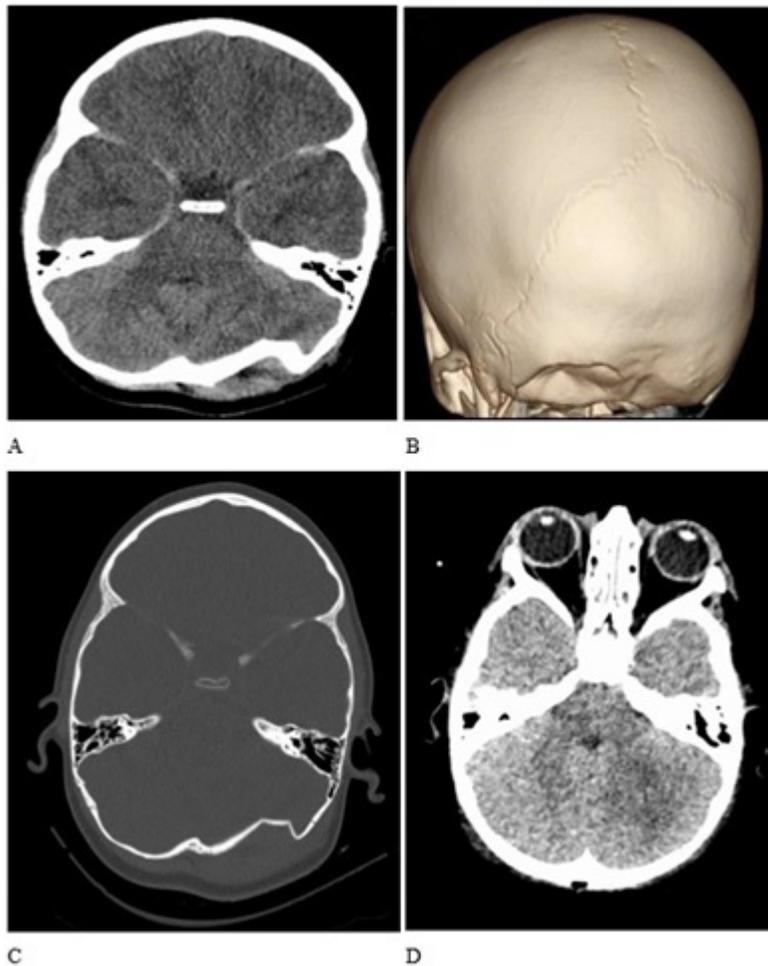


Figure 1: Computed tomography of the head depicting an infratentorial “ping pong” fracture of the left-sided suboccipital bone (A - C). Diffuse brain swelling in the posterior fossa with consumed basal cisterns and some compression of the fourth ventricle can be noted (D)

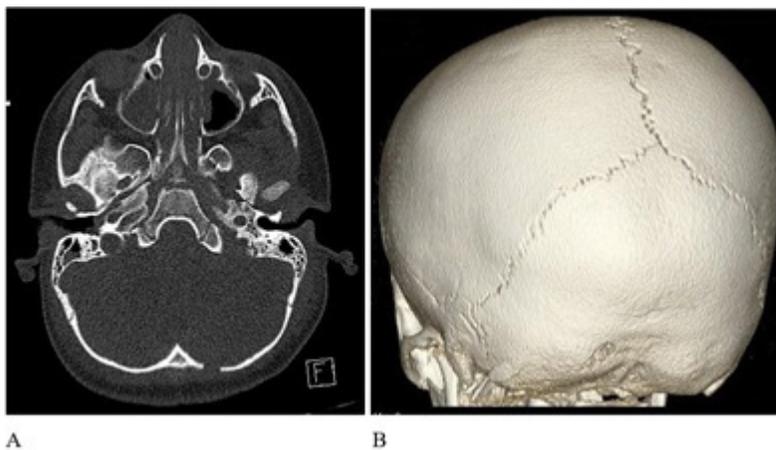


Figure 2: Post-operative CT showing appropriate elevation and reconstruction of the depressed skull fracture.

4. Discussion

To our best knowledge, we present the first case of a 3-year-old boy with a severe TBI and closed “ping pong like” fracture of the suboccipital bone indenting the posterior fossa.

Depressed skull fractures account for approximately 7-10% of all skull fractures in children 6 and approximately one third in pediatric patients are simple or closed. “Ping pong” fractures or greenstick fractures mostly occur in children younger than one year and differ from those found in older children [11]. This is caused by the relative plasticity of the infantile skull which is not completely ossified and possesses great malleability [10, 11]. There are three mechanisms producing a “ping pong” fracture: In utero trauma, obstetric trauma and direct trauma. While the precise mechanism of in utero trauma is not really known, a compression of fetal skull against the sacral promontory or against uterine tumors has been suggested. Obstetric injuries are usually caused by forceps and forefingers (instrument-assisted) applied to the newborn skull [8, 10], while direct trauma represents the most common entity mostly occurring after falling on objects [8].

Although the membranous sutures, the fontanelles and the low level of calcium determine a high level of plasticity and malleability in neonates and very young children, the cause of the “ping pong like” fracture in our case at age 3 is less clear. It is well known that the suboccipital bone remains very thin lateral to the midline for some time. It may be speculated that a precise impact in this area not sufficiently dampened by the thin overlay of nuchal muscles allowed this rare injury to occur.

The management of depressed fractures remains controversial. Spontaneous elevations of depressed skull fractures generated by birth trauma has been described in neonates. Possibly increased intracranial pressure during crying, cerebral edema following the injury [2, 11], and / or the properties of neonatal bone [10, 11] can be responsible for spontaneous elevation.

Bullock et al recommend surgical management in open cranial fractures, if the impression is depressed more than the thickness of the skull bone to prevent further complications [1]. Conservative care is preferred, if there is no clinical or radiographic evidence of dural penetration, space-occupying intracranial hematoma, depression of the bone greater than 1 cm, frontal sinus involvement, pneumocephalus, gross cosmetic deformity, wound infection, or wound contamination [1].

Operative management of impressed fractures includes craniotomy, removal of all bone fragments followed by reconstruction either with autologous bone fragments or using a titanium mesh for reconstruction [7]. Elevation of a “ping pong” fracture is usually done by a single burr hole with or without craniotomy [4]. In the recent literature, new methods to elevate depressed “ping pong” fractures have been described. While Zalamito et al used a self-tapping percutaneous screw [12], Ramiro et al and Tania et

al applied a breast milk extractor or a pediatric resuscitator (CRP-mask) with a 50-ml syringe, to lift the depressed skull [8, 10].

To our best knowledge, “ping pong” or “ping pong like” fractures of the suboccipital bone indenting the posterior fossa in children have not been reported, hence no management algorithms are available. In the presented case, being aware of anatomically constricted space in the posterior fossa, the decision to elevate the fracture with eliminating the space-occupying bone indentation in a minimally invasive way was made also due to the diffuse brain swelling in the posterior fossa with consumed basal cisterns and a compression of the fourth ventricle (Figure 1: D). Nonetheless, the fourth ventricle was not fully compressed so that craniotomy was not deemed necessary. With initial poor neurological status at admission and additional radiological findings on CT, ICP monitoring was indicated accordingly.

While “ping pong” fractures are considered in neonates and infants, the very thin bone overlaying the cerebellar hemispheres seems to allow this fracture type even in older children. Simple surgical elevation appears to offer adequate management. Importantly, the vast majority of these injuries are associated with complex TBI. Thus, adequate neurointensive care management is pivotal in these patients.

5. Conclusion

Elevation of “ping pong” and “ping pong like” fractures via a single burr-hole can be performed safely also in the posterior fossa. Importantly, the subsequent appropriate patient management including neurointensive care is fundamental for final favorable clinical outcome.

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