

# Circumscribed thinning of the calvaria - a long-term sequela after vacuum extraction delivery

Benjamin Liniger, Department of Paediatric Surgery, Inselspital, Bern University Hospital, University of Bern, Switzerland

## Background

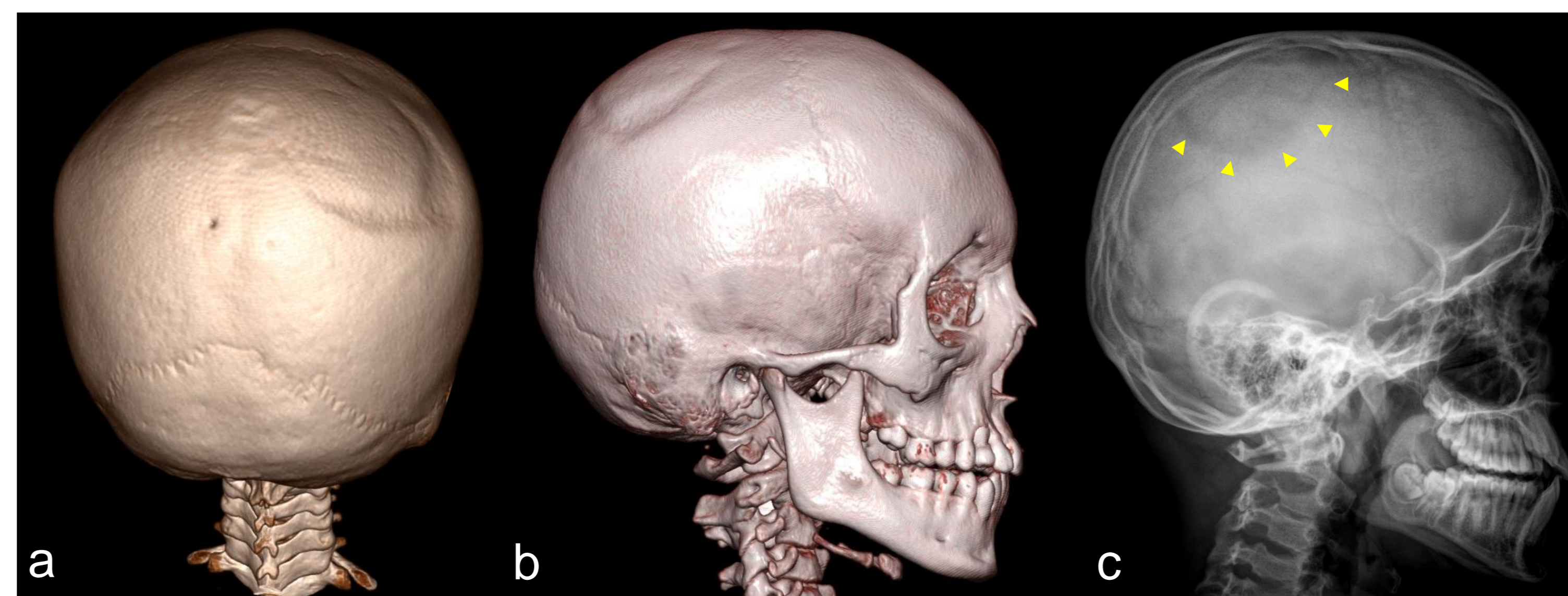
Vacuum extraction deliveries are associated with a number of complications. These range from mild injuries to the skin to subperiosteal, subgaleal and intracranial hemorrhages<sup>1,2,3</sup>. Even skull fractures have been described<sup>4</sup>. In contrast, data on persistent changes in the bone structure of the skull such as thinning of the calvaria is lacking in the literature. Knowing about this complication could help to avoid extensive investigations in some cases and to reassure the patients and their families.

## Methods

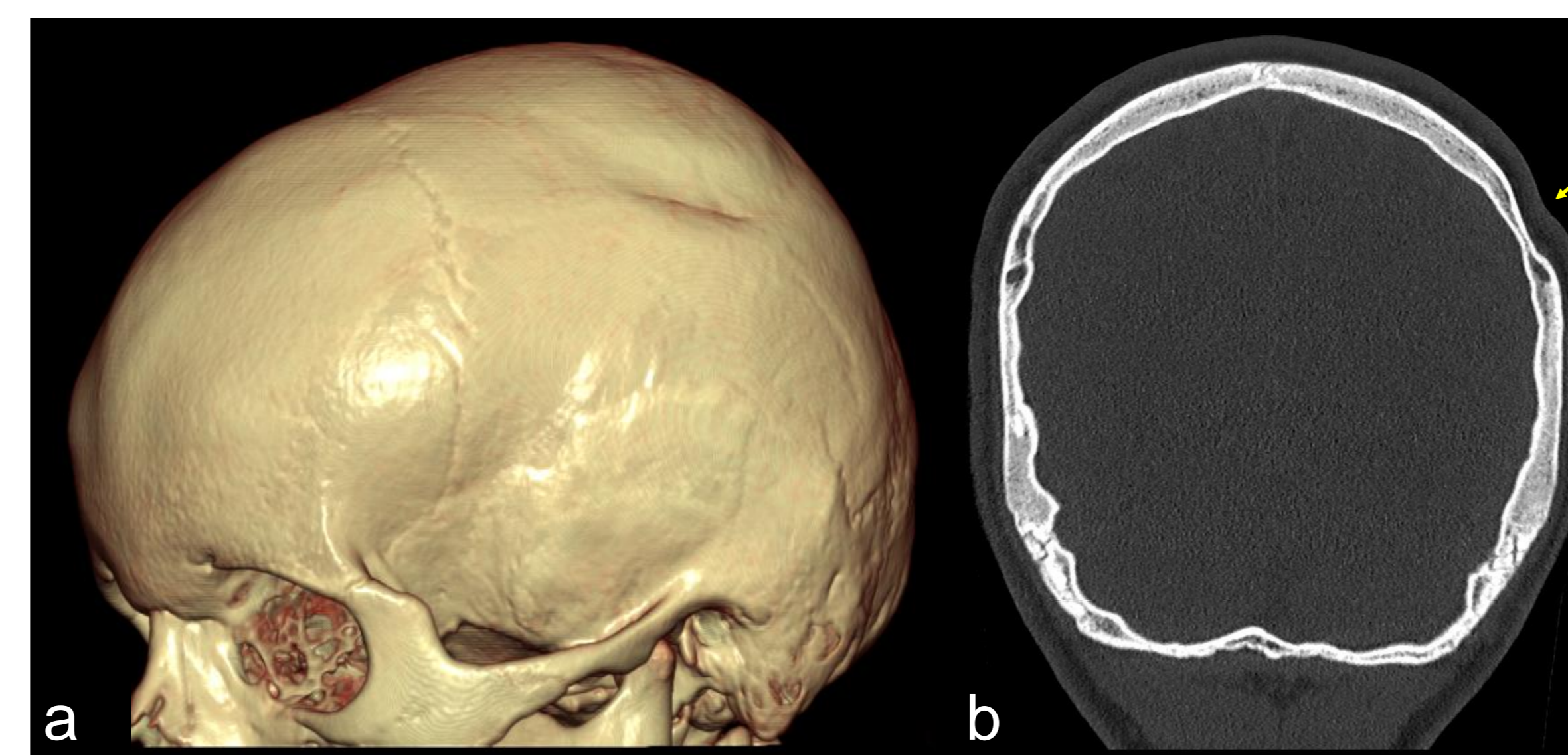
We present a series of 5 children from 8 to 14 years of age, who were referred to our clinic because of an irregularity of the cranial surface without other symptoms. The investigations revealed a circumscribed thinning of the calvaria in all 5 cases. Detailed history and the specific clinical findings were crucial in the assessment and various imaging techniques were used to visualize the lesions and rule out some differential diagnoses.

## Results

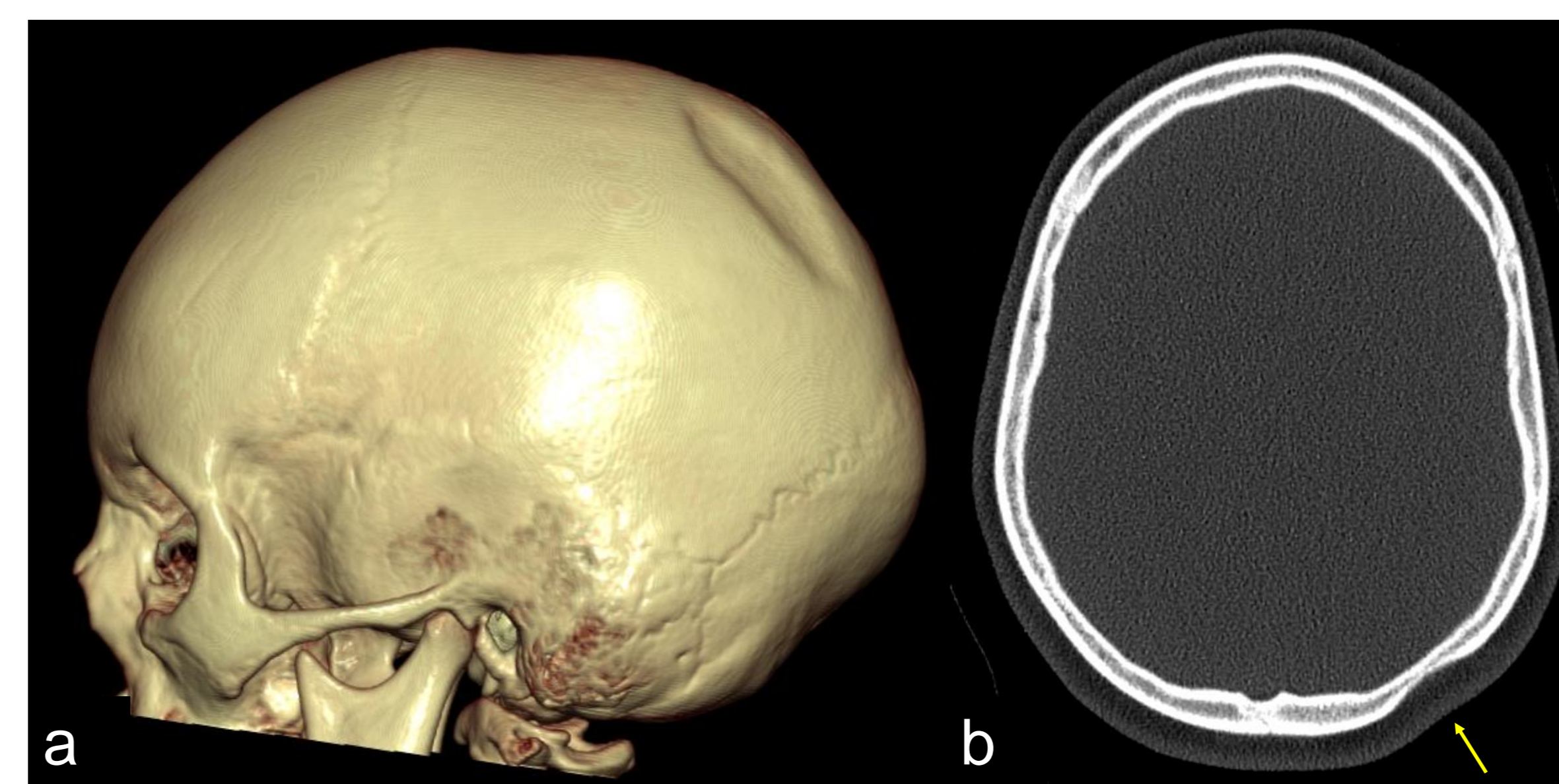
All 5 children had undergone a vacuum-assisted delivery at term and the irregularities of the cranial surface were discovered incidentally during hair care or touching of the head. Clinical examination revealed a round (n=3) or linear (n=1) channel-shaped indentation of the calvaria in 4 cases. The shape and size of the annular thinning of the calvaria matched devices commonly used in vacuum extraction (figure 4) very well. In one patient, a localized protrusion of the calvaria was palpable, but an indentation more posteriorly was detected in the CT scan. CT scan was performed in 4 children. In one, parents refused this examination. Representative images of 3 patients are shown in figure 1-3. To exclude histiocytosis or any other destructive bone or soft tissue process, other imaging modalities were used in some cases (ultrasound, MRI). Further on, no progression of the findings nor symptoms were observed in any of the patients.



**Figure 1:** Boy, 12y, annular thinning right parietal bone. CT scan 3D-reconstruction (a) and (b), x-ray (c).



**Figure 2:** Boy, 14y, annular thinning left parietal bone. CT scan 3D-reconstruction (a) and coronal (b).

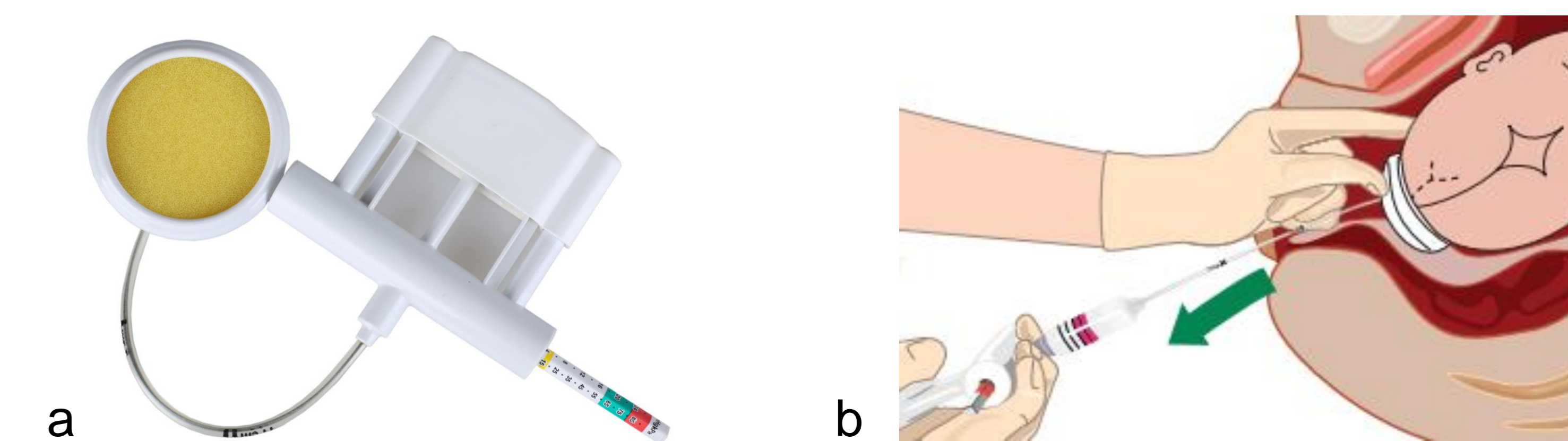


**Figure 3:** Girl, 8y, linear thinning left parietal bone. CT scan 3D-reconstruction (a) and axial (b).

## Conclusions

Considering the clinical and CT findings, it can be assumed that the thinning of the cranial bone is a consequence of vacuum extraction. However, the underlying mechanism is unclear. One could hypothesize that the pressure from the device leads to localized atrophy of the bone. Such long-term sequelae have hardly been reported in the literature. We found only one report of 2 very similar cases, in which though the authors discussed any connection with the vacuum-assisted delivery to be implausible<sup>5</sup>.

In children and adolescents who present with irregularities of the cranium without other symptoms, an accurate history, including the mode of birth, and detailed clinical examination should be performed. Knowledge about the presented pathology may help to avoid extensive investigations, particularly CT scan, in certain patients. The publication of further cases could support the propagation of the circumscribed thinning of the calvaria after vacuum extraction as a distinctive clinical entity.



**Figure 4:** Device (a) and technique (b) of vacuum extraction delivery. <https://au.clinicalinnovations.com/portfolio-items/kiwi-complete-vacuum-delivery-system/>

## References

1. Towner D et al. Effect of mode of delivery in nulliparous women on neonatal intracranial injury. *N Engl J Med.* 1999 Dec 2;341(23):1709-14.
2. Demissie K et al. Operative vaginal delivery and neonatal and infant adverse outcomes: population based retrospective analysis. *BMJ.* 2004 Jul 3;329(7456):24-9.
3. Schreiber H et al. Vacuum-Assisted Delivery Complication Rates Based on Ultrasound-Estimated Fetal Weight. *J Clin Med.* 2022 Jun 17;11(12):3480.
4. Simonson C et al. Neonatal complications of vacuum-assisted delivery. *Obstet Gynecol.* 2007 Mar;109(3):626-33.
5. Watson L et al. Focal Idiopathic Calvarial Thinning: A Condition of Uncertain Prevalence and Significance. *J Craniofac Surg.* 2021 Oct 1;32(7):e680-e682.