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EDITORIAL (BY INVITATION)

The resilience of a dead brain: commentary to "The intracranial pressure–volume relationship following decompressive hinge craniotomy compared to decompressive craniectomy—a human cadaver study"

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In this issue of *Acta Neurochirurgica*, Søndergaard et al. [1] describe a human cadaver experiment ($n=2$), exploring the pressure–volume relation following (a) a hinge craniectomy, (b) a conventional decompressive craniectomy (DC), and (c) a sham experiment with fixation of the bone flap. The authors report that a volume increase of 130 ml was tolerated in the fixed bone flap, 190 ml in the DHC, and 290 ml in the DC model before ICP exceeded 20 mmHg. Ct-derived calculations were reported to show that a hinge craniectomy could increase the intracranial volume by up to 84 ml and allow for approximately 60 ml increase in intracranial volume before ICP exceeds 20 mmHg. They suggest that this should be sufficient in patients with treatment refractory intracranial hypertension. The study is timely and relevant, in particular as a hinge craniectomy is gaining popularity as it may reduce the risks of complications seen after conventional craniectomy and obviate the risks of cranioplasty-related complications. However, as the authors state, relatively little is known about the effects of a hinge craniectomy on intracranial pressure–volume relations. This study provides some insight, but results should be interpreted with great caution. First, only 2 studies were conducted: one in a freshly thawed frozen specimen and one in an alcohol-preserved specimen. The authors claim consistency of results across the two experiments, but differentiated results are not provided. Second, the pressure/volume relationship may well be very different between a "living brain" in a physiological environment and a dead brain. Third, the studies were conducted in previously healthy brains, and it is doubtful if results can be extrapolated to patients with a tight brain situation. It would be of some interest to repeat the studies in a cadaver specimen of a patient, who had suffered intracranial hypertension without receiving a DC.

Some of these limitations are acknowledged by the authors, but they nevertheless suggest that their findings indicate sufficient "reserve" gain with a hinge craniectomy. This is somewhat surprising as they also report that volume gained by a hinge craniectomy is less than half of that obtained by a conventional craniectomy. An alternative conclusion could therefore be that a hinge craniectomy is not nearly as effective in creating "reserve volume" as a conventional DC is. This alternative conclusion is, however, as shaky as that of the authors given the very limited numbers and the unphysiological situation of a dead, but previously healthy, brain.

Reference

1. Søndergaard CB, Villa C, Jacobsen C, Lilja-Cyron A, Fugleholm K (2022) The intracranial pressure-volume relationship following decompressive hinge craniotomy compared to decompressive craniectomy – a human cadaver study. Acta Neurochirurgica (in press)

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