

Are human heads getting larger?

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I am responding to the intriguing PNAS article by Mitteroecker et al. (1), "Cliff-edge model of obstetric selection in humans." My understanding is that the authors believe that Caesarean section births will allow fetuses with larger heads to survive, thus allowing our species to evolve larger heads.

This is an interesting hypothesis but, as an obstetrician, I find some areas of concern. Mitteroecker et al. (1) suggest that head size has increased recently because of the number of Caesarean sections being performed for cephalopelvic disproportion (CPD). However, I do not find any reference in the Mitteroecker et al. report that shows that, indeed, newborn head size has increased. On the other hand, there are several reasons that the incidence of CPD may seem to have increased over the past few decades.

The authors propose a variable, D , "...that represents the difference between the size of the neonate and the size of the maternal pelvic canal" (1). Although this idea makes some sense, D does not represent the conditions with which a woman in labor has to cope. There are other physical factors that can cause obstructed labor, including soft tissue. Indeed, it is generally recognized that the increase in maternal obesity is one of the causes of the increase in Caesarean section deliveries; maternal fat blocks the egress of the fetus (2). Although this may be coded as CPD, it not the disproportion referred to by the authors' D .

In the United States, those of us who help women in childbirth have to be concerned with medical-legal issues. If a baby is born vaginally and has a problem,

in court the question will usually arise as to whether a Caesarean section birth might have prevented that problem. Therefore, the threshold for performing Caesarean section births is lowered. This is a common reason for recommending operative delivery, and is often coded as CPD or "nonreassuring fetal status" (3).

Furthermore, the "cliff edge" that Mitteroecker et al. (1) postulate is not consistent with the realities of birthing. The second stage of labor, the time from complete cervical dilatation until the delivery of the baby, may today be limited for the sake of fetal well being (4). If a woman is allowed to push longer, the probability of vaginal birth increases, but the possibility of an injured baby may also increase. Therefore, I question the statement, "Individual female fitness... increases linearly with D to its maximum at $D = 0$; thereafter fitness drops to zero because of fetopelvic disproportion" (1).

Another reason for the increase in Caesarean section births is that doctors are no longer trained to perform forceps deliveries. This operative method to aid vaginal delivery of a "stuck" baby has fallen out of favor, partly because of medical-legal issues. Finally, an alternative to Caesarean section birth, subcutaneous symphysiotomy (5), has not been practiced in much of the world for decades.

Thus, there are several reasons that the Caesarean section rate has increased. Although the article by Mitteroecker et al. (1) presents an interesting hypothesis, I would have preferred that it had been written in consultation with people who know the obstetric literature well.

- 1 Mitteroecker P, Huttegger SM, Fischer B, Pavlicev M (2016) Cliff-edge model of obstetric selection in humans. *Proc Natl Acad Sci USA* 113(51):14680–14685.
- 2 American Congress of Obstetricians and Gynecologists (2015) Practice Bulletin No. 156: Obesity in pregnancy. *Obstet Gynecol* 126(6): e112–e126.
- 3 Barber EL, et al. (2011) Indications contributing to the increasing cesarean delivery rate. *Obstet Gynecol* 118(1):29–38.
- 4 American Congress of Obstetricians and Gynecologists (2015) Practice Bulletin No. 154: Operative vaginal delivery. *Obstet Gynecol* 126(5):e56–e65.
- 5 Wilson A, Truchanowicz EG, Elmoghazy D, MacArthur C, Coomarasamy A (2016) Symphysiotomy for obstructed labour: A systematic review and meta-analysis. *BJOG* 123(9):1453–1461.

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