Deceleration Area and Deceleration Capacity: Poor predictors of fetal acidaemia in human labour! The strengths of visual versus computerised cardiotocography interpretation.

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Letter to the Editor, BJOG

Title:Deceleration Area and Deceleration Capacity: Poor predictors of fetal acidaemia in human labour! The strengths of visual versus computerised cardiotocography interpretation.

Re: *Georgieva A, Lear CA, Westgate JA, Kasai M, Miyagi E, Ikeda T, Gunn AJ, Bennet L. Deceleration area and capacity during labour-like umbilical cord occlusions identify evolving hypotension: a controlled study in fetal sheep. BJOG 2021; https://doi.org/10.1111/1471-0528.16638.*

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Dear Editor,

It seems intuitive to birth-attendants that the bigger/frequent fetal heart rate (FHR) decelerations over a longer period (bigger deceleration area - DA) would lead to increasing fetal acidaemia/hypotension/hypoxaemic injury. The animal study by Geogieva et al [1] confirms this known correlation. Furthermore, there is already much information available from well-designed studies in human labour examining DA.[2,3] These show that correlation (even statistically-significant) does not entail clinically useful positive/negative predictive values (PPV/NPV). These studies show that the DA is unsatisfactory in clinical practice with further multiple unresolved logistical difficulties.[2,3] The quoted[1] study by Cahill et al mistakenly states that their 'DA cut-off' requires five caesareans to prevent one case of acidaemia; but with its PPV of 4%, the correct calculation is 25 to 1. The "deceleration capacity (DC)" measures no capacity, hence a misnomer. The cohort study of DC on 22,000 women[1] lacked statistically-significant improved acidaemia detection and the important receiver-operating-characteristic (ROC) curves were missing. Another large cohort study on 11,980 showed the area under curve (AUC) for DC to be 0.66.[4] This AUC reveals that if we want to detect 90%, 80% or 50% of acidaemic babies, the same DC was shared by 80%, 60%, 25% of normal babies respectively.[4] The AUCs for DA in human studies are very similar and disappointing for clinical application.[2,3]

A lesson from wider experience in artificial intelligence (AI) implies that a constricted-single-parameter approach (e.g. DC/DA) would be insufficient for the complex intrapartum fetal monitoring. Computers have been beating chess-grandmasters for 25 years; because chess offers a "kind learning environment" with fixed rules, patterns repeating exactingly, feedback extremely accurate and very rapid. In the "unkind learning environments" devoid of rigid rules, single domains and reams of perfect historical data; the AI and machine learning have been disastrous. Cardiotocography (CTG) requires integration of multiple FHR parameters with mother-fetus-labour-condition permutations. Intervention changes outcome; hence, the feedback can be inaccurate/unreliable. Human cognition assimilates these paradoxes. The greatest human strength is the exact opposite of narrow specialisation of AI. It is the ability to integrate broadly.

Research in computerised non-visual parameters is important but without subverting the visual CTG interpretation which is indispensable in foreseeable future. Computerised parameters/assistance could offer helpful real-time warnings if programmed to emulate/complement the visual pattern-recognition. Recently, some articles are promoting a concept/philosophy that all FHR decelerations are due to hypoxaemia[1] which contradicts clinicians' observations and all international CTG guidelines. Clinicians are urged that chemoreflex is an indefatigable guardian of hypoxaemic fetus, consequently hypoxaemia per se does not matter – await fetal decompensation - all decelerations are due to hypoxaemia anyway – hence timing of decelerations is irrelevant (red herring) – DA is the future.[5] Obstetricians can contemplate whether optimal thresholds of DA/DC relative to clinical-risk-factors, variable labour/CTG durations and FHR-matrix can be derived realistically/reliably from retrospective data[1] (cord-gases available on skewed smaller subgroups). Should birth-attendants place all FHR decelerations into a single category, relinquishing to computerisation/DA/DC? Notwithstanding, it seems important to protect/improve the scientific visual CTG pattern-recognition given the limitations, changeability and "back-box" nature of AI.

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