A lowest oxygen level acceptable (LOLA) standard should apply to All ages

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Editor—We appreciate Habre and Petak’s attention. We write to highlight three issues that they do not address and which we believe are worthy of all anaesthetists’ attention.

First, ample concern exists about oxygen’s involvement in biological processes outside the anaesthetist’s arena. Lane theorizes that an uneven continuum exists in susceptibility or resistance to oxidative damage due to genetic variability that makes it impossible to predict who will be affected by oxidative stress exposure and when they might be most vulnerable. Non-anaesthetists like Gupta and colleagues argue contemporary oxygen research is biased for ‘hypoxia’ and oxidative stress effects over ‘the impact of oxygen on the basic biological processes of life such as transcription, DNA replication, cell cycle progression, protein folding, apoptosis, senescence, and cellular motility’ that shape health under normal and abnormal conditions. Embedded in their critique is the supposition that patients exposed to supplemental oxygen experience deviations from normoxia with potential age-independent consequences. By way of illustration, the example of bone marrow stem cell niche oxygen handling underscores how ‘middle age’ alone might not confer oxygen resistance at every relevant biological site.

Second, ‘middle age’ is ill defined in Habre and Petak’s review. While oxygen use is being re-evaluated in a number of clinical settings, we see oxygen supplementation by anaesthetists during parturition for ‘non-reassuring foetal status’ as a salient example where ambiguity exists. Here the parturient in ‘middle age’ carries the oxygen-vulnerable foetus. Hamel and colleagues suggest insufficient evidence exists to support administering oxygen to a non-hypoxic mother in order to convert her into an oxygen conduit for her stressed foetus. They urge ceasing this practice with limited objective efficacy and potential dual harmfulness until rigorous controlled trials are conducted.

Third, it is known that anaesthesia reduces oxygen consumption. So, increase tissue oxygen levels above what is necessary or can be used? Different anaesthetics disrupt respiratory chain function enough to disturb intra-mitochondrial reactive oxygen and nitrogen species (RONS) ecology. A reduction in oxygen requirement accompanied by altered RONS ecology can lead to mass action effects engendered by intra-mitochondrial hyperoxia, which can overwhelm antioxidant defences, even briefly, and further contribute to baseline oxidative damage. Because supply limitation thresholds are very low, mitochondrial oxygen tensions exceeding the threshold may contribute less to oxygen-ATP homeostasis than to pro-oxidant kinetics. Even assuming being ‘middle age’ confers oxygen resistance greater than that mustered by the very young and the very old, the logic of excessive arbitrary oxygen exposure seems unfounded simply on a physical chemistry basis.

In summary, Habre and Petak deserve credit for their contribution to reassessment of anaesthesia’s ‘oxygen culture’. Like all drugs, oxygen has specific indications, dosing requirements, and toxic potentials. As the most potent drug anaesthetists use, oxygen use deserves restraint at every age. In this spirit we advocate adoption of a ‘lowest oxygen level acceptable’ (LOLA) standard coupled with objective monitoring during anaesthesia and sedation in any setting.

Declaration of interest

None declared.

References


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