

Correspondence to:

Professor Jaideep J Pandit

St John's College

Oxford OX1 3JP

Tel: 01865 221590

Fax: 01865 220027

email: jaideep.pandit@dpag.ox.ac.uk

The isolated forearm paradox: why never a response to command in the completely unparalysed?

Jaideep J Pandit, DPhil, FRCA

Nuffield Department of Anaesthetics, Oxford University Hospitals NHS Foundation Trust,

Oxford OX3 9DU, UK

Funding: None

Conflicts of interest: None

Sanders, Gaskell et al.¹ have carefully performed an international study by an distinguished consortium that I am sure was not easy to organise. That said, the fact that apparently suitably anaesthetised patients move during isolated forearm test (IFT) after induction and tracheal intubation is well established and unsurprising. Long reported, with systematic review showing 31 previous papers with >1300 patients studied², a positive response to IFT is easily reproducible by any anesthesiologist, anywhere, at any time. There is some modest interest in the now reported response rate (~5%)¹ being lower than the aggregate of these previous studies (~40%)², but it is difficult to see what else is novel about this latest report.

Pryor and Veselis³ offer important advice for the direction of future research and I would like to add two suggestions based on ‘paradoxes’ in the observations. By paradox I mean responses that appear difficult to reconcile, given the stimulus. During the IFT, when we observe the patient moving only to verbal command but not to the obvious, ongoing and greater stimulus of surgery, we properly regard that as surprising enough to develop sophisticated theories of dysanesthesia^{4,5}, connected consciousness¹ or cognitive unbinding⁶. Yet, when a patient during IFT fails to move to verbal command, but makes other spontaneous movements that appear purposeless, we dismiss these movements as ‘reflex’ or ‘light anesthesia’. We do not seem equally surprised that a patient ‘light’ enough to move will not also respond to command. Perhaps it is time to study also this second apparent paradox in more detail, especially if brain imaging coupled with IFT is a way forward, as Pryor and Veselis suggest³.

A much more important paradox is why the finding cannot be reproduced in the non-paralysed (ie, patients who have received no neuromuscular blockade). I have already reported on the impossibility of eliciting a positive IFT response to verbal command during surgery in these circumstances⁷. Even when patients retain the ability to move spontaneously

to stimuli, they fail to respond to verbal command if unparalysed, even when they have received the same anesthetic doses and are at similar bispectral index levels as those reported in previous studies. Why this paradox? Why do things change when they are (save the isolated forearm) paralysed? This distinguished and experienced team has the infrastructure now to explore this paradox more robustly than I previously reported. So in good spirit I challenge Sanders, Gaskell et al. to harness their international collaboration and report a single case of positive IFT in an apparently suitably anesthetised but unparalysed patient, anywhere in the world. Or if they are unable to do so, to explain why this is impossible and how this paradox fits into existing theories of a positive IFT response.

References

1. Sanders RD, Gaskell A, Raz A, Winders J, Stevanovic A, Rossaint R, Boncyk C, Defresne A, Tran G, Tasbihgou S, Meier S, Vlisides PE, Fardous H, Hess A, Bauer RM, Absalom A, Mashour GA, Bonhomme V, Coburn M, Sleigh J: Incidence of connected consciousness after tracheal intubation: a prospective, international, multicenter cohort study of the isolated forearm technique. *Anesthesiology* 2017;126: 214-222
2. Pandit JJ, Russell IF, Wang M: Interpretations of responses using the isolated forearm technique in general anaesthesia: a debate. *Br J Anaesth* 2015;115 Suppl 1:i32-i45
3. Pryor KO, Veselis RA: Isolated forearm test: replicated, relevant, and unexplained. *Anesthesiology* 2017; 126:202-204.
4. Pandit JJ: Isolated forearm - or isolated brain? Interpreting responses during anaesthesia - or 'dysanaesthesia'. *Anaesthesia* 2013; 68: 995-1000.
5. Pandit JJ: Acceptably aware during general anaesthesia: 'dysanaesthesia'--the uncoupling of perception from sensory inputs. *Conscious Cogn* 2014; 27:194-212

6. Mashour GA. Cognitive unbinding: a neuroscientific paradigm of general anesthesia and related states of unconsciousness. *Neurosci Biobehav Rev* 2013; 37: 2751-9.
7. Pandit JJ: An observational study of the 'isolated forearm technique' in unparalysed, spontaneously breathing patients. *Anaesthesia* 2015; 70: 1369-74.