

Anesthesiology
1998; 88:1130
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Lippincott-Raven Publishers

Perfusion Monitoring during Radical Perineal Prostatectomy: Pulse Oximetry Is Not Reliable Monitor of Tissue Perfusion

To the Editor:—Findlay *et al.*¹ recommended using toe pulse oximetry for patients in exaggerated lithotomy position, claiming it provides "reassuring documentation throughout the procedure that distal perfusion is being achieved." Despite their disclaimer that pulse oximetry "cannot guarantee adequate perfusion in all parts of the limb," we are concerned that their recommendation may lead some to a false sense of confidence.

The algorithm in pulse oximeters is designed exclusively to determine oxyhemoglobin saturation, not blood flow. Although pulsatile flow is necessary for the pulse oximeter proper function, Lawson *et al.*² have shown that pulse oximeters are sensitive enough to continue to function with less than 10% normal flow. Ten percent normal flow to a toe tells us little about the flow to the muscle masses of the lower extremity and the potential for a compartment syndrome.³

Further, Graham *et al.*⁴ demonstrated with replanted and revascularized fingers that the sudden loss of the plethysmographic signal may indicate arterial occlusion and that a continuous slow decrease in pulse oximetric saturation may indicate diminished tissue perfusion as a result of venous occlusion. However, in the case of successfully replanted toes, they were never able to obtain a pulse oximeter reading.

Therefore, with the pulse oximeter on a toe, there may be adequate flow with no pulse oximeter reading or markedly reduced flow with satisfactory pulse oximetric output. We do not find this at all reassuring.

We would consider a sudden change in the toe pulse oximeter reading or a large discrepancy between the toe and finger pulse oximetry values as cause for concern and further investigation, but we do not find normal pulse oximetry reassuring regarding flow and perfusion. Unfortunately, we still await a reliable, noninvasive, widely available monitor of tissue perfusion.

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In Reply:—We are aware of the issues raised by both correspondents regarding the amplification potential of currently used pulse oximeters and also that the relationships between flow in different regions of an extremity, blood pressure, and the pulsatile flow required to generate a pulse oximeter response are not simple. Research is currently underway at this institution to investigate some of these matters. However, even with the limitations of pulse oximetry in this circumstance, our technique identifies events (loss of a previously present waveform) that imply markedly decreased perfusion and require a response from the monitoring anesthesiologist (in our experience, increasing the blood pressure returns the waveform). That we identify these events would seem to us better than identifying no events at all—the situation if no monitor was used.

Dr. Sessler proposes an alternative monitoring method involving

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(Accepted for publication December 9, 1997.)

the use of a blood pressure cuff on the ankle. We would be interested in hearing how this fares when used in practice.

What is required, of course, is a clinical study documenting the incidence of complications attributable to poor perfusion during surgery in the exaggerated lithotomy position and whether that incidence is influenced by the use of monitoring; until this is done, we merely speculate.

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(Accepted for publication December 9, 1997.)