Of course, in many cases, neither the medical/anaesthetic history nor the preoperative examinations raise suspicions for an arrhythmogenic syndrome. A characteristic case is the one reported by Hirata and colleagues, regarding a surgical patient with undiagnosed Sick Sinus Syndrome and normal preoperative cardiac examinations, including a Holter electrocardiogram. The syndrome was unveiled after induction of general anaesthesia and was confirmed a few months after operation by a diagnostic new Holter electrocardiogram.

In patients with unexplained, suspicious intraoperative arrhythmias, even if they resolved without further complications, postoperative 24 h haemodynamic monitoring and further cardiological investigation, although associated with increased costs, would probably be useful in revealing an arrhythmogenic syndrome. If a sudden perioperative death occurs, postmortem investigation and—if indicated—familial genetic screening should be performed. In these cases, the anaesthesiologists may also play a significant role in announcing the death, explaining, informing, and even guiding the family members towards investigations which may be lifesaving for them, if a hereditary syndrome is diagnosed and thus treated early.

**Declaration of interest**

None declared.

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\( F_{O_2} \) and studies on oxygenation during one-lung ventilation

Editor—We read with interest the study by Rozé and colleagues comparing the effects of two ventilation strategies on oxygenation during one-lung ventilation (OLV).

Although not explicitly stated, the authors seem to have used variable levels of \( F_{O_2} \) across subjects during OLV. However, to study the effects of changes in ventilation strategy (or any other intervention) on oxygenation during OLV, it may not be advisable to vary \( F_{O_2} \) across subjects and present data as \( PA_{O_2}/F_{O_2} \). It rather may be helpful to use a constant and high \( F_{O_2} \) in all patients and present data as \( PA_{O_2} \).

Why is it better to use not only a constant but also a high \( F_{O_2} \) (>0.8) and present data as \( PA_{O_2}/F_{O_2} \)? This is because the relationship between \( PA_{O_2}/F_{O_2} \) and \( F_{O_2} \) is not linear and may vary considerably with \( F_{O_2} \). The variation would be most apparent in patients with large shunts and ventilation/perfusion abnormalities, pathologies prevalent in the thoracic surgical patient population. A low \( F_{O_2} \) in patients with low ventilation/perfusion ratio may, for example, increase venous admixture. Thus, using variable levels of \( F_{O_2} \) in a patient population with respiratory disease and different shunt fractions may generate excess variation in \( PA_{O_2}/F_{O_2} \) values unrelated to the intervention. The cross-over design in this study may have averted gross variation with respect to the intervention but does not rule out excess interindividual variation.

Why is it better to use not only a constant but also a high \( F_{O_2} \) (>0.8) and present data as \( PA_{O_2}/F_{O_2} \)? This is better because while using high \( F_{O_2} \) even small changes (increase or decrease) in shunt fraction, induced, for example, through the intervention under study, would predictably lead to large changes in \( PA_{O_2} \). While using low \( F_{O_2} \) similar changes in shunt fraction may lead to comparatively smaller changes in \( PA_{O_2} \) and thus less chances of obtaining statistically significant results. This can be readily appreciated by studying the iso-shunt lines, the graphic interrelationship between \( PA_{O_2} \), shunt, and \( F_{O_2} \).

During clinical OLV, however, we too advocate using low \( F_{O_2} \) compatible with sufficient oxygenation.

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None declared.

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**Reply from the authors**

Editor—We thank Karzai and Klein for their interest in our article. We totally agree with them regarding the interpretation of the \( PA_{O_2}/F_{O_2} \) ratio. It is important to clarify that this
relationship is not linear.2 We used a high FIO2 ratio in this study (mean 80%, sd 15) in order to avoid hypoxaemia which could have modified the patient’s FIO2 during the protocol. Almost all measurements of PaO2 during the cross-over protocol were at the same high FIO2. We did not choose FIO2 of 100% for all the patients as it was not our daily practice. According to our results, we use low FIO2 compatible with sufficient oxygenation with a reduced tidal volume of 5 ml kg⁻¹ of ideal body weight with a higher PEEP of 9 cm H2O in non-obstructive patients.

In our clinical practice, the occurrence of clinically relevant hypoxaemia during one-lung ventilation remains low and easily treatable with oxygen administered with a continuous positive airway pressure of 5–10 cm H2O to the non-dependent lung without interfering with surgery.3

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Ultrasound-guided pulsed radiofrequency treatment of myofascial pain syndrome: a case series

Editor—Myofascial pain syndrome is characterized by muscle pain, tenderness, and fatigue that are often caused by hyperirritable trigger points in the muscle.1 Treatment options include injection into the trigger point with local anaesthetics, steroids, or botulinum toxin A.2 3 The pain relief provided is generally short-lived, rarely lasting beyond 6–12 weeks.2 4–6 As a result, outcomes can be disappointing and the condition can interfere significantly with quality of life. Pulsed radiofrequency (PRF) treatment is a well-established procedure and has been previously reported in the treatment of myofascial trigger points.4 5 The author presents the first report of ultrasound-guided PRF treatment of refractory myofascial pain with durable analgesia at 6 months after treatment.

A prospective audit of patients with refractory myofascial pain who underwent ultrasound-guided PRF treatment was conducted. Patients with cervicothoracic or abdominal wall myofascial pain with palpable trigger points who were non-responders to multiple steroid trigger point injections were included.

The trigger point was palpated and the skin over the tender area was marked.

Thereafter, the marked area was scanned in the sagittal and coronal plane using a high resolution (7–12 MHz) linear array transducer probe (S Nerve, Sonosite, USA), initially to identify the underlying muscle (trapezius or rectus abdominis) and then to identify any visible changes in the muscle corresponding to the marked area on the skin. After infiltration of the skin with 1% lidocaine, a 20 G 50 mm needle with a 5 mm tip (RF StimJect Cannula, Neuro Therm, Wilmington, MA, USA) was inserted in plane with the ultrasound probe. On entering the visualized area, patient response was noted (needle sign: reproduction of the patient’s pain but at a greater intensity).5 Thereafter, the altered area was treated with PRF lesions at 42° for 5 min and then 3 ml of 0.5% levobupivacaine was injected into the trigger point. If the patient had more than one trigger point, this procedure was repeated.

Response to treatment was evaluated in post-procedure telephone review at 1 and 6 months. Numerical rating scale pain scores and Euro QoL 5 D–3L quality of life questionnaire scores were collated from two points: before treatment and at 6 months post-treatment. Twelve patients had ultrasound-guided PRF treatment of trigger points in the 18 month period. Eight patients (66%) reported above 50% pain relief and one patient reported 40% improvement at 6 months follow-up. Three patients (25%) showed no benefit (Table 1). Euro QoL 5D–3L scores showed an improvement in quality of life in the nine patients who showed an improvement at 6 months. Numerical rating scale pain scores showed a decreasing trend in nine patients. The median percentage pain relief was 59% at 6 months telephonic review.

There have been previous reports of the effectiveness of PRF in the management of myofascial pain. Bevacqua and Fattouh4 first reported PRF in the treatment of myofascial pain. However, they reported extended analgesia lasting ‘weeks to months’ and the procedures were performed utilizing a landmark (blind) technique. Tamimi and colleagues5 in 2009 reported the use of PRF in a case series. Although they reported extended (>6 months) benefits, their patients also received steroids after blind PRF treatment. Ultrasound scanning enhances both accuracy and safety profile of trigger point injections. This has greater significance when PRF is considered. The needle used has a larger gauge and there is, potentially, an increased risk of pneumothorax (cervicothoracic trigger) and bowel perforation (abdominal wall trigger). This is more so when the patients are either obese or underweight. Ultrasound scanning definitely allows the placement of the needle tip in the underlying muscle, which, in turn could enhance the success of this technique.

The precise mechanism of the action of PRF remains unclear, although there is some evidence for a neuromodulatory effect.7