relationship is not linear. 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 H\(_2\)O 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 H\(_2\)O to the non-dependent lung without interfering with surgery.

**Declaration of interest**

None declared.

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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. Treatment options include injection into the trigger point with local anaesthetics, steroids, or botulinum toxin A. The pain relief provided is generally short-lived, rarely lasting beyond 6–12 weeks. 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. 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). 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 5D-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 Fattouh 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 colleagues 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.
This audit has inherent weakness including a small sample size and lack of a control group. However, this report highlights the advantages of ultrasound guidance in enhancing the accuracy and safety profile of a minimally neuro-destructive technique. Further randomized controlled trials are needed to confirm the efficacy of this treatment modality.

Declaration of interest

None declared.

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Sugammadex in rocuronium anaphylaxis: dose matters

Editor—Anaphylaxis is a known complication of rocuronium and treatment with sugammadex has raised questions regarding its role and dose.1–4 We report a case that indicates that its efficacy in this role is dose-dependent.

A 44-yr-old morbidly obese woman required surgery for an incisional hernia associated with re-siting of her colostomy. She had had many surgical procedures, in relation to her spina bifida. Her medical history also included chronic renal failure, hypertension, a renal stone, and an atonic bladder.

Three months earlier, she had been screened for allergies after developing angio-neurotic oedema after a procedure on her bladder. The screen identified latex allergy, but no response to neuromuscular blocking agents.

Surgery was planned with total latex exclusion and a rapid sequence induction. After propofol 250 mg, rocuronium 80 mg, and sufentanil 10 μg, the train of four disappeared and tracheal intubation was performed within 2 min. No antibiotics were administered.

Immediately, the arterial pressure decreased to 50/28 mm Hg, the heart rate increased to 130 beats min−1, and the inflation pressure increased. The diagnosis was anaphylactic shock, and oxygen 100%, a rapid infusion of 500 ml of crystalloid, and i.v. epinephrine 0.1 mg were given.

Rocuronium was suspected, and it was decided to give sugammadex 1200 mg (12 mg kg−1). Immediately, the arterial pressure increased to 50/28 mm Hg, the heart rate increased to 130 beats min−1, and the inflation pressure increased. The diagnosis was anaphylactic shock, and oxygen 100%, a rapid infusion of 500 ml of crystalloid, and i.v. epinephrine 0.1 mg were given.

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Blood samples for histamine, tryptase, and for specific IgE levels were obtained and repeated 1 h later.

Hypotension and tachycardia returned, together with bronchospasm and desaturation to 85% SpO2. Six additional

| Table 1 Patient characteristics and previous treatment received for myofascial pain syndrome. M, male; F, female; Diag., diagnostic; TPI, trigger point injection; A, abdomen; CT, cervicothoracic; NRS, numerical rating scale |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Case | Sex | Age (yr) | Duration of symptoms (yr) | Previous treatments for trigger points | Site | Number of triggers treated | NRS baseline | NRS 6 months |
| 1 | F | 34 | 5 | Endometrial laser, Diag. laparoscopy, steroid TPI × 3 | A | 2 | 8 | 0 |
| 2 | F | 39 | 4 | Hysterectomy, steroid TPI × 5 | A | 2 | 8 | 2 |
| 3 | M | 48 | 3 | Steroid TPI × 3 | A | 3 | 8 | 2 |
| 4 | M | 49 | 6 | Steroid TPI | A | 4 | 8 | 8 |
| 5 | F | 50 | 5 | Diag. laparoscopy, steroid TPI × 1 | A | 2 | 9 | 9 |
| 6 | M | 45 | 4 | Steroid TPI × 4 | A | 2 | 7 | 4 |
| 7 | F | 40 | 5 | Steroid TPI × 3 | A | 2 | 8 | 1 |
| 8 | F | 69 | 3 | Steroid TPI | A | 3 | 6 | 2 |
| 9 | M | 66 | 5 | Steroid TPI × 3 | CT | 1 | 7 | 1 |
| 10 | F | 42 | 2 | Steroid TPI × 2 | CT | 1 | 7 | 2 |
| 11 | F | 59 | 3 | Steroid TPI × 6 | CT | 2 | 7 | 7 |
| 12 | M | 32 | 3 | Steroid TPI × 2 | CT | 1 | 7 | 2 |