their study had what can be considered serious respiratory depression and apnoea. Unsurprisingly, these events were more evident in the elderly group, which overall received lower doses of remifentanil; however, some younger age group subjects also experienced respiratory depression, again at a relatively low dose of remifentanil. The authors’ definition of an adverse event was related to the respiratory depression we observed cannot be considered trivial by any means.

At least in part, our investigation was motivated by the increasing use of bolus dose remifentanil in the USA. Bolus injection of remifentanil in various clinical settings, for example analgesia for eye blocks, awake laryngoscopy, and shock wave lithotripsy, is commonplace. Our study aimed to better understand and define this practice.

The UK data sheet indicates that remifentanil may be administered as a bolus of 0.5–1.0 μg kg⁻¹ min⁻¹ over not less than 30 s during induction of anaesthesia. Even under these controlled conditions, this practice has not found wide acclaim because of the associated incidence of hypotension and bradycardia. Where remifentanil is used, a titrated infusion is increasingly preferred. A bolus of remifentanil is not recommended in spontaneously breathing anaesthetized patients or in sedated ICU patients. Indeed, the product licence for remifentanil in the ICU stipulates remifentanil infusion for mechanically ventilated patients only. Whereas we would advocate use of a remifentanil infusion in a variety of settings and different patient groups, particularly in spontaneously breathing patients where lack of accumulation and titratability can make it a superior choice of analgesia, its use in bolus form is unpredictable and associated with a host of uncontrollable and undesirable effects.

Overall, the conclusions reached by Egan and colleagues are not reflective of their study results, and should do little to convince the readership that bolus administration of remifentanil is a safe and effective means of analgesia in spontaneously breathing patients.

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Editor—We thank Dr Mallick and colleagues for their comments regarding the use of remifentanil by bolus injection, as discussed in our manuscript. They correctly underscore the potential dangers of the technique.

As noted in our manuscript, the primary side-effect of concern in association with remifentanil bolus injection is respiratory depression, again at a relatively low dose of remifentanil. Rapid onset opioids like remifentanil are especially troublesome in this regard because the carbon dioxide ventilation–response curve (i.e. the relationship between minute volume and PaCO₂) is altered before the patient’s PaCO₂ rises sufficiently to sustain ventilatory drive.

Our manuscript was not intended to minimize these risks. On the contrary, the study was intended to provide a scientific foundation to begin understanding and characterizing these risks. While the respiratory depression observed in all subjects in our study was easily managed with simple clinical manoeuvres (i.e. prompting to breathe and the administration of supplemental oxygen), some subjects, particularly older ones, exhibited substantial respiratory depression even at low doses. The degree of respiratory depression we observed cannot be considered trivial by any means.

As noted in the original manuscript, from a clinical perspective, the ‘take home’ messages from our study are: (i) that bolus dose remifentanil does in fact produce substantial respiratory depression; (ii) that this respiratory depression is highly variable and is typically more serious in older subjects; (iii) that the respiratory depression can be managed with simple clinical manoeuvres; (iv) that practitioners should be expert at the administration of remifentanil by infusion before attempting bolus injection techniques; and (v) that practitioners administering remifentanil by bolus injection should be experts at the recognition of inadequate ventilation and airway management.

Intraoperative i.v. morphine reduces pain scores and length of stay in the post anaesthetic care unit after thyroidectomy

Editor—Postoperative pain after thyroid surgery may be important especially in the first few hours after surgery. The analgesic efficacy of different medications including non-steroidal anti-inflammatory drugs possibly in combination with paracetamol, oral opioids and regional and local anaesthesia, have been described after thyroidectomy.


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consisted, for the control group, of an i.v. injection of saline 10 ml and, for the morphine group, an injection of morphine 0.1 mg kg$^{-1}$ diluted by an equivalent amount (10 ml) of saline. The treatment was injected by a physician not participating directly in the patient’s care, while the anaesthetist in charge of the patient was blinded to the randomization. Inhalational anaesthesia was maintained until the last skin stitch. All patients were extubated in the PACU. Patients were then asked to rate their pain according to a visual analogue scale (VAS, 0–100 mm). When the VAS score was >40, i.v. morphine by titration (2 mg increment, 5 min interval) was started and pain was assessed every 5 min until relief was obtained (VAS <40). The length of stay in the PACU was decided by a physician blinded to the randomization. I.v. acetaminophen was repeated every 6 h for the first 24 h. In the ward, subcutaneous morphine was given every 6 h if the VAS was >40.

Four patients were withdrawn from the study: two for prolonged surgery because of cancer; one because of surgical haematoma requiring drainage; and one for acute respiratory failure attributable to bilateral recurrent laryngeal nerve damage. No patient had delayed extubation or a ventilatory frequency <9 bpm during their stay in the PACU.

The initial mean (sd) postoperative pain scores in the PACU were lower in the morphine group (35 (10) mm) compared with control (55 (15) mm); ($P<0.05$). The request for morphine, the duration of morphine titration, and the total amount of morphine given in the PACU was less in the morphine group than in the control group ($P<0.05$). However, the cumulative amount of morphine given (intraoperative + PACU) was not different between groups. The length of stay in the PACU was shorter in the morphine group (103 (30) min) than in the control group (147 (35) min; $P<0.05$). In the surgical ward, maximum pain scores, and the incidence and amount of morphine required were not different between groups. The incidence of nausea and vomiting during the first 24 h was similar (about 45%) in both groups.

This study shows that morphine given before the end of surgery was effective in controlling postoperative pain in the PACU in patients undergoing thyroidectomy. Morphine requirements, the necessity for morphine titration, and the length of stay in PACU were reduced. However, the incidence of opioid-related side-effects in the PACU and in the surgical ward was unchanged. After thyroid surgery, nausea and vomiting may be related to the surgery itself, and postoperative pain confounded by post-intubation sore throat.

In summary, intraoperative use of morphine i.v. 0.1 mg kg$^{-1}$ is a useful method of decreasing immediate postoperative pain scores and the length of stay in the PACU after total thyroidectomy, without increasing the incidence of opioid-related side-effects.

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