fed into the esophagus. The laryngoscope was then removed and the PLMA railroaded into position using the digital technique with a midline approach. On this occasion, ventilation was easy with no air leakage and the bite block was correctly located between the teeth. The GEB was removed whilst holding the PLMA. Subsequent passage of a gastric tube was easy.

By guiding the PLMA tip towards the hypopharynx the GEB ensures that the PLMA is correctly positioned. The GEB may also help prevent impaction in the back of the mouth and should prevent the cuff folding over. Drolet and Girard[1] recently described a similar technique using a gastric tube. We speculate that the GEB is a better guide than the gastric tube because of its greater stiffness.

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Systemic effects of subcutaneous and topical epinephrine administration during burn surgery

To the Editor:

Subcutaneous injection (tumescence) of burn wounds and skin graft donor sites with epinephrine-saline solution (1:500 000, 2 $\mu g \cdot mL^{-1}$) in conjunction with topical epinephrine dressings (1:33 33, 30 $\mu g \cdot mL^{-1}$) reduces blood loss during tangential burn wound excision.[1] Despite the demonstration of elevated levels in the blood, the cardiovascular effects of administered epinephrine during anesthesia have not been quantitatively described in the anesthesia literature.[2,3] In this pilot study, we performed a semi-quantitative analysis of the incidence and severity of intraoperative cardiovascular adverse events to generate hypotheses and to guide a prospective study of anesthesia for this operation.

A retrospective cohort analysis of all anesthetic and surgical records of 52 consecutive patients (80 operations) admitted to the Ross Tilley Burn Centre between December 30, 1998 and June 30, 1999 was performed. Systolic blood pressure (SBP), heart rate (HR), and electrocardiogram data were collected in the 15 min (baseline) period prior to epinephrine injection and for five-minute intervals over a period of 60 min postepinephrine administration.

The mean age of the study cohort was 46 yr (95% CI, 42–49), and the mean % total body surface area burn was 19% (95% CI, 16–22). The majority of the patients were male (69%). The most frequent (mode) ASA physical status classification was II. In the 80 operations the mean dose of subcutaneous epinephrine injected was 5.6 mg (95% CI, 3.3–6.8). In 62 of 80 cases there was an increase in SBP of less than 15% from the pre-injection baseline. In 18 of 80 cases an increase in SBP of greater than 15% occurred (mean 45.3%, 95% CI, 35.0–55.6). Correlation between epinephrine dose, whether subcutaneous (Pearson correlation coefficient $r^2 = 0.003$) or topical ($r^2 = 0.010$) and % change in SBP was poor (Figure). In 6/18 cases with an increase in SBP of greater than 15% there was also a mean increase in HR of 11 $beats \cdot min^{-1}$ (95% CI, 3–20). Transient ST segment depression occurred in 1/18 patients. There were no intraoperative dysrhythmias.

To summarize our findings, administration of subcutaneous and topical epinephrine during burn surgery was associated with a low incidence of intraoperative cardiovascular sequelae. There was a poor correlation between dose of epinephrine and intraoperative changes in blood pressure. Our results may reflect desensitized beta-receptor responses following burn injury, which have been demonstrated in rats[4] and in human *ex vivo* lymphocytes.[2] Alternatively, they may reflect varying depths of anesthesia in the study cohort. A prospective study will investigate the interaction between depth of anesthesia and cardiovascular responses during burn surgery.

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Non-pharmacological relief of acute pain following total abdominal hysterectomy

To the Editor:

Transcutaneous electrical nerve stimulation (TENS) has been used effectively to reduce postoperative pain.[1,2] Unfortunately, TENS is seldom available to the anesthesiologist in the operation theatre. We undertook a study to observe the efficacy of peripheral nerve stimulator (PNS) induced electrical stimulation in comparison to TENS as a mode of postoperative pain relief in patients undergoing elective total abdominal hysterectomy for the first 24 hr after surgery since both devices can deliver a similar configuration of current intensity and frequency.[3,4] Forty-five ASA I and II patients (mean age 50.6 ± 5.03 yr, mean weight 50.21 ± 6.39 kg) were selected for this study. The patients were randomly divided into three groups of 15 patients each. Group I received Sham TENS (with reversed electrodes), Group II received conventional TENS (frequency 100 Hz, intensity 40–60 mA) and Group III received electrical stimulation by PNS (frequency 100 Hz, intensity 10–20 mA) for pain relief. Each period of monophasic rectangular pulsed electrical stimulation[3,4] lasted for 20 min. This was administered on arrival in the recovery room and then eight and 16 hr later in the ward. Twenty minutes of TENS stimulation administered every eight hours has been reported earlier for relief of postoperative upper abdominal pain.[1] All patients received a uniform premedication, general anesthetic technique and postoperative care. Before applying the dressing, para-incision electrodes were applied to deliver electrical stimulation.

Pain relief was graded as good = no pain, satisfactory = bearable pain not requiring rescue analgesia, unsatisfactory = unbearable pain requiring rescue analgesia (tramadol 2 $mg \cdot kg^{-1}$). It was observed that 66.66% and 73.33% patients of Groups II and III respectively had good postoperative analgesia during the study period (Table). On the contrary, 86.66% of the patients in the Sham TENS group had unsatisfactory pain relief. The mean doses of tramadol per kilogram body weight in the first 24 hr was 1.193 $mg \cdot kg^{-1}$ and 0.828 $mg \cdot kg^{-1}$ in Groups II and III respectively, compared to 3.680 $mg \cdot kg^{-1}$ in Group I patients. This difference between Groups II and III, compared to Group I was statistically significant (unpaired t test, $P < 0.05$). 73.33% and 80% of patients in Groups II and III respectively expressed their willingness to opt for a similar technique for postoperative pain relief in the future. We conclude that electrostimulation delivered with a PNS can provide good pain relief in the postoperative period in patients undergoing open abdominal hysterectomy. Pain relief was comparable to conventional TENS.

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TABLE Duration of satisfactory analgesia (hr)

Time (hr)	*0–6*		*6–12*		*12–18*		*18–24*	
	No. of Pts	*%*	*No. of Pts*	*%*	*No. of Pts*	*%*	*No. of Pts*	*%*
Group I (n = 15 (Sham)	0	0.00	0	0	0	0	0	0
Group II (n =15) (TENS)	2	13.33	1	6.66	2	13.33	10	66.66
Group III (n = 15) (PNS)	2	13.33	1	6.66	1	6.66	11	73.33

No. = number; Pts = patients; TENS = trancutaneous electrical nerve stimulation; PNS = peripheral nerve stimulator.