The BIS monitor is still a kind of "black box". Descriptions of the algorithm are sparse and, in their details, contradictory.[2,3] Recently a part of the BIS algorithm was made public:[4] burst suppression ratios > 40% are invariably and linearly correlated with the BIS (r = -1), according to the equation: BIS = 50 – burst suppression ratio / 2.

Conversely, BIS values below 30 are linearly correlated with the burst suppression ratio. Therefore, the reported BIS value of 8 can be directly translated into a burst suppression ratio of 84% according to the above equation.

A BIS value of 8 is not related to phase coupling, nor to bispectral analysis, but is just an effect of the burst suppression ratio.

Thus, the observation of Mérat *et al.* is not BIS-specific but merely secondary to the occurrence of a burst suppression pattern associated with cerebral ischemia. In principle, such extensive burst suppression pattern can easily be identified by visual inspection of the electroencephalography and does not require processed monitoring like the BIS.

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Reply:

We agree with Dr. J. Bruhn concerning the poor interest of the bispectral index (BIS) for values below 30. However our purpose wasn't to say that BIS always reflects the depth of anesthesia. We solely think that an unexpected modification of the BIS value, without modifications of anesthesia, is abnormal. In such a case, when the BIS decrease is unrelated to anesthesia, we suggest that the BIS may be useful to detect severe cerebral ischemia, whatever the BIS value.

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Injury to the liver and spleen after diagnostic ERCP

To the Editor:

Endoscopic retrograde cholangiopancreatography (ERCP) is an invasive procedure performed to diagnose and treat pancreatic and biliary disease. In approximately 5%–10% of cases, the procedure itself causes adverse events.[1] Splenic injury is a relatively rare, but increasingly reported complication of endoscopic procedures.

A 42-yr-old man was referred for diagnostic ERCP because of intermittent epigastric pain. His past medical history was unremarkable. Abdominal sonography revealed cholecystolithiasis with a markedly dilated common bile duct. ERCP was performed with relative ease. The cholangiogram showed cholecystolithiasis, a distal common duct stricture, and several stones within the dilated prestenotic portion of the duct. The patient complained of diffuse abdominal pain soon after the procedure. Vital signs and physical examination were unremarkable.

Twenty minutes after, the patient was hypotensive (systolic blood pressure 70 mmHg), but was otherwise well. Intravenous saline was administered, and the blood pressure returned to normal. One hour later, hypotension recurred, and the patient's hematocrit was found to be 18%. After resuscitation with blood and crystalloid, a hemoperitoneum was found upon opening the abdominal cavity (2.0 L). Exploration revealed a splenic laceration as the source of bleeding. Other organs were normal. Conservative surgery was performed and the postoperative course was uneventful.

Several cases of splenic injury have been described after colonoscopy, and rare cases of splenic rupture after ERCP have been published. Splenic rupture during routine ERCP was reported in 1988.[2] A possible mechanism is the avulsion of the splenic vessels secondary to bowing of the endoscope in the stomach during attempts to pass the large endoscopes through the narrowed duodenum or while attempting to cannulate the papilla while in the "long" position.[3]

Splenic injury during endoscopy is a real possibility and may occur even when the procedure is not technically difficult. Delayed diagnosis is a characteristic feature in many cases. Although the signs and symptoms are the same as for splenic rupture from non-endoscopic causes, splenic injury needs to be considered if sudden abdominal pain, hypotension, or drop in hematocrit value occur after diagnostic or therapeutic ERCP. The diagnosis requires a high

index of suspicion, even when symptoms begin days after ERCP. Although the diagnosis has been made by ultrasonography, computed tomography, laparoscopy and angiography, laparotomy is often needed for diagnosis and treatment.

Injury to the spleen can occur after upper gastrointestinal endoscopy also. Significant symptoms at the time of endoscopy may be absent, and recognition of the injury and its severity are often delayed. In summary, splenic injury should be considered whenever cardiovascular instability or signs of occult hemorrhage develop following endoscopic procedures.

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Use of a remifentanil PCA for a patient with multiple rib fractures

To the Editor:

A 48-yr-old woman, weighing 55 kg, fell off her horse and was admitted to our High Dependency Unit with fractures of L1–L3 transverse processes, fractured left second to eighth ribs and hemopneumothorax requiring a chest drain and regular chest physiotherapy.

The patient was given regular oral paracetamol 1 g six hourly and tramadol 50 mg at six hourly intervals and started on a morphine patient-controlled analgesia (PCA) pump, programmed to give 1 mg boluses with a five-minute lockout time. However, the patient complained of bad dreams, paranoia, drowsiness and nausea while using it. In view of this the morphine in the PCA was changed to remifentanil on the fourth day. A concentration of 25 $\mu g \cdot mL^{-1}$ was prepared and administered as a PCA pump with boluses of 25 µg (approximately 0.5 $\mu g \cdot kg^{-1}$) using a five-minute lockout time. On day six a continuous infusion of 50 $\mu g \cdot hr^{-1}$ (approximately 1 $\mu g \cdot kg^{-1} \cdot hr^{-1}$) was added as a background infusion to the PCA. The patient reported feeling less nauseated, and claimed the bad dreams and paranoia had stopped. The daily mean sedation and nausea scores improved while on the remifentanil PCA.

No bradycardias or desaturations were observed in our patient. We suggest that the use of remifentanil as a PCA be considered in patients where rapid control of analgesia is required, e.g., for chest physiotherapy, and the accumulative sedative and respiratory depressant effects of longer-acting opiates are undesirable.

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TABLE Daily pain, sedation and nausea scores with morphine and then remifentanil

	←...*Morphine*...→				←... *Remifentanil*...→			
Day	*1*	*2*	*3*	*4*		*5*	*6*	*7*
Mean pain score	0.2	0.65	2.38	2.33	1.38	0.777	1.05	0.83
Mean sedation score	1	0.71	1.91	1.4	0.285	0.5	0.1	0.66
Mean nausea score	0.2	0.222	0.21	0	0	0.08	0	not recorded
Total analgesia used	15 mg	26 mg	25 mg	21 mg	600 µg	1010 µg	1925 µg	1200 µg

Pain score	*Sedation score*	*Nausea score*
0 = no pain at rest/movement	0 = awake and alert	0 = no nausea
1 = slight pain on movement	1 = awake but drowsy	1 = mild nausea
2 = intermittent pain at rest moderate pain on movement	2 = asleep easily roused	2 = moderate nausea
3 = continuous pain at rest	3 = asleep difficult to rouse	3 = severe nausea
4 = severe pain on movement	4 = unrousable	4 = retching/vomiting