The history of epilepsy is littered with treatments that never stood the test of time. In the 19th century, Russell Reynolds complained that virtually every substance that was capable of passing through the gut of a human being had, at some time, been used to treat epilepsy. It is less well recognized that a similar history exists for physical treatments. Marshall Hall and Brown-Séquard were proponents of the reflex theory of epilepsy, which stated that the medulla was the seat of epileptic seizures. Bizarre treatments were used such as tracheostomy, cauteration and the application of stimulant substances to the skin. In this century, cerebellar stimulation was first introduced to reduce spasticity, and then abandoned as a treatment for epilepsy in the mid-1980s when a clinical trial concluded (probably incorrectly) that it was ineffective. The Food and Drug Administration approved vagus nerve stimulation (VNS) in 1997, and over 8000 patients have now been treated. People are now much better informed and some of this momentum may be driven by patient advocacy and the internet. Brain stimulation for epilepsy has expanded greatly over the last decade at a time when it is perceived that the market for new drugs may have become saturated.

Physicians have tended to be slower than neurosurgeons to accept VNS. Most epileptologists are familiar with the feedback loops of the hippocampus but only dimly remember the noradrenergic projections of the nucleus of the tractus solitarius. Why on earth, it is asked, should intermittent stimulation of the proximal part of the left vagus nerve help epilepsy? As it happens, the theoretical and experimental basis for VNS is quite strong, stronger, it could be argued, than for some anti-epileptic drugs. Phenytoin was used for 40 years before it was found to inactivate open sodium channels, a mechanism that might explain a preferential action against rapidly firing neurones. Valproic acid is an organic solvent; anti-convulsant properties were discovered purely by chance and, to this day, the mechanism of action remains very uncertain. Hughlings Jackson famously defined epilepsy as a localized discharge of grey matter. Human seizures are accompanied by electrical discharges that are both highly synchronous and very rhythmic. Brain stimulation might disrupt this hypersynchrony and rhythmicity and so exert a therapeutic effect. The classic work of Morruzzi and Majoun showed that desynchronization of the cortical EEG occurred with stimulation of the brainstem reticular activating system. A similar effect occurred with stimulation of the afferent fibres of the vagus nerve, and this was found to have a therapeutic effect in various animal models of seizures. These have included the focal application of strychnine, cobalt and penicillin, maximal electroshock, pentylenetetrazole and also amygdala kindling. Chronic vagus nerve stimulation in humans produces changes in blood flow in the thalamus, an area of brain important for production of brain rhythms in general, and the synchronization of epileptiform discharges in particular.

This book is a timely and useful summary of current knowledge. It contains detailed descriptions of the surgical technique for implanting the device and appropriate illustrations of the surgical anatomy. This is combined with very practical instructions on how to use the device. Indeed, the overall feel is that of a well-written and excellently illustrated instruction manual. The cover tells us that it is written to provide the attending neurologist with step-by-step information on this exciting and new method of treating epilepsy, and the Foreward reassuringly refers to watershed events in the history of seizure therapy. Fortunately, this breathless prose is not continued in the body of the text. A studied avoidance of promotional material is betrayed, however, by the illustrations that carefully include the name of the manufacturer on all engravings of the prosthesis in question. The price seems high for such a slim volume and the scientific content, which is available in recent journal reviews, is likely to go out of date very quickly. The book has modest ambitions and is more likely to be found in the bag of the Hospital Representative than on the University bookshelf.

More importantly, the book does not address important outstanding issues. It is worrying that no specific seizure type or syndrome has emerged which is particularly amenable to treatment by VNS. Recent experimental studies have
suggested that stimulation of other cranial nerves, e.g. the sensory component of the trigeminal nerve, is also effective against seizures in animal models of epilepsy. It would greatly undermine the position of VNS if the therapeutic effects were found to be a non-specific consequence of arousal. As with drug studies, the pivotal clinical trials of vagus nerve stimulation have suffered from the blight of regulatory authorities. A 30% responder rate against placebo tells us nothing as to whether VNS is better than standard drug treatment. When it comes to be assessed by people who are not pioneers and enthusiasts the benefits may turn out to be extremely modest. Will VNS go the way of all flesh and, like cerebellar stimulation, sink without trace? Probably not. Because seizures in humans are accompanied by hypersynchronous rhythmic electrical discharges, brain stimulation as a method of treatment is conceptually important. Interesting reports have appeared of more rational approaches using temporal lobe or deep brain stimulation. The use of brain stimulation to treat other conditions such as Parkinson’s disease and depression is widening the remit of functional neurosurgery. The current vogue for VNS may falter but it is likely to be a catalyst for new research and the development of other treatments for drug resistant epilepsy.

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