As the Gut Churns: Feeding Challenges in the Head-Injured Patient

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Even though it was recognized by Drew et al in 1947 that rapid nutritional deterioration occurred after craniotomy, the approach toward nutrition support for the head-injured patient has been relatively slow compared with that for other critically ill populations. The reasons for this are unclear. Perhaps it is due in part to the fact that this population of patients is more likely to be adequately nourished prior to the acute neurologic event, which leads to the perception of a stable nutritional status.

Attempts at enteral feeding have been hampered by the high degree of gastric feeding intolerance in the head-injured population. In addition, there were also beliefs that total parenteral nutrition (TPN), with its hyperosmolar solutions and high volumes, could be deleterious to brain-injured patients because of concerns over the possible progression of cerebral edema. Thus, there were few attempts at feeding, either enterally or parenterally, until the classic study by Rapp and colleagues demonstrated not only the safety of TPN in head-injured patients, but also improved survival compared with those patients who were fed enterally and were unable to tolerate intragastric feedings.

In this issue of JPEN, Weekes and Elia relate some interesting observations about head-injured patients. Because of the small number of patients in this report, one must be very careful of making sweeping conclusions about this population. Although some trends are noteworthy, they require confirmation in additional trials with use of larger sample sizes. In the present study, two sets of measurements were performed. The first battery was performed on six patients between days 3 and 5 postinjury and included measurements of indirect calorimetry continuously at the bedside, body composition, urinary nitrogen excretion, gastric emptying studies by the phenol red technique, and collection of random samples of saliva during fasting and feeding to detect glucose concentration. A second set of measurements, including indirect calorimetry and body composition, was performed on four patients between weeks 2 and 3 postinjury.

Changes in energy expenditure (EE) are easily measured with the use of indirect calorimetry devices. These are now available as metabolic cart units or, more recently, as integrated hardware in ventilator systems that specifically detect moment-to-moment or day-to-day changes in EE. With use of an indirect calorimeter continuously for a mean of 20 hours, the data in this study suggest that in a stable, sedated, ventilated patient who complies with the ventilator, a short-term measurement will be adequate in predicting 24-hour EE. However, in less stable patients who are not compliant with the ventilator, become febrile, or have ongoing cerebral events, short-term measurements are less satisfactory. The elevation of EE in this study was only 30% to 35% above the predicted basal metabolic rate (BMR), which conflicts with other studies that show EE elevations to be greater than 50%. It is unclear whether this discrepancy is due to the small sample size, time after injury, or other factors.

Energy and nitrogen balance studies were negative and, given the low nutrient intake, should be of no surprise. This underscores the fact that intragastric foods are poorly tolerated in this population, and in order to minimize or reverse negative nitrogen balances, aggressive nutrition support must be provided. This fact was substantiated in a study by Twyman et al, who showed that providing 2.2 g/kg of protein could not only decrease the nitrogen excretion toward equilibrium, but could also place many patients into positive nitrogen balance.

Weekes and Elia measured body composition by skinfold thickness at four body sites, bioelectrical impedance, and near infrared interactance. All of these, I believe, are neither sensitive enough nor sufficiently validated at a 2- to 3-week interval in this critically ill population to be considered accurate.

Gastric emptying was measured by the phenol red technique, which will not be reviewed here. The sensitivity of this technique is accurately compared with four normal volunteers; however, the clinical usefulness of this technique is unclear. While it does suggest a problem in gastric emptying of feeding provided and failure to empty gastric secretions, the authors did not correlate the magnitude of the delay with the occurrence of glucose in the saliva, a test that they used suggesting a risk for tube feeding aspiration.

Although the importance of these observations reinforces many of our now common practices in head-injured patients, many questions remain unanswered. Our institution’s approach has been developed and refined over the past decade and supports the need for strong interdisciplinary cooperation. Nutrition support is considered a priority in these patients. After injury, if laparotomy has been required, either a needle-catheter jejunostomy or a gastrojejunostomy tube is often placed. The latter can be serviced or removed endoscopically, as required. For iso-
lated head injury, a decision for enteral or parenteral nutrition is typically made within the first 72 hours after admission. When the need for ventilator support is believed to be short, and nasoenteric tubes do not reach a postpyloric position, then nasojejunal tubes, which allow gastric decompression and jejunal feeding, are placed endoscopically. These tubes can be placed in an average of 11 minutes and often last 2 weeks or more. For patients who have had facial injuries and for whom nasal tubes are proscribed or the hospital course is likely to be prolonged, we typically place gastrojejunostomy tubes using a guide wire technique, which yields a feeding tube in the distal duodenum or jejunum and is combined with a gastric port for decompression and medication delivery. There have been no episodes of tube feeding aspiration with use of this feeding technique. We have placed tubes in patients as early as 2 hours after admission to the intensive care unit following neurosurgery and cervical spine stabilization. For centers with less aggressive endoscopic services, radiologic placement techniques or parenteral nutrition are available.

Many questions still remain in the treatment of the brain-injured patient. Can the hypermetabolic state be ameliorated by early feeding, enteral, parenteral or a combination of both? Is there an optimal enteral fuel for these patients, such as an immunomodulatory formula or a yet-to-be determined future product such as “EinsteinCal”? What role, if any, does bacterial translocation play in this population? Is there a better clinical method to predict who would best be served by a short-term enteral access route (eg, nasogastric and nasoduodenal/jejunal tubes or combined nasogastrojejunal tubes) compared with a long-term enteral access route such as a percutaneous gastrojejunostomy tube?

What is clear in head-injured patients is that early nutrition support can alter outcome and survival. This is in contrast to other patient populations who may tolerate 7 to 14 days without nutrition support and not suffer any major change in outcome. Whether performed surgically, radiologically, or endoscopically, “technical” tools now exist that provide multiple methods to achieve early enteral access. It is incumbent upon us to support these patients in a manner that allows them to achieve their highest level of recovery. Continued research in this area should include larger sample sizes and answer many of the aforementioned nutrition-related questions.