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Combination enteral and parenteral feeding regimes improve glycaemic control in the post-operative surgical patient

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The provision of parenteral nutrition (PN) to stressed patients often results in hyperglycaemia which may negate any benefit derived from nutritional support[(1)]. It has been demonstrated that in critically ill patients morbidity and mortality can be dramatically improved by achieving normoglycaemia[(2)]. Similarly there are a substantial group of surgical patients in whom nutritional requirements may not be achieved with enteral feeding alone. Animal experiments suggest that combining enteral nutrition (EN) and parenteral nutrition may result in better outcomes[(3,4)]. There is no human data examining the effects of combination feeds on glucose homeostasis.

Thirty six consecutive non-diabetic patients undergoing gastro-oesophagectomy for cancer were recruited to a two-armed randomised trial. One group received 100% of their nutritional requirements with PN. The second group achieved their target with a combination of 70% PN and 30% EN. Both feeding regimes were isocaloric and isonitrogenous. Glucose homeostasis was assessed using a number of parameters; continuous interstitial glucose monitoring, fasting blood glucose, and insulin resistance (IR) derived using short insulin tolerance tests (ITT) and homeostasis assessment model (HOMA-IR). Insulin sensitivity was also calculated using HOMA-β, and glucose-dependent insulinotropic polypeptide (GIP) levels were tested.

Thirty patients were eligible for inclusion and assessed on an intention to treat basis. The two groups were demographically and biochemically similar at baseline. Following surgery there was a rise in blood glucose levels ($P<0.001$) and insulin levels ($P = 0.001$). Neither level returned to the baseline value during the study period. The combination of PN + EN resulted in lower glucose concentrations ($P = 0.002$), reduced insulin resistance ($P = 0.045$) and improved insulin sensitivity ($P = 0.037$). Incretin levels, specifically GIP, fell postoperatively ($P<0.001$) but were significantly higher in the combined PN + EN group ($P = 0.011$) recovering to the baseline level by day 4. In the PN group, GIP remained depressed for the whole study period.

The combination of PN + EN when compared to PN alone results in improved glucose homeostasis, which is associated with an improved clinical outcome. There are reductions in glucose concentrations, insulin resistance and increased stimulation of Incretin production. This human data supports animal studies suggesting stimulation of the entero-insular axis improves glycaemic control. Critically 100% of the patients' nutritional requirements were achieved with normoglycaemia and the avoidance of insulin therapy precluded risks associated with this therapy.

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