Editorial

Time of parenteral nutrition in paediatric critical care patients, prior nutritional status probably makes the difference?

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It is well known that a delay in nutrient administration in the critical patient leads to a poor prognosis (1-4). It can induce an increase in nosocomial infections, mechanical ventilation duration, intensive care unit (ICU) length of stay (LOS), and mortality. In paediatrics there are only few clinical trials that have systematically analysed the importance of good nutrition in the pediatric critical patient's outcome (5).

The clinical practice guidelines published to date recommend, in both critically ill adult and pediatric patients, early administration of macronutrients, preferably enteral rather than parenteral (6-8). They advise about the importance of considering the patient's previous nutritional status. It is suggested that patients at high risk of malnutrition or those that are malnourished receive 80% of calculated energy and protein intake, at between 48 and 72 hours after admission. However, these guidelines are supported primarily by expert consensus, and the degree of evidence is low.

The latest guide for nutrition in the adult critical patient was published by the American Society for Parenteral and Enteral Nutrition (ASPEN) (9) in 2016. It is suggested, although with low scientific evidence, that the use of exclusive parenteral nutrition (PN) in patients with low risk of malnutrition can be delayed until the week of ICU admission, even though there may not be correct enteral protein and caloric intake. In patients with high nutritional risk and malnutrition at admission, the expert consensus recommends initiating the PN as soon as possible if correct enteral nutrition (EN) in the first 48 hours from admission is not possible. In both groups of patients, with high and low risk of malnutrition, parenteral nutritional supplementation is recommended in two different indications. The first situation is when 60% of the energy and protein intake needed is not achieved with EN, even after 7–10 days from PICU admission. The second is about initiating supplementary PN prior to this 7 to 10 days period in critically ill patients when EN does not improve outcomes; this may be detrimental to the patient.

These data are supported by several clinical trials in critically ill adult patients, in which worse results were observed regarding morbidity and LOS when early PN was administrated. Patients who received PN from day 3 after admission when a minimum of 60% of the energy requirement was not reached had worse outcomes compared to groups which received low calorie EN (10,11).

Of note is the great study done by Fivez *et al*., published March 2016 in the *New England Journal of Medicine*. This was a multicenter clinical trial (Netherlands, Belgium, and Canada) that stands out for the high number of pediatric patients (1,440 children), and for being the only one examining the patient admitted to pediatric intensive care unit (PICU) so far. The primary outcomes were to determine the presence of new infections and duration of ICU stay (according to Centers for Disease Control definitions), and the secondary were to analyse safety and efficacy, depending on the moment that PN was initiated. These objectives were clearly defined and in accordance with the definitions set out in two groups. All critically ill patients with moderate or severe malnutrition were admitted to PICU and then randomized. The level of malnutrition was assessed with the STRONG Kids scale score, and patients were included when these values were greater than or equal to 2. Eligible patients were then classified into two

groups: those receiving parenteral from admission, the early PN group (first 24 hours), and those who received beyond the first week, the delayed PN group (8 days). Parenteral was always supplemental with EN until attaining the caloric and protein needs, calculated for each patient. The EN was started early and progressively increased according to the protocol of each centre, in the two groups of patients. In both groups, intravenous micronutrients were administered, from the 2nd day and until EN contributions were 80% of the necessary input, as needed.

To try to avoid bias, patients were compared in groups according to age (under or over one year) and pathology (medical-neurologic-, medical-other surgical-cardiac; surgical or-other). The two groups were statistically comparable and no statistically significant differences between them were detected, in terms of different clinical variables (number of patients under one year old, male, average weight, height, body mass index, level of malnutrition on admission, severity on admission, emergency admission, diagnosis on admission, need of MV extracorporeal membrane oxygenation, and infection at admission).

A limitation of the study is that both groups received enteral diet with similar caloric intake, but this couldn't be statistically assessed since no comparative statistical analysis of this variable was performed. It seems that the only difference between the groups was the time of beginning parenteral (early or delayed). Patients achieved caloric intake more quickly in the early PN group compared with the delayed PN, but again no statistical comparative analysis was made. Nonetheless, the early PN group developed a greater number of complications than the delayed group, regarding the total number of infections, LOS in PICU, and PICU dependence as primary outcomes. Regarding secondary outcomes, duration of MV, liver dysfunction during first 7 days in PICU, and total LOS were also worse in the early PN group.

Another limitation of the study is that the number of days with EN and PN, added together, was quite long (about 16 days), and it is not clear why the EN did not raise caloric intake 50%, even at the 8th day, in either group. It would be expected that at the 5th–7th day patient use would be quite stabilized, with EN intakes up to 70–80% of caloric requirement. However, the caloric and macronutrient intake was calculated differently at the three participating hospitals. A further limitation, acknowledged by the authors, was that the study was not blind for the patients, parents, and PICU staff in charge of the patients.

We may conclude that while the perfect time to start parenteral supplementation in pediatric critical patients does not exist, it seems wise not to start early. Nutritional status at admission and severity of the disease are mainly responsible for energy expenditure during PICU stay, so items need to be accurately analysed in each patient. When malnutrition is detected at admission, early PN may be valid, especially if it is calculated that the patient cannot achieve 60% of caloric intake with EN. In the other cases exclusive EN may be indicated in the first days, with the possibility of initiating PN at seven days if nutritional requirements cannot be achieved or if patient evolution is not optimal. Enteral and parenteral nutritional intakes should therefore be assessed in each case and the prior nutritional status probably makes all the difference.

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Footnote

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