

# Feed intolerance in a paediatric traumatic brain injury patient.

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## Introduction.

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It is well known that traumatic brain injury (TBI) increases the body's metabolic response.<sup>1,2</sup> This increased metabolic response leads to hyperglycemia, protein wasting and an increased energy demand, thus adequate nutrition support is vital for recovery.<sup>2-4</sup> Adequate nutrition has been a clinical challenge for decades as poor feed tolerance; due to increased gastric residuals, abdominal distension and diarrhoea has often been observed.<sup>5,6</sup> Although it has been recommended that nutrition support is started within 72 hours, it should be kept in mind it takes time to fully meet calorie and protein requirements of TBI patients.<sup>3,7-9</sup>

The research indicates that parenteral nutrition (PN) should be started if and when enteral nutrition (EN) is contraindicated or not tolerated, but the best route and timing for administration is yet to be established.<sup>5,10</sup>



# Background.

A 9 year old boy was admitted from the middle-east following a road traffic accident, 3 months earlier. He was initially treated conservatively in the middle-east as his GCS was 15/15, but his condition deteriorated on the same day with generalised seizures. He was diagnosed with fronto-parietal subdural haematoma, left hemispheric oedema with midline shift and right parietal and occipital subgaleal haematoma. He underwent a decompressive craniotomy. On opening the dura, there was immediate herniation of the brain through the dural opening with subsequent haemodynamic instability. The skull defect was covered with a skin flap and no further surgery was undertaken in the middle-east.

Upon admission to Bupa Cromwell Hospital, the child had a clinical diagnosis of being severely marasmic with a weight of 16kg (< 0.4th centile), no information was available on his weight before the accident. His abdomen was soft and he had bowel sounds. According to the handover he tolerated nasogastric (NG) feeds of PaediaSure® (standard feed) at 120kcal/kg/day (64ml/hr) in the middle-east, but as soon as we started him on PaediaSure®, he developed watery diarrhoea leading to hyponatremia, which required correction. Enteral feeds were stopped; two thirds intravenous fluids and one third Dioralyte™ were started. Although his electrolytes were stable he continued to have diarrhoea.

PN was started on day 7 with “trophic feeds” of Neocate® (5ml/hr). The child received PN for 35 days, as he required numerous craniotomies, washouts and debridement of the skull and brain tissue secondary to necrosis and infection.

Once PN was weaned, Neocate® was changed to Peptamen® Junior powder (PJ powder) to allow for adequate catch-up weight gain, growth and to better meet the nutritional requirements for his age. The head of his bed was elevated to 45 degrees to assist in achieving feed tolerance. At this point he was stable in PICU with a slight improvement in his level of consciousness.

Once full enteral feeds were established and tolerated, Peptamen® Junior powder was slightly concentrated to 1.25kcal/ml and finally 1.5kcal/ml by adding more scoops of Peptamen® Junior powder to the volume of water as per mixing instruction; allowing for maximum catch-up growth without increasing volume. Over a period of days we moved toward bolus feeds to allow a rest period for intensive rehabilitation sessions with occupational therapists and physiotherapists.

Two months after arriving in the UK, this child was clinically stable with a weight of 22.5kg, adequate bowel functioning and tolerating his feeds. Although the optimal location of EN administration is still debated (gut or small bowel), a decision was made at this time to place a gastrostomy tube for this boy.<sup>5</sup>

Since admission he was on multiple antibiotics to treat his infections; thus a probiotic was started – given once daily via the gastrostomy tube. Once he was stable post gastrostomy he was transferred to the paediatric ward where he continued with his rehabilitation and feeding regime, which was regularly adjusted for weight and rehabilitation phase.

He had minimal left hemisphere and only a skin flap on the L side of the skull. After 6 months in hospital he was discharged to a rehabilitation centre in London. His weight upon discharge was 26.5kg (9th–25th centile) and he was tolerating his feeding regime.<sup>11</sup> A suggestion was made in the dietetic discharge report to start him on a semi-elemental feed with added fibre called Peptamen® Junior Advance. Khoshoo et al. found that whey based feeds with added fibre resulted in a more normal stool consistency in neurologically impaired children.<sup>12</sup>

Regular dietetic review will be required to adjust his feeding regime volume and feed type as needed in line with weight gain and rehabilitation improvement.

# Nutritional problems and dietetic intervention.

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- Severe marasmus, weight was 16kg upon admission (<0.4th centile).
- Feed intolerance; to re-establish feed absorption and encourage age appropriate weight gain and growth.
- Meet macro and micro nutrient requirements.

Initially an NG feed was started alongside PN, until full enteral feeds were established. Once adequate weight gain was achieved a gastrostomy tube was placed. Patient was discharged on a feeding regimen of 70ml bolus x 16 hours (4 x 4 hourly bolus feeds) of Peptamen® Junior powder at 27.5% concentration (1.25kcal/ml) with 50ml water flushes before and after each bolus feed and additional water given with medications.

This feeding regimen of 1120ml Peptamen® Junior powder provided; 1400kcal (53kcal/kg/day, 56% of TER), 50.4g protein (1.9g/kg/day) and 13.44mg zinc (requirements is 7.2mg zinc) 12 and total fluid 1520ml per day.

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## Reasoning.

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It is well known that patients who have suffered TBI often struggle to tolerate their feeds which can result in diarrhoea, a common problem as discussed earlier. The advantages and disadvantages of PN and EN are well defined, but EN continues to provide a more comprehensive mix of macro and micronutrients and have also been shown to reduce gastric emptying times in neurologically impaired children.<sup>12,13</sup>

With comparing various peptide-based feeds Peptamen® Junior powder seemed to be the best option for this patient as;

- The feed could be concentrated if and when required; this is not possible with ready to hang feeds.
- Has a higher zinc content per 100ml than standard feeds. Zinc plays an important role in various metabolic functions and the immune system.
- Higher protein content per 100ml; TBI patients have higher protein requirements due to their hyper catabolic state.
- And a lower osmolality and osmolarity (if used in standard concentration of 22%).

Although continuous feeding seems to be better tolerated in TBI patients, this boy did well when we eventually switched him onto bolus feeds.<sup>5</sup>

# Results achieved with Peptamen<sup>®</sup> Junior Powder.

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- Nutritional requirements (macro and micro) for age met.
  - Appropriate, gradual weight gain achieved.
  - Tolerating feeds – volume was not increased but feeds could be made more calorie dense.
  - Bowel movements normal.
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## Conclusion.

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Feeding problems in children with neurological impairment are common and severe.<sup>14</sup> The effect of nutrition in TBI recovery has often been underestimated as early, adequate nutrition support can be very challenging.<sup>5,15</sup>

Although EN seems to be the route of choice, it is not well tolerated directly post injury and is linked to the severity of the brain trauma.<sup>12,16</sup> PN is initially suggested following brain injury until EN can be tolerated.<sup>17</sup> Peptide, whey-based feeds seems to be better tolerated compared to standard feeds, even when given as bolus feeds.<sup>3</sup>



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