The Role of Modular Protein Supplements in Nutrition Support

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Providing adequate dietary protein intake in the diets of individuals is essential for maintaining a positive protein balance within the body to ensure healthy cell metabolism, wound healing and an effective immune response. These requirements are increased following injury or with disease, and it can often be challenging to ensure that patients receive an adequate protein intake balanced with meeting requirements for energy and other nutrients. Oral nutritional supplements (ONS) and enteral feeds have existed for many years to aid clinicians in providing patients with adequate protein intake. These can consist of a combination of energy, protein and other nutrients and are often nutritionally complete. However, in order to meet high protein requirements, it may be difficult to simply do this with just one product. Although, modular protein supplements exist in both liquid and powder form, this article will discuss the role of liquid modular protein supplements in meeting individual protein requirements.

Current guidelines

Protein requirements for individuals are dependent on several factors, including: disease state, metabolic rate, past and recent energy intake, and protein losses.[1] Consequently, protein requirements of up 1.0-1.5 g/kg body weight per day are recommended by the Parenteral and Enteral Nutrition Group (PENG), a specialist group of the British Dietetic Association (BDA), for most clinical conditions.[1] Various evidence-based guidelines exist as a basis for these recommendations. In critical illness, the European Society for Parenteral and Enteral Nutrition (ESPEN)[2] recommend a minimum protein intake of 1.3 g/kg per day. This is based on a wide range of evidence and, in observational studies, higher protein intakes in this group of patients have been shown to reduce mortality and improve outcome.[3] However, ESPEN[2] also conclude that this benefit is only demonstrated if overfeeding is avoided. In other clinical settings high protein intakes are also recommended. For patients with liver disease, protein intakes of 1.2-1.5 g/kg/day are recommended in the cirrhotic patient.[4] A protein intake of 1-1.5 g/kg/day has also been advocated in cancer patients[5] and elderly care medicine.[6] There is strong evidence supporting protein requirements of 1.1-1.4 g/kg/day in patients with chronic kidney disease (CKD) requiring renal replacement therapy (RRT)[7] and 1.7 g/kg/day in acute kidney injury (AKI) if hypercatabolic and requiring continuous RRT.[8] It is important to note that for renal patients, recommended protein requirements are increased in order to compensate for protein lost through the dialysis process.

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Hypoproteinaemia

Hypoproteinaemia occurs when an inadequate protein intake is consumed. As a result, there is increased risk of malnutrition and associated complications, such as delayed wound healing, muscle wasting, reduced immune response and, ultimately, poor patient outcome.[9] Nutritional screening tools, such as the 'Malnutrition Universal Screening Tool' ('MUST'), are useful for identifying patients suffering from, or at risk of, malnutrition.[10] Where nutritional support is required, calculating nutritional requirements as per PENG guidelines[1] can provide a helpful baseline estimate of an individual's calorie and protein needs. This will form the basis of the nutritional care plan but should not be relied upon as the only assessment method. The importance of dietetic clinical judgement should not be overlooked and, in addition to changes in body weight, anthropometric measurements (e.g. mid-upper arm circumference, triceps skinfold thickness and grip strength) are recognised methods of assessing and monitoring a patient's nutritional status.[1, 10] As dietitians, our challenge is to assess, advise, and support patients to maximise their nutritional intake by the most appropriate route, and thus help achieve the best possible clinical outcome.

Management of hypoproteinaemia

Oral nutritional supplements

Patients consuming inadequate protein can be managed by a systematic approach as described in **Figure 1**.

When adequate protein intake cannot be achieved from a fortified diet, the next step is to commence a nutritionally complete oral nutritional supplement (ONS). Such products contain varying quantities of calories, protein and micronutrients, and studies suggest that they are an effective means of improving nutritional status.[11] In recent years, new products have been developed, and a variety of high protein nutritionally complete milk-based products are now available. For many patients these are entirely suitable for meeting all of their nutritional requirements. Although containing a large amount of protein, they can vary in volume, sodium, potassium and phosphate content (see **Table 1**), and may therefore not be suitable for patients who require a fluid restriction or low potassium/low phosphate diet. As yet, there is no non-milk-based equivalent and achieving adequate protein intake in individuals who dislike milk-based products can be challenging.

Enteral feeding

A wide range of enteral tube feeds exist, yet it is not always possible to provide adequate protein intake through these alone, particularly if excess calories are to be avoided. In critical illness for example, patients can be receiving high doses of the sedative propofol, which at 1.1 kcal/ml can provide a significant additional calorie intake. As overfeeding has been shown to be potentially detrimental to patient outcome,[2] there is a requirement for a low calorie, high protein feeding regimen, which cannot be achieved using standard 1 kcal/ml enteral feeds. A variety of high protein enteral feeds are available but combined with calories from propofol may still provide an excess calorie intake if protein requirements are to be met. Patients with a high body mass index (BMI) are also particularly at risk of overfeeding. Guidelines from ASPEN[12] suggest that high protein, hypocaloric feeding may be of benefit, although PENG[1] issue a note of caution in initiating this without careful monitoring of fat mass and fat free mass. If this guidance is to be followed, it may be difficult to fully meet an obese patient's protein requirements from a single enteral feed if overfeeding of calories is to be avoided. In managing patients who require a low volume, low sodium, or semi-elemental feed, it can also be difficult to meet protein requirements using the enteral feeds currently available.

Figure 1: A Stepwise Approach to Oral Nutrition Support

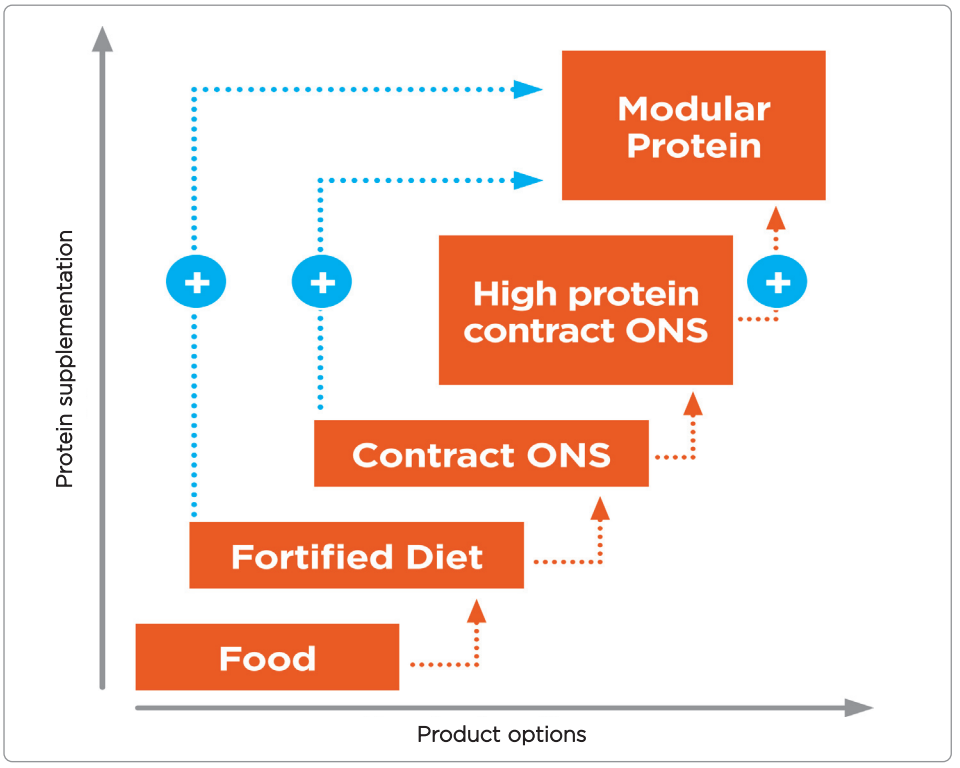

Table 1: A Comparison of Volume, Sodium, Potassium & Phosphate Content of High Protein ONS

	Unit size (ml)	Protein (g/unit)	Energy (kcal/unit)	Sodium (mmol/unit)	Potassium (mmol/unit)	Phosphorous (mmol/unit)
Fortisip® Compact Protein	125	18	300	2.1	3.4	12.1
Ensure® Plus Advance	220	20	330	14.3	15.2	8.3
Fresubin® 2 kcal Fibre	200	20	400	5.2	8.2	7.8

Modular protein supplements

Modular protein supplements have been developed in liquid form to help customise a nutritional care plan to the specific needs of an individual and can be given orally or via the enteral route. There is a clear role for these within many clinical conditions where a patient is unable to achieve an adequate protein intake through dietary fortification alone. Lack of appetite can significantly reduce nutritional intake at a time when providing adequate nutrition is critical. Protein requirements may also be further increased by pressure sores, surgery or dialysis losses. These can all exacerbate or increase the risk of malnutrition. A recent Cochrane Review[13] looking specifically at protein-based ONS suggested that, in malnourished dialysis patients, these may be an effective way of providing adequate protein and improving nutritional markers. Such products have a high protein to calorie ratio so, in the oral nutrition setting, are ideally suited to patients who are able to consume calorie rich foods but have a limited protein intake. They may also be of benefit alongside other products where tolerance is limited, or used in combination with a high calorie ONS. Modular protein supplements have the advantage of being low in volume – ideal where a fluid restriction is required – and this small dose size may promote patient adherence. Some products can also be mixed into food or drink.

Modular protein supplements have also been designed for administration via an enteral feeding tube and can significantly help protein requirements to be met in the scenarios described earlier. These products enable additional protein to be added in a high dose, but small volume and it makes sense to choose a product that contains the most protein per dose when a fluid restriction is required. Nevertheless, it should be noted that water flushes are required before and after administration down feeding tubes to avoid risk of blocking, and only Renapro® Shot and Prosource® TF do not require premixing with fluid. Also, being free from fat and consisting of hydrolysed protein, liquid modular protein supplements are suitable for administration alongside a semi-elemental formula.

Whether given orally or administered via the enteral route, it is relevant to note differences in electrolyte composition between modular protein products (Table 2). This may be particularly significant for renal patients requiring a low potassium, low phosphate diet, or where a low sodium feed is requested. Amino acid profile also differs between products and not all achieve a 100% Protein Digestibility-Corrected Amino Acid Score (PDCAAS). Whilst there is evidence to suggest that not achieving adequate protein and amino acid intake in critical illness can lead to a poor outcome,[3] it is unclear as to the efficacy of using PDCAAS as a method for evaluating protein quality and how accurately it can be applied in the disease setting.[14] It is also important to consider that modular proteins are always used in combination with other protein sources (enteral feed or oral diet), which in themselves will contribute to the overall PDCAAS score. Other factors which will have a bearing on the choice of modular protein are product palatability, patient preference, convenience of administration for tube feeding and local hospital prices.

Conclusion

The development of modular protein products has enhanced the portfolio of products available for nutritional support by both the oral and enteral route. It is now possible to customise nutritional care plans to individual need and avoid shortfalls in protein provision due to limited product choice. Consequently, we are able to give our patients the best possible chance of optimising their nutritional status and achieving a good clinical outcome.

Table 2: A Comparison of Sodium, Potassium, Phosphorous & Calcium Content of Modular Protein Products

	Unit size (ml)	Protein (g/unit)	Sodium (mmol/unit)	Potassium (mmol/unit	Phosphorous (mmol/unit)	Calcium (mmol/unit)
Renapro® Shot	60	20	4.96	0.28	0.029	0.4
Prosource® Liquid*	30	10	1.23	0.30	2.61	0.17
Prosource® Plus**	30	15	1.83	0.30	3.96	0.17
Prosource® TF	45	11	0.95	0.25	3.06	0.07
Prosource® TF Plant	45	15	6.95	1.21	3.09	0.53
Prosource® Jelly***	118	20	2.12	4.01	0.03	0.52

*Original **Neutral ***Orange and Fruit Punch

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