Nutrition concerns and demands in patients with burns

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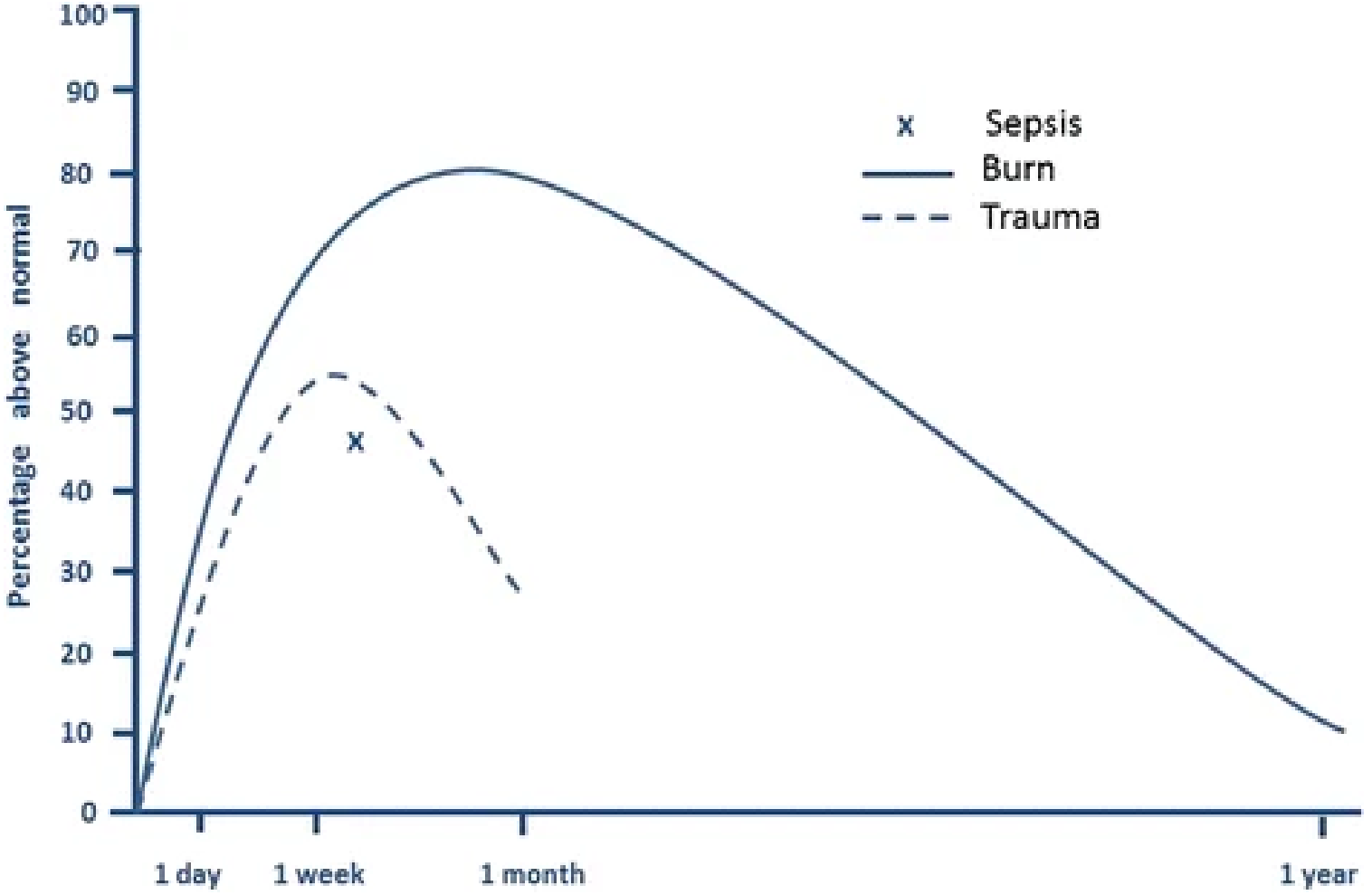
Background of nutritional needs in burns

- Nutritional support is a critical aspect of the treatment of burn patients. The metabolic rate of these patients can be greater than twice the normal rate, and this response can last for more than a year after the injury
- Severe catabolism accompanies the hypermetabolic state and leads to a tremendous loss of lean body mass as well as a decline of host immune function
- Unfortunately, our knowledge regarding the complicated physiology of nutrition is incomplete and nutritional regimens vary widely between individual centers.

The hypermetabolic state

- Trauma and sepsis also result in hypermetabolism, although to a much lesser degree and for a significantly shorter duration
- Severe burns cause a profound pathophysiological stress response and a radically increased metabolic rate that can persist for years after injury.
- Hypermetabolic state reflects an increase in whole-body oxygen consumption, and a patient is usually considered hypermetabolic when resting energy expenditure (REE) is more than 10% above normal
- Burn that covers greater than 40% of total body surface area (TBSA) have a REE between 40 and 100% above normal
- unchecked hypermetabolism results in an enormous loss of lean muscle mass, immune compromise, and delayed wound healing.



Hypermetabolic response after burn, trauma and sepsis

Mediators of hypermetabolic response

- Increased levels of catabolic hormones: Epinephrine, cortisol and glucagon
- Leads to inhibition of protein synthesis and lipogenesis
- Protein breakdown becomes the necessary large source of energy leading to chechexia
- This lasts from 1-3 years post burn.
- To combat this early nutrition provision was proposed as a mandatory requirement for overall improving immunity, wound healing, survival and hospitalisation

Do we have evidence to support this?

- In animal studies early therapy reduced the hypermetabolic response and improved outcomes.
- But, in humans, specially children, early excision of dead burned tissue along with aggressive early start for nutrition support, actually triggered the full blown hypermetabolic response!
- This was not seen in patients who received delayed treatment.

- Muscle protein catabolism was reduced in the group that received early treatment.

Weight loss is unavoidable in major burns.

- 10% loss – Immune dysfuntion
- 20% loss – impaired wound healing
- 30% loss – severe infections
- 40% loss - mortality

Early enteral feeding is still advocated:

- Preserving the skeletal muscle mass
- Regulating the catabolic hormone levels
- Maintaining the gut mucosal integrity
- Reducing the problem of Curlings ulcer
- Improving immunity and wound healing
- Reduced ICU stay

Supportive measures to ameliorate hyper metabolic state

- Keep the environment warm 30 degrees
- Closed dressing
- Early wound closure by reducing the inflammatory cytokines
- Propranolol given for 1 year post burn reduces the heart rate
- Oxandralone, synthetic androgen has shown to improve the lean body mass and bone mineral density along with reducing the hypermetabolic response in major burns in children.

Timing of nutritional support

- Ideally should be started within 24 hours of burn injury
- Studies have shown no significant change in outcomes even if it got started within 7 days!
- Enteral nutrition is preferred. Parentral has associated risks of infection.
- When EN is not possible small phases can be supplemented with PN / PN+EN
- Both are given as a continuous feed for initial reaching of goals.
- Later EN can be administered more physiologically as interrupted during the day

Constitution of the diet

- Carbohydrate: High carb diet have a protein sparing effect and promote wound healing, therefore preferred. Max dose is 7gms/kg/day
- Fats: given to avoid essential fatty acid deficiency. Excess fat calories lead to fatty liver which has lead to high mortality in children. <15% of total calories should be from fats
- Protein: Proteolysis is greatly increased in major burns(0.5 pound of skeletal mass daily). To overcome this and improve immune function, wound healing and maintain lean body mass, protein is required. Current requirement: 1.5-2 gm/kg/day in adults and 2.5-4gm/kg/day in children.
- Non protein cal : nitrogen in smaller burns 150:1, 100:1 in major burns.
- Muscle wasting is seen at this supplement too due to proinflammatory and catabolic hormonal mileu.

Immuno nutrition and micronutrients

- Glutamine in doses of 25gm/kg/day is shown to improve the outcomes by expediting recovery.
- Arginine is not indicated in burns.
- Vit A, C, D, E, Fe, Se, Zn, Cu
- Calcium supplement is important as it gets leached out from kidneys and the osteoblastic apoptosis reduces the calcium availability in blood.

Complications of EN in practice:

- Vomiting
- Diarrhea
- Constipation
- Abdominal distension
- Occasionally refeeding syndrome
- Occasionally obesity in follow up sedentary patients
- Weight loss
- We have not seen fatty infiltration of liver in our patients.

Mobilisation and cardio + strength training is vital

For incorporating the high protein administered in the muscle

Long term effects

- Growth retardation and delayed mile stones in children surviving major burns
- If the nutrition support is not continued for 1-2 years then malnutrition and skeletal muscle loss is evident
- Very few cases of obesity seen.

References:

- 1.A. Clark, J. Imran, T. Madni, S. Wolfe. Nutrition and metabolism in burn patients. Burns and trauma,(2017)5:11. doi 10.1186/s41038-017-0076-x
- Total Burn Care, Edited by David Herndon, 2014.

Thank you

Burn care is a multidisciplinary team approach. Together we help them.