

# 烧伤患者热量供应

## —— 尚待探讨课题

汪仕良

How to evaluate energy requirement of burn patients —— a question still needs farther investigation WANG Shi-liang. Institute of Burn Research, Southwest Hospital, State Key Laboratory of Trauma, Burns and Combined Injury, the Third Military Medical University, Chongqing 400038, P. R. China

**【Abstract】** After a series of study of early feeding (EF), we consider the evaporative heat loss from the burn wound is not the main mechanism of burn hypermetabolism. EF could resuscitate the intestine, preserve its structural integrity and function, prevent bacterial translocation and release of inflammatory mediators, reduce muscle protein catabolism and hypermetabolism. Our studies concerning the relationship between EF and hypermetabolism have already extended to involve hypothalamus now. At the end of 1960s, the advancement in "Intravenous Hyperalimentation" has epoch-making significance, but it has been found later that energy has been oversupplied by this measure, thus it exacerbated visceral loading and led to disorder of internal environment, and it has been found not beneficial to alleviate hypermetabolism. Whether "hypocaloric nutrition" for post-operative patients of G-I (gastro-intestine) surgery is applicable to severe burn patients remains as a problem. Some specialists suggest it is better to supply  $126 \sim 146 \text{ kJ} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$  in severe burn patients. After evaluating the bias and precision of 46 methods of estimating energy supply of burn patients reported from 1953 to 2000, Dikerson RN et al. concluded that the most precise, unbiased methods were those of Milner (1994), Zawacki (1970) and TMMU (1993, Third Military Medical University formula). Though formulas are simple and convenient to estimate energy supplementation, however, it is difficult to evaluate the requirement of energy when the patient's condition changes immensely.

**【Key words】** Burns; Hypermetabolism; Energy requirement

**【关键词】** 烧伤; 高代谢; 热量需求

烧伤后分解、合成代谢均升高,分解代谢高于合成代谢,体内物质消耗加剧,而外源性营养物质不能完全纠正高代谢时机体消耗,营养底物在机体器官、组织、细胞的消化吸收转化受阻,底物堆积导致细胞、组织、器官代谢紊乱<sup>[1]</sup>。探讨烧伤患者热量供应时,会遇到一系列问题,如为什么伤后热量丢失加剧,伤后供应热量高低应如何掌握,如何较确切、简便地估算所需热量,热量供应时相及病情急剧变化时应如何掌握。

作者单位:400038 重庆,第三军医大学西南医院全军烧伤研究所,创伤、烧伤与复合伤国家重点实验室



### 1 为何伤后热量丢失加剧——“创面蒸发”与“机体调控”

一般认为主要是由于伤后代谢率增高所致。伤后高代谢机制复杂,涉及人体组成的整体、系统、器官、组织、细胞、分子、原子各个层次,与激素、细胞因子、脂类递质以及细胞信息传递、基因信息传递均有关。但总体而言,在细胞、分子、基因水平研究高代谢时,至少有一点需要解决,即高代谢是否主要由创面水分蒸发引起,是目前争议的主要观点<sup>[2]</sup>。创面包绕不透水膜、包扎敷料、环境温度保持在  $30 \text{ }^{\circ}\text{C}$  左右,固然可以使代谢率有所降低,但不能使伤后高代谢恢复正常。

伤后高代谢除与创面水分蒸发有关外,主要还是通过烧伤后应激反应,与下丘脑-垂体-肾上腺轴、急性相反应、自主神经系统以及应激反应时调控基因活性的一些转录因子均有关。曾有学者认为早期喂养不能降低创面水分蒸发所致热量丧失,所以不能降低高代谢。笔者研究烧伤早期肠道喂养 20 多年,对其认识仍在不断深化,发现早期肠道喂养可促使伤后肠道复苏,改善肠黏膜能量代谢,维护肠道结构功能,促进肠黏膜增殖修复,减轻肠道移位及肠黏膜细胞、枯否细胞活化,减少炎性递质释放,降低 26S 蛋白酶复合体活性及含量,减少肌蛋白分解,降低尿氮含量,降低高代谢。所以,仅从创面水分蒸发来看高代谢,无疑是表面的、局部的<sup>[3]</sup>。

近几年来,我们将早期肠道营养与伤后高代谢反应关系延伸至下丘脑研究。下丘脑促肾上腺皮质激素释放因子受体 2 (corticotropin releasing factor receptor 2, CRFR2) 可能参与严重烧伤大鼠高代谢反应调节,早期肠道营养可能通过下调下丘脑 CRFR2 mRNA 及蛋白表达而降低烧伤高代谢。这进一步说明,仅将“创面蒸发水增加”作为烧伤高代谢的主要机制是难以成立的。

### 2 “高热量”与“低热量”

烧伤后机体高代谢,热量消耗增加。静脉营养开始用于临床时称“静脉高价营养”(intravenous



