

The Surgically Induced Stress Response¹

What is the study about?

The stress response to surgery, critical illness, trauma, and burns involves disruptions of metabolic and physiological processes. The disturbances in the inflammatory, acute phase, and hormonal responses lead to muscle wasting, impaired immune function and wound healing, organ failure, and death. The surgery-induced stress response is very similar to the stress response triggered by injuries. Burn injuries provide an extreme model of trauma induced stress responses that can be used to study the long-term effects of a prolonged stress response. Major surgery, critical illness, trauma, and burn injuries bring about hypermetabolism in an attempt to restore homeostasis. Hypermetabolism refers to a state of increased metabolism where the body's rate of energy production rises above normal. Early on, this process is beneficial. However, prolonged inflammatory, hormonal, and metabolic responses induce clinical complications, delay recovery, and increase mortality. This article discusses the ways to counteract and treat the stress response in order to improve patient outcomes.

How was the study conducted?

This article is a review of current knowledge and research on stress resulting from surgery referencing many clinical studies that describe the complex stress response following a major event such as surgery, trauma, critical illness or burn injury. This article also references studies that focus on treatment of the stress response. Most of the studies discussed in this article focus on the long term effects of burn injuries. Burns are used as a model of trauma induced stress response. The article presents the current knowledge about stress resulting from surgery.

What did the study find?

This article discusses the complex and devastating effects of the stress response after a major surgery, critical illness, trauma, or burn. For example, burn-induced inflammatory and stress responses are accompanied by profound insulin resistance and hyperglycemia. Hyperglycemia is the medical term for high blood glucose (sugar). High blood sugar reduces the rate of wound healing and is associated with increased inflammation, infectious complications, ventilator dependence, length of hospital stay, and mortality. Therefore, tight glycemic control with intensive insulin administration is needed. Additionally, both burn and severe traumatic injuries induce a hypercatabolic response that can lead to organ failure. Hypercatabolism refers to the excessive metabolic breakdown of a specific substance or of body tissue (in this case, muscle tissue). The authors discuss several ways to combat muscle wasting such as the drug, Oxandrolone. Also, after a major surgery, trauma, critical illness, or burn, the body's ability to absorb nutrients is altered. Therefore, nutrition supplementation is needed to counteract the dietary deficiencies. If the patient is unable to ingest sufficient nutrition orally, enteral nutrition delivery is used. Enteral nutrition delivery is when nutrition is provided through the gastrointestinal tract via a tube or catheter. In general, a high carbohydrate, high protein, low fat enteral diet (with supplements) is recommended. Pharmacological, surgical, or environmental interventions may be needed as well. Additionally, early exercise and monitored rehabilitation after surgery will improve muscle strength, range of motion, thermoregulation, pulmonary function, and quality of life. In conclusion, improvement of the systemic inflammatory, hormonal, and metabolic responses with nutrition supplementation, pharmacologic interventions, and exercise reduces the impact of the hypermetabolic and stress responses.

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¹ Finnerty, C. C., Mabvuure, N. T., Ali, A., Kozar, R. A., & Herndon, D. N. (2013). The Surgically Induced Stress Response. *Journal of Parenteral and Enteral Nutrition*, 37(5 suppl), 21S-29S.