Indirect Calorimetry versus Mathematical Calculations after Burn Injury: Are There Improved Health Outcomes?

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Background

- Good nutrition is VITAL to the health and recovery of burn patients
- Energy expenditure increases after burns
- Underfeeding may cause muscle wasting and impaired wound healing
- Overfeeding may cause serious complications such as fatty liver, hyperglycemia, and prolonged ventilator dependency
- Indirect calorimetry is coined the “gold standard” in calorie needs estimation
- No recent randomized, controlled, clinical trials to show improvement in health outcomes using indirect calorimetry
- Mathematical calculations such as Harris Benedict Equation are often used as an alternative to indirect calorimetry

What is Indirect Calorimetry?

Indirect calorimetry (IC) is a respiratory test that measures exchange of oxygen and carbon dioxide in the lungs. The test is usually performed by a Registered Respiratory Therapist, and the end result provides a factor to REE to calculate actual caloric needs.

Mathematical Calculations

The alternative to IC are mathematical calculations. Multiple equations exist to calculate needs and are based on a variety of factors, including height, weight, gender, burn size, and activity level. At Memorial Medical Center, we most commonly use the Harris Benedict Equation plus factors for stress and burn size.

Methods

- Implement routine indirect calorimetry testing on all burn patients who require nutrition support
- Completed initially within 72 hours of nutrition support initiation, then weekly until nutrition support was discontinued
- Prospective data collected on 12 patients recruited between September 22, 2008 and July 31, 2009
- Case matches based on age, gender, and burn severity index score

Results

24 patients enrolled
- 12 experimental participants
- 12 historical case matched controls

Statistical testing included Chi-Square, Fisher’s Exact Test, and Paired T-Tests with significance defined as p < 0.05. Groups were compared for statistical differences, then relationships between study groups and selected health outcomes were identified.

Each study group consisted of 75% male and 25% female. Groups were statistically similar in age, body size, burn severity index score, micronutrient supplementation, and insulin use.

Analysis did reveal significant differences in operative interventions between groups. The control group had significantly more days until first operative procedure (p=0.0062), while the experimental group had significantly more surgical interventions (p=0.0011).

Conclusion

- Patients undergo an acute rise in energy expenditure after burn injury
- Calorie needs can be determined using mathematical calculations or indirect calorimetry
- Based on this small sample, no significant improvements in health outcomes were identified
- A larger, multi-center study is warranted before practice guidelines can be implemented

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