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Various Types of Enteral Feeding for Burned Pediatric Patients and Their Clinical Consequences with Anaesthesia Management

Çocuk Yanık Hastalarında Enteral Beslenmenin Değişik Yöntemleri ve Anestezi Uygulamaları ile Klinik Yansımaları

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ABSTRACT

Objective: Calorie intake is vital for the treatment of burns. As wound care is managed under anaesthesia in our burn unit, pre-anaesthesia fasting also affects burn patients. Under all these circumstances, we aimed to evaluate the differences between oral and nasogastric feeding with or without anaesthesia management.

Material and Methods: We evaluated 98 patients hospitalized with major burns between 2009 and 2012. Orally fed patients formed the oral group, and patients fed with the nasal route were accepted as the nasogastric group. In our protocol, burns higher than 30% body surface area were fed by nasogastric tube. Pre-anaesthesia fasting was performed, and postoperative feeding was started after 3 hours for all admitted patients. Diarrhoea, vomiting, gastric residues, daily calories, feeding types and anaesthesia procedures were recorded. Differences of complaints and consequences of feeding policies were evaluated in the groups' own characteristics.

Results: Patients in the nasogastric and oral groups had similar age and gender distribution. 73 patients received oral food, and 25 patients were fed by nasogastric tube. Vomiting was the most common problem (17.8%) in the oral group, and residue (36%) was the most common problem in the nasogastric feeding group. The calorie intake was raised for both groups on the days without anaesthesia.

Conclusion: Nasogastric feeding with high calorie nutrition solutions seems to be an essential route to maintain a reasonable calorie intake for high percentage burn patients. It is more effective when no anesthesia is administered. However, anesthesia is also essential for wound care quality. Providing adequate nutrition support will be a matter of debate. We believe that treatment using anesthesia can be coordinated with adequate nutrition.

Key Words: Anesthesia, Burn, Children, Enteral, Nutrition

ÖZET

Amaç: Yanık tedavilerinde kalori alımı hayati önem taşır. Yanık bakımı hastanemizde anestezi altında yapıldığından, anestezi öncesi açlık uygulaması da yanık hastalarını etkilemektedir. Bütün bu koşullar altında, ağızdan ve nazogastrik tüp aracılığı ile beslenmenin anestezili ve anestezisiz uygulamalarda ne gibi farklılıklar gösterdiği değerlendirilmiştir.

Gereç ve Yöntemler: 2009 ile 2012 yılları arasında yatmış olan 98 geniş yanık hastalar incelenmiştir. Ağızdan beslenen hastalar oral grubu, nazal tüp yoluyla beslenenler ise nazogastrik tüp grubunu oluşturdu. Protokolümüze göre %30 ve üzeri yanıklar nazogastrik tüp ile beslendi. Anestezi öncesi açlık uygulaması yapıldı ve operasyon sonrası 3.saatte işlem yapılan hastaların tamamına beslenme başlandı. İshal, kusma, mide rezidüsü, günlük kaloriler, beslenme tipleri, anestezi prosedürleri kayıt edildi. Şikayet farklılıkları ve beslenme uygulamalarının sonuçları grupların kendi karakteristikleri içinde incelendi.

Bulgular: Oral ve nazogastrik grupların yaş ve cinsiyet dağılımları benzerdi. Oral grup 73 ve nazogastrik grup 25 hastadan oluşmaktaydı. Oral gruptaki en fazla görülen problem %17.8 ile kusma idi. Nazogastrik grupta ise %36 ile gastrik rezidü olması idi. Anestezi uygulanmadığı günlerde kalori alımının fazla olduğu bütün gruplarda görüldü.

Sonuç: Yüksek yüzdeli yanıklarda makul seviyede kalori alımını temin etmek için nazogastrik beslenme zorunlu bir yöntem gibi görünmektedir. Anestezi uygulanmadığında ise daha da etkilidir. Ancak yanık bakımının kaliteli olması için de anestezi uygulaması gereklidir. Uygun beslenme desteğinin sağlanması tartışma konusu olmaya devam edecek gibi görülmektedir. Bizim görüşümüze göre, anestezi uygulaması uygun beslenme ile koordine edilebilir.

Anahtar Sözcükler: Anestezi,Yanık, Çocuklar, Enteral, Beslenme

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INTRODUCTION

Burn injuries are one of the most important issues of trauma in the world (1,2). Authors dealing with burns must be cautious regarding all the issues that may affect the patients' mortality (2). Energy consumption is one of the most critical parameter for burns. If achieving the calorie target fails, surgical procedures may be unsuccessful (3). Changes in the physiologic and metabolic circumstances must be taken into account to achieve suitable nutritional therapy in burn patients (4). For children, energy consumption per unit weight will be more than adults' energy requirements per unit weight because of dynamic growth and physical activity. The calorie demand can increase up to 5000 cal/d in burn cases (5).

Oral or other enteral ways are the most advocated types for feeding burn patients to balance the consumption. Also, enteral feeding is safer than parenteral nutrition for infections. Enteral feeding prevents bacterial translocations, and host increases its ability with this way of nutrition (6). In addition, it is also well tolerated and cheaper (4).

For high percentage burn injuries, oral feeding may not be sufficient to access to an optimum energy requirement. Nasogastric feeding can therefore be essential.

Some circumstances can interfere with the treatment of burns. Anaesthesia-assisted burn care is one of these interferences. Anaesthesia is usually used to provide a qualified, painless and effective therapy for burns. Oral and nasogastric nutrition was evaluated regarding calorie intake differences with or without anesthesia management in this study.

MATERIAL and METHODS

A total of 98 major burn patients who had been hospitalized between 2009 and 2012 were evaluated for their nutritional and anaesthesia-assisted treatment status retrospectively. Patients who had been fed orally were collected in the oral group, and patients who had been fed by nasogastric tube formed the nasogastric group. Patients with other types of nutrition such as intravenous were excluded. Patients with both oral and nasogastric nutrition during hospitalization were also excluded. Patients having higher than 30% of total body surface area burn injury had been fed by only nasogastric tubes. All patients had 6 hours fasting before anaesthesia. Patient in the oral route group were fed 3 hours after anaesthesia management, and feeding was started in the nasogastric group 3 hours after anaesthesia with continuous infusion and the amounts were increased in a step-by-step manner. All patients were monitored, and diarrhoea, gastric residue, vomiting, calorie needs and intake, feeding methods and treatment with anaesthesia were recorded. The Shriners Burn Hospital methods were used to calculate daily calorie intake.

RESULTS

A total of 73 patients were fed by the oral route and 25 patients by nasogastric tube. The groups were homogenous. The burn types of the patients are defined in Table I.

The most frequent complaint within oral feeding was vomiting, and 17.8% of the patients suffered from it. Gastric residue was the most common finding for nasogastric tube feeding as 36% of patients had gastric residue, and patients had at least one gastric residue.

Calorie intake was higher in the oral group than the nasogastric group. For both groups, calorie intake was higher when anaesthesia was not used. Calorie rates are presented according to feeding route and anaesthesia-assisted procedures in Table II.

DISCUSSION

Nutrition is a dynamic process (4). As children are in the growth period, they certainly have more physical activity. Therefore, children need more energy than adults (5). Adding a burn injury in these circumstances can increase the daily caloric demands to more than 5000 calories for both children (5,7).

Calorie consumption increases according to the level of burns. Pre-burn history, pre-injury weight and height, and the clinical features are the basic nutritional evaluation criteria (4). Nevertheless, catabolic effects of thermal trauma cannot be completely eliminated (7). In addition, the stomach is prone to ileus and gastric distension, nausea and aspiration may also develop under stress such as seen with burns (8).

Enteral nutrition is better than parenteral nutrition in every condition (7). Parenteral nutrition is not physiological management. The gut is not used adequately by parenteral nutrition, and complications will be much more common than with enteral feeding for critically ill patients (4).

Intestinal barrier function is lost in a very short time after burn injury (1,6). Enteral nutrition should start as soon as possible after fluid resuscitation to protect gastrointestinal functions and improve overall nutrition for burn patients (5, 8). Thanks to early nutrition, intestinal barrier function and immune abilities are protected by enteral nutrition (6, 9). Also, the metabolic and hormonal effects may change rapidly if enteral feeding is started within 6 hours (1). In addition, the wound-healing period will be shorter, and mortality caused by long hospitalizations will be decreased (9). However, protein catabolism cannot be recovered although early and aggressive enteral nutrition is recommended (10).

Although enteral feeding is better for burn patients, it may not be sufficient to balance the calorie and protein needs for many reasons. Nasoenteral catheters are useful for patients who cannot be fed by mouth. Enteral nutrition may have some disadvantages like imbalance of the intestinal oxygen demand, and the increase in intestinal perfusion may cause problems (4). One of

Table I: Distribution of patients according to burn type (%).

Burn Factors	Fire	Hot Liquid	Electric	Total
Patients	19	74	5	98
%	19.4	75.5	5.1	100

Table II: Comparison of the calorie intake percentage with oral and nasogastric tube feeding with or without anaesthesia.

Feeding Route/Anaesthesia	Oral (%)	Nasogastric (%)
With Anaesthesia	89.2	71
Without Anaesthesia	93.8	82.6

the side effects with nasogastric feeding in the first day of burn injury is regurgitation, and enteral nutrition failed in 18% of burn patients for this reason (7). Patients may also have anorexia, diarrhoea, electrolyte imbalance or eating difficulties during healing (8,11). In our series, we mostly detected gastric residue for nasogastric tube feeding. Gastric residue was present in 36% of the patients, and patients had at least one episode. For nasogastric feeding, we slowed the infusions down or delayed the nutrition. As a hidden problem, we detected that nasogastric nutrition was managed step-by-step causing a delay in reaching the maximum dosage of calorie intake. The reason for this was also the precautions regarding residue and its side effects.

Oral diet may be accompanied by diarrhoea and malabsorption. Mucosal atrophy may be the reason for intestinal problems such as diarrhoea and malabsorption (6). Oral feeding seemed to be more effective regarding the percentage of calorie intake than nasogastric nutrition. This might be because of lower burn percentages for the oral nutrition group. Intragastric feeding must be started as soon as possible but feeding after 18 hours may cause gastroparesis at a high rate, and intravenous nutrition may be needed. Vomiting may be a limitation too. Most of the vomiting incidences were with small amounts and infrequent. Nasojejunal tubes may be a solution for this problem (9). In our clinics, vomiting is also a problem, and 17.8% of the patients suffers from it. One of two feeding periods are deferred to prevent vomiting of patients.

Anaesthesia effects for burn management have not been studied in detail. It can be suggested that therapies like chemical sedation will reduce the energy requirement (8). Preoperative fasting is an important process for burn care and treatments. Using a nasogastric tube, feeding may shorten the preoperative fasting period before surgery. In some clinics, enteral feeding is not postponed for the intubated burn patients. However, it will be better to stop 4 hours before surgery. (12). Like vomiting, it will be an advantage to delay oral nutrition. In contrast, residue is the main reason for delaying for the patients fed by nasogastric nutrition. Anaesthesia is also important for nasogastric nutrition.

CONCLUSION

It is very difficult to support nutrition in children with a high percentage of burned body surface area by the oral route. Nasogastric feeding with high calorie nutrition solutions are essential for these patients. Without anesthesia, optimum nutrition may be possible for sufficient calorie intake. However, we are dealing with a dilemma between comfortable wound care under anesthesia causing nutrition insufficiency and providing adequate nutrition support and this will be a matter of debate. The choices are comfortable management under anesthesia or high calorie nutrition by the nasogastric route?

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