ORIGINAL ARTICLE

Can we make an early 'do not resuscitate' decision in severe burn patients?

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ABSTRACT

BACKGROUND: The present study was conducted to examine topic of issuing early do-not-resuscitate (DNR) order at first diagnosis of patients with severe burn injuries in light of current law in Turkey and the medical literature. DNR requires withholding cardiopulmonary resuscitation in event of respiratory or cardiac arrest and allowing natural death to occur. It is frequently enacted for terminal cancer patients and elderly patients with irreversible neurological disorders.

METHODS: Between January 2009 and December 2014, 29 patients (3.44%) with very severe burns were admitted to burn unit. Average total burn surface area (TBSA) was 94.24% (range: 85–100%), and in 10 patients, TBSA was 100%. Additional inhalation burns were present in 26 of the patients (89.65%). All of the patients died, despite every medical intervention. Mean survival was 4.75 days (range: 1–24 days). Total of 17 patients died within 72 hours. Lethal dose 50 (% TBSA at which certain group has 50% chance of survival) rate of our burn center is 62%. Baux indices were used for prognostic evaluation of the patients; mean total Baux score of the patients was 154.13 (range: 117–183).

RESULTS: It is well known that numerous problems may be encountered during triage of severely burned patients in Turkey. These patients are referred to burn centers and are frequently transferred via air ambulance between cities, and even countries. They are intubated and mechanical ventilation is initiated at burn center. Many interventions are performed to treat these patients, such as escharotomy, fasciotomy, tangential or fascial excision, central venous catheterization and tracheostomy, or hemodialysis. Yet despite such interventions, these patients die, typically within 48 to 96 hours. Integrity of the body is often lost as result of aggressive intervention with no real benefit, and there are also economic costs to hospital related to use of materials, bed occupancy, and distribution of workforce. For these reasons, as well as patient comfort, early do-not-resuscitate or do-not-intubate protocol for these patients is suggested. Resources could then be directed to other patients with high expectancy of life and patients with burns that are beyond treatment can experience more comfortable end of life.

CONCLUSION: At present in Turkey, it is not possible to give DNR order for patient with severe burns that are incompatible with survival due to legal interdiction. This subject should be discussed at high-level meetings with participation of doctors, legal experts, economists, and theologians.

Keywords: Do not intubate order; do not resuscitate order; severe burns.

INTRODUCTION

Cardiopulmonary resuscitation (CPR) is routine intervention when patient experiences cardiac or respiratory arrest. When administered outside hospital circumstances, airway management is initially performed. Next, for recovery of circulation, chest compressions are used. Chest compression to ventilation ratio of 30:2 should be provided. If the patient is in a hospital, more advanced treatment modalities are added to intervention, such as endotracheal intubation and cardiac defibrillation for rhythm recovery. Drugs such as adrenaline, atropine, and sodium bicarbonate may be administered via intravenous cannula.[1]

Most important goal of CPR is prevention of clinical death.[2] However, use of CPR is frequently insufficient to achieve this objective. Study performed with 12 266 patients from

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Table 1. Total burn surface area distribution of the patients

Total burn surface area (%)	85–89	90–94	95–99	100
Number of patients	3	12	4	10

Table 2. Age distribution of the patients

Age	<10	11–20	21–30	31–40	41–50	51–60	>60
Number of patients	1	3	8	5	7	2	3

between 1960 and 1980 reported that 39% of the patients survived the procedure and 17% of the patients survived until discharge from hospital.[2]

Do-not-resuscitate (DNR) order requires withholding CPR in event of respiratory or cardiac arrest and allowing natural death to occur. It was first introduced to medical literature in 1976.[3] It is frequently implemented for terminal cancer patients and elderly patients with irreversible neurological disorders. This decision is usually ordered by patient's relatives. In small number of cases, the patient can provide informed consent regarding DNR order. Decision can only be considered if accepted by doctors and ethical committees of the hospital.[3]

In severely burned patient, third-degree burns encompass nearly all of the skin. Inhalation injury may also be present. In early hours, spontaneous ventilation may be observed in these patients and they may be conscious, but with time, clinical situation becomes severe. Despite implementing all of the most recent medical interventions, injuries are irreversible and the patients are lost.

Serious burn injuries constitute significant cause of morbidity and mortality.[4] Although apparent improvements in overall survival in burn injuries have been achieved, mortality in patients with severe burn injuries admitted to intensive care remains high.[4] The present study examined early DNR order for severe burn patients with analysis of the literature and current law in our country.

MATERIALS AND METHODS

Medical records of 841 patients admitted to regional burn center between January 1, 2009 and December 31, 2014 were analyzed retrospectively.

The Kartal Dr. Lütfi Kırdar Education and Research Hospital Wound Care and Burn Center was established in Istanbul, Turkey in late 2008. Main hospital was opened in 1987 as dedicated trauma hospital to meet needs in the area as result of industrial growth and increase in population. It is second largest state hospital in Turkey with 706 hospital beds, and burn center is the largest and best equipped in the country. It has 6 intensive care unit (ICU) beds, 16 burn service beds, and 2 separate operating rooms, all housed in single building. Helicopter landing site on premises accepts patients from every region of Turkey, as well as from neighboring countries. Multidisciplinary team consisting of general surgeons, plastic surgeons, anesthetists, infectious disease specialists, pediatric surgeons, physiotherapists, psychologists, dieticians, and burn nurses work in the center according to American Burn Association (ABA) guidelines.

All data for this study were obtained from medical records of the hospital. Age and gender of the patients, total burn surface area (TBSA), burn degree, duration of hospital stay, type and total count of surgical interventions, mortality rate, venue of burn incident, and ICU requirements were recorded.

RESULTS

Between January 2009 and December 2014, 29 patients (3.44%) with very severe burns were admitted. Average TBSA was 94.24% (range: 85–100%), and in 10 patients, TBSA was 100% (Table 1, Figure 1). In addition, 24 patients (82.75%) had inhalation burns (Figure 2). In all, 6 patients were female and 23 were male. Mean age was 35.27 years (range: 7–66 years) (Table 2). Three patients were Syrian and had been transferred to center by air ambulance from Syria, where burn injuries occurred (Figure 1). Another 16 patients had been transferred from surrounding districts of Istanbul.

Majority of burns (n=24; 82.75%) were flame burns. Three cases were electrical burns and 2 were scald burns (Table 3).

All of the patients died, despite every medical intervention. Mean survival was 4.75 days (range: 1–24 days). Total of 17 patients died within 72 hours. LD50 (% TBSA at which certain group has 50% chance of survival) rate of our burn cen-

Table 3. Types of burn in the patients

Type of burn	Flame	Electrical	Scald
Number of patients	24	3	2

Figure 1. A patient transferred to our burn center by air ambulance with full-thickness burns and 100% total body surface area involvement.

Figure 3. A patient with echarotomy performed on trunk as well as upper and lower extremities.

Figure 2. A patient with inhalation burn. Soot is aspirated with endotracheal tube.

Figure 4. Another patient with echarotomy performed on trunk and upper and lower extremities.

ter is 62%. Baux indices were used for prognostic evaluation of the patients; mean total Baux score of the patients was 154.13 (range: 117–183).

DISCUSSION

Several difficulties may be experienced in triage of severely burned patients in Turkey. Patients are referred to burn centers and may be transferred via air ambulance between cities, and even countries. Intubation of the patients may be performed either at the scene before transfer or at burn center. Upon arrival to burn center, mechanical ventilation is initiated. Many interventions are performed to treat these patients, such as escharotomy, fasciotomy, central venous catheterizations and tracheostomy, or hemodialysis (Figure 3, 4). But despite such interventions, these patients die, typically within 48 to 96 hours. Integrity of the body is often lost as result of aggressive intervention with no real benefit, and there are also economic costs related to use of materials, bed occupancy, and distribution of workforce. Total Baux score was calculated for every patient in study and mean total Baux score was 154.13 (range: 117–183).

Original Baux score[5] is sum of the patient's age and percentage of TBSA involvement; it is often quoted as estimated percentage risk of death.[6] Osler et al.[7] evaluated Baux score in 39 888 patients from the National Burn Registry of the USA and added inhalation injury as scoring component, creating revised Baux score. The Belgian Outcome in Burn Injury score[8] uses revised Baux score variables in different statistical model, which was derived from study of 5246 Belgian patients. The Abbreviated Burn Severity Index[9] utilizes gender and presence of any full-thickness burn in addition to the above variables.

Studies in the literature have reported that revised Baux score and updated Charlson comorbidity index are independently associated with mortality in intensive care burn patients, and that total Baux score >140 is not compatible with life.[7]

Wilton et al. performed retrospective review at the United States Army Institute of Surgical Research burn intensive care unit (BICU). Charts from January 1, 2000 through August 31, 2009 were analyzed for the study. Data were collected from adult burn patients who experienced in-hospital cardiac arrest and CPR, either in BICU or burn unit operating room. It was found that CPR was effective in burn patients, and that those who survive are likely to have good neurological outcomes. However, prolonged CPR time is unlikely to result in return of spontaneous circulation and may be considered futile. Furthermore, those who experience multiple episodes of cardiac arrest are unlikely to survive to discharge. Multiple instances of cardiac arrest and prolonged CPR time can be observed in severely burned patients.[10]

When results of these studies are considered, one must think about solution for these patients with severe burns. DNR order for these patients can provide patient with smoother, more natural death and opportunity for time with relatives, as well as avoiding aforementioned economic costs to hospital.

In study of O'Mara et al., retrospective evaluation was conducted of all deaths that occurred in pediatric burn unit over 7-year period. Of 29 deaths (total admissions: 1261; 2.3% death rate), 12 were patients with DNR status. Active withdrawal of support occurred in 15 cases: 10 patients with DNR order, 5 without. Of the 12 patients with DNR status, only 5 had order indicating no CPR, no vasopressor, and no cardioversion was to be used. Mean time from activation of DNR protocol until death was 22.9±49.6 hours (median: 2.75 hours). Patients without DNR order in place before death had more CPR attempts (0.8-0.6 vs 0.3-0.6; $p<.05$). At time of death, few patients with DNR order were receiving vasopressor (2 patients) or underwent CPR (1 patient). Of the 17 patients without DNR order, 12 underwent resuscitative efforts: CPR, vasopressor, or cardioversion. No resuscitative efforts were undertaken for 4 children, 2 of whom had DNR order. In this study, authors found that further evaluation of indications, timing, and implementation of DNR order for children with severe burns was warranted.[11] This study is an example of use of DNR order with burn patients and can give an idea about DNR order for other severely burned patients.

In our country, a committee makes decision regarding brain death. We propose similar committee organization for DNR decision in cases of severely burned patients. In case of brain death, aim is preservation of organ functions, but goal for severely burned patients will be aggressive pain treatment for comfort of the patient, rather than organ preservation.

Similar to brain death evaluation commission, team consisting of emergency care, general surgery, plastic and reconstructive surgery, pediatrics and pediatric surgery, anesthesiology and reanimation, internal medicine, and chest disease specialists could evaluate severity and survivability of burn injury. Information about clinical status of the patient could be given to relatives and they could provide informed consent not to transfer patient to burn center for further treatment. Hospital directors, judicial authorities, and ministry of health would also be informed.

Main goal of ICU in case of brain death is to protect organs so that they may be transplanted, rather than to protect the brain. However, in severely burned patients it should be just the opposite: Rather than the whole body, it is proposed that in these cases, support be given to the patient's brain. We will try to keep the patient conscious and free from pain to give them an opportunity to meet with relatives for as long as possible. Proper fluid resuscitation and oxygen support will be provided alongside effective pain treatment and sedation for anxiety. No intervention disturbing integrity of the body will be performed, and when respiratory or circulatory arrest occurs, CPR will not be performed. We found no such example in the literature.

Hammond et al. report indicated that DNR order should be guided by experience of the center.[12] This is useful, but it is opinion of the authors that decision should also be unanimous. Once goals of treatment have been agreed upon, decisions about end-of-life care of individual patient are to be made. Conditions of care should be mutual decision with the understanding of the healthcare team that additional intervention has become inappropriate given goals decided upon. It is important to realize and remember that even when these conditions are met, there is still a duty to provide care for the patient. DNR order is not equivalent to a do-not-care order.[13]

National laws and ethics committee rules must define profile of patients for whom this decision process will apply. In Turkey, 2012 Ministry of Health treatment algorithm for burn injuries noted importance of appropriate transfer of burn patient. It specified that burn patients are to be transferred from accident site to healthcare center, or from one healthcare center to another more experienced or better-equipped facility. In the guidelines it is noted that first point to be determined before transfer of patient is probability the patient will survive and likelihood of new threat to patient's life occurring during transport. Immediate transfer to healthcare facility is specified for patient with probability of survival. Transfer is not priority for patients who have low probability of survival or severe cardiopulmonary instability, according to the treatment algorithm.[14]

However, there is currently no related article of law in Turkey pertaining to this situation. Turkish Criminal Code maintains that one may be held responsible for death of a person when there is failure to perform a work-related responsibility. From this point of view, it can be inferred that a doctor may be charged with not performing duty to do all possible to save the life of a patient if DNR protocol is followed.

Conclusion

In Turkey, legal interdiction currently prevents DNR order for a patient with severe burns that are not compatible with survival. This subject should be discussed at high-level meetings with participation of doctors, legal experts, economists, and theologians. Once consensus has been reached, practice can be implemented in burn intensive care units. We offer DNR procedure, but legal circumstances must be addressed in our country prior to application. Such a protocol will offer patients with unsurvivable burn injuries a more comfortable end of life, prevent disturbing integrity of the body, avoid economic costs associated with intervention, and allow hospital resources to be directed to other patients with high expectancy of life.

Conflict of interest: None declared.

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ORİJİNAL ÇALIŞMA - *ÖZET*

Ciddi yanık hastalarında erken "do not resuscitate-resüsite etme" talimatı verilebilir mi?

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AMAÇ: Ülkemizdeki ciddi yanık hastalarında erken "resüsite etmeme=DNR" kararı verilip verilemeyeceği sorusuna literatür ve ülkemizin yasal mevzuatını inceleyerek cevap aramaya çalıştık.

GEREÇ VE YÖNTEM: DNR terimi bir hastada solunumsal ya da dolaşım arresti meydana geldiğinde yapılan kardiyopulmoner resüsitasyon uygulamasının durdurulmasını ifade eder. Tıp literatürüne ilk olarak 1976 yılında girmiştir. Sıklıkla son dönem kanser hastalarında ve geri dönüşümsüz nörolojik hastalıkları olan hastalarda uygulanır.

BULGULAR: Ocak 2009 ile Aralık 2014 tarihleri arasında yanık merkezimize 29 çok ciddi yanık hastası kabul edildi (%3.44). Ortalama toplam yanık yüzey alanı (TBSA) %94.24 (dağılım, %85–%100) idi ve 10 hastada TBSA oranı %100 dü. Yirmi altı hastada ilave inhalasyon yanığı mevcuttu (%89.65). Hastaların tümü bütün tıbbi girişimlere rağmen kaybedildi. Ortalama sağ kalım süresi 4.75 gündü (dağılım, 1–24). On yedi hasta ilk 72 saat içinde kaybedildi. Yanık merkezimizin LD50 oranı %62'dir. Prognostik değerlendirme için hastaların Total Baux indeksleri hesaplandı. Ortalama Total Baux İndeksi 154.13'tü (dağılım, 117–183).

TARTIŞMA: Türkiye'de ciddi yanık hastalarının triyajında çeşitli sorunlarla karşılaşabileceğimiz bir bilinen faktördür. Bu hastalar yanık merkezlerine yönlendirilir ve hava ambulansları vasıtasıyla şehirler arasında ve hatta ülkeler arasında nakledilirler. Yanık merkezlerinde entübe edilip mekanik ventilasyon başlanır. Bu hastaları monitörize etmek ve tedavi etmek için birçok girişim uygulanır. Eskarotomiler, fasiyotomiler, tanjansiyel ya da fasiyel eskaratomiler, santral venöz kateterizasyonlar, trakeostomiler ve hemodiyaliz uygulamaları bu hastalarda gerçekleştirilir. Ancak tüm bu girişimlere rağmen 48–96 saatlik takip sırasında bu hastalar kaybedilirler. Bu durum da ekipman kullanımı, yatak işgali ve iş gücü kaybı gibi ekonomik kayıplara neden olmaktadır. Gerçekte hiçbir fayda sağlamayan çok çeşitli girişimlerle hastaların vücut bütünlüğü daha da bozulmaktadır. Bu nedenle, bu hastalarda alınabilecek bir erken DNR kararı ya da entübe etmeme kararı ile ekipman kullanımı, yatak işgali ve iş gücü kaybı gibi ekonomik kayıplar azalacaktır ve bu kaynaklar daha yüksek yaşam beklentisi olan diğer hastalar için efektif olarak kullanılabilir. Ayrıca yaşamla bağdaşmayacak kadar ciddi yanığı olan hastalar da daha huzurlu ve rahat bir şekilde hayatlarını sonlandırabileceklerdir. Türkiye'de yasal kısıtlamalar nedeniyle ciddi yanık hastalarında bir DNR kararı almak mümkün değildir. Bu konu doktorların, hukukçuların, ekonomistlerin, ilahiyatçıların katılacağı büyük toplantılarda tartışılmalıdır.

Anahtar sözcükler: Ciddi yanıklar; entübe etme kararı; resüsite etme kararı.

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