TITLE OF CASE: Burn Injuries and Management

AUTHOR OF CASE: Magdalena Malinowska

SUMMARY: Patient is a 23 year old female who was brought in by EMS to the Emergency Room post a motor vehicle accident in which the car she was in caught on fire and exploded. She was driving about 35 mph with her son when their car got hit on the passenger side where her gas tank was and immediately caught on fire. At the time of collision she obtained only minor injuries. Major injuries were obtained when she tried to get her 3 year old son from the back seat of the burning car. She was not able to get her son before someone pulled her out of the car, then the car exploded. She obtained 1\textsuperscript{st}, 2\textsuperscript{nd} and 3\textsuperscript{rd} degree burns that covered 15\% of her body surface area. Most severe burns were on her hands and shoulders. Her hair and eyebrows were singed.

After being stabilized and examined, she was transferred to the burn unit. There she was washed and dressings were put on her hands and shoulders. Throughout her stay she had multiple surgeries on her hands.

BACKGROUND: Doing my surgery rotation in a Trauma Center, which was also a Burn center, I saw a fair share of burn victims. This case stood out in my mind because it was the first case that made me and a majority of nurses/physicians in the trauma bay very emotional due to the patient loosing her son in such a tragic way. This case presents a topic that is more common than I thought it would be, therefore, I believe that it’s important to know how to determine the severity of a burn as well as its management, whether it will be seeing a burn at home, a clinic or a trauma center. It’s also important to educated patients on burns prevention.

CASE PRESENTATION:

HPI: JL is a 23 year old female hospitalized with 1\textsuperscript{st}, 2\textsuperscript{nd} and 3\textsuperscript{rd} degree burns, post an MVA in which her car exploded with her son still in the car. Patient obtained 15\% TBSA burns.

PMH/PSH: negative – no meds, no surgeries, no allergies

Family Hx: Father – HTN

Social Hx: Denies ETOH, tobacco or illicit drug use. Lives with fiancé.

ROS:

Gen: + distress, + chills

Resp: - SOB, - cough, - respiratory distress
Msk: (R) hip and flank pain

Otherwise, unremarkable

PE:

Vitals on arrival: Stable

Gen: A&Ox3

HEENT: 1st degree burns on neck, ears and face, eyebrows and hair singed, mild face edema

Cardiac: RRR

Resp: CTA, no respiratory distress

Abd: soft, nondistended, no guarding or rebound, (R) flank tenderness and mild ecchymosis

Msk: (R) hip tenderness and ecchymosis and decreased ROM

Int: (B) hands, arms, shoulders 2nd/3rd degree burns

INVESTIGATIONS:

CXR, AXR, pelvic X-ray unremarkable

TREATMENT/OUTCOME/FOLLOW-UP

Patient was taken to the burn unit about two hours after arrival in the trauma bay. In the burn unit, I helped to wash her and put dressings on her hands and shoulders. At that time her facial edema has markedly increased to the point where she had a hard time seeing.

She was closely monitored and 3 days later had a debridement of her hands done which I observed in the OR.

After that I finished my rotation and therefore was not present during the remainder of her stay. I do know that she had skin grafts done to her hands (skin from her hips) and there was no time during her stay that she needed intubation.

DISCUSSION

There are many studies and journal articles on descriptions and treatments of burns. Ones that I was interested in are about resuscitation, types of fluids and the need for antibiotics.
One on resuscitation is from the Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine. The title of it is “Management of burn injuries – recent developments in resuscitation, infection control and outcomes research”. The article is from November 2008.

One of the main point of the research for this article is that “burn injured patient is easily and frequently over resuscitated”.

Research done by Blumetti and coworkers from the University of Texas Southwestern in Dallas was a 15 year retrospective analysis. It included patients with TBSA >19%, where adequate fluid resuscitation was defined as a urine output of 0.5 to 1.0 mL/kg/hr. Over resuscitation was defined as a urine output >1.0mL/kg/hr. It was a review of almost 500 patients and about 43% of them received adequate resuscitation based on urine output criteria. 48% were over resuscitated. There was no difference in complication rates or mortality regardless of over resuscitation vs adequate. There was a 1% incidence of abdominal compartment syndrome even with burns exceeding 40% TBSA where resuscitation volumes exceeded 250 mL/kg. This can be compared to another study done by Ivy and others which report that abdominal compartment syndrome commonly occurred with resuscitation in excess of 250 ml/kg.

In summary of these, patients commonly received higher fluid volumes than predicted by the Parkland formula and had same complications. The Parkland team (Blumetti research) recommended emphasis on calculated formula volumes only as a guide to initial resuscitation and the use of careful titration to urine output as the most important intervention.

Studies have been done to compare colloids to crystalloids being used in resuscitation and Fakhry and team found that colloids are no better, and are more expensive than crystalloids for maintaining intravascular volume initially after the thermal injury. The argument is predicted upon the observation that even large proteins, on the order of 300 kd, leak from capillaries for approximately 24 hours after thermal injury, hence any theoretical advantage of colloids is negated. There are three approaches described:

1- Protein solutions are not given in the first 24 hours because during this period they are no more effective than crystalloid in maintaining intravascular volume
2- Proteins, specifically albumin, should be given from the beginning of resuscitation with crystalloid
3- Protein should not be given 8 to 12 hours postburn because of the massive fluid shifts during this period after which they should be used

There was no meaningful benefit or difference with the use of FFP in limiting weight gain, reducing edema and decreasing resuscitation volumes.
In a study regarding use of prophylactic antibiotics written by Timmons, shows that only a small percentage develop infections (particularly Strep pyogenes), even if no systemic prophylaxis is used. The researchers suggest that regular wound cleaning and debridement, topical chemoprophylaxis, for example with silver sulphadiazine, and early excision of the burnt tissue with skin grafting reduce the incidence of significant infection. The mere presence of bacteria other than Strep pyogenes on a burn is no indication for the use of systemic antibiotics.

In a study written by Rashid and team, their results show that prophylaxis can decrease the incidence of toxic shock syndrome in a burn patient. In their study out of 50 children admitted to the burns unit, 39 received prophylactic antibiotics in the referring accident and emergency. Two of these became unwell but none fulfilled the CDC criteria. The remaining 11 patients were given antibiotics on admission out of which one child required direct admission to the intensive care unit with a working diagnosis of TSS. Retrospectively, his features did not conform to the CDC criteria.

**LEARNING POINTS/TAKE HOME MESSAGES**

1. The depth of a burn determines its severity. *First degree burns* damage the outer layer of epidermis and cause pain, redness and swelling. *Second degree burns* damage the epidermis and the inner layer, the dermis, causing erythema and blistering. Damage from *third degree burns* extend into the hypodermis, causing destruction of the full thickness of skin with its nerve supply (numbness). Third degree burns leave scars and may cause loss of function and/or sensation.
2. When the skin is burned, it can't protect the body against germs, prevent the loss of body fluid, or keep the body at a normal temperature, therefore a burn patient needs constant, close monitoring.
3. It is important to never underestimate the severity of a burn. It takes approximately 24 hours for a burn to fully "declare" itself regarding its severity. When treating burn patients, the provider should be able to determine the extent of the burned areas. One of the easiest and most popular ways is to use the *Rule of Nines*. The body surface is broken down into areas representing 9 percent or multiples (calculation is different for an adult and a child). A rule of thumb is that the patient’s palm represents 1 percent of their body surface area.
4. Remember the *Parkland Formula* when calculating fluid requirements for burn patients. The burn patient is easily over resuscitated. Practitioners must be willing to reduce fluid prescriptions when signs of adequate perfusion are present. Currently, adequate vital signs and urine output are the "gold standard" for perfusion assessment.

   Fluid requirement = TBSA burned (%) x Wt (kg) x 4mL
   Give ½ of total requirement in 1st 8 hours, and then give 2nd half over next 16 hours
5. Make sure to know when it is necessary for a patient to be transferred to a burn center.
6. Patient education regarding smoke detectors, smoking in the house, hot water heaters temperatures (<140 F or 60 C) and flame resistant sleep ware for little kids
REFERENCES

   http://www.ameriburn.org/BurnCenterReferralCriteria.pdf


