BURNS

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ETIOLOGY (TYPES OF BURN):

There are 3 types of burns depending on the etiology; themal, chemical and electric.

1.THERMAL BURNS

Heat causes **coagulative necrosis** of tissue, by coagulation of the cellular proteins, so the cell which is run by enzymes is no more working leading to its death. This type of necrosis is characterized by, preservation of the shape of the tissue involved. The temperature that causes coagulative necrosis is usually greater than 45 degrees centigrade. The depth **(degree of burn)** depends on the **quantity of heat** (both the temperature and the duration of exposure to heat), so exposure to a relatively lower temperature for long period may cause more damage than exposure to high temperature for a short period.

Thermal burns is classified into,

A. Dry heat (direct flame burn) direct exposure to fire.This type is serious because it may be associated with inhalation injury.
B. Moist heat (scald burn), exposure to hot liquids.
C.Contact burn. contact with hot metals like an iron.
D.Friction burns.

The burn wound and surrounding tissues classically have been described as a system of several circumferential zones radiating from primarily burned tissues, as follows:

1. Zone of coagulation: The area of dead necrotic tissue.
2. Zone of injury: also named as zone of ischemia or stasis: Refers to the tissues surrounding the (zone of coagulation). The tissues in this zone initially are injured but not dead. They may progress irreversibly to necrosis if not resuscitated properly. So good medical care should be directed to tissues in this zone to save them rather than leaving them to become necrotic.
3. Zone of hyperemia - Peripheral tissues that undergo vasodilatory changes due to neighboring inflammatory mediator release but are not injured thermally and remain viable

The primary aim of burn management should be concentrated on the (zone of injury) to preserve the injured tissues in it. The management is achieved by: General management and local management.

GENERAL MANAGEMENT

1. **Maintaining adequate oxygenation.**

2. **Proper fluid resuscitation to maintain adequate perfusion, management of electrolytes and acid-base derangements.**

3. **Treatment of anemia.**

4. **Nutritional support.**

5. **Minimizing tissue edema which has a negative effect on micro-circulation and decreases tissue perfusion, this is achieved by <u>proper</u> fluid resuscitation (avoid over-resuscitation) and by elevation of injured limbs.**

LOCAL MANAGEMENT

6. **Proper burn wound management later as discusses in the lecture: <u>*wound care.*</u>**

If the above measures are not performed properly, more necrosis will follow and the degree of burn would increase, so a second degree burn may become third.

2.CHEMICAL BURNS

Caused by acids or alkalis: characterized by deeper penetration and tissue damage due to the longer duration of action of the chemical agent which continues to damage until it is inactivated by reaction with the tissues.
Contrary to expectations, acids produce less damage, and less penetration, than alkalis, because acids usually produce **coagulative necrosis** (denaturation of cellular proteins) this forms a barrier limiting the destructive effect of acids on tissues, while alkalis produce **liquefaction necrosis**, allowing deeper penetration and destruction.
The primary management of chemical burns is by irrigation of the area affected by water to dilute the chemical agent, this should continue for 2-4 hours in case of alkaline burn, and 30 minutes for burns caused by acids. Note that we **<u>DO NOT</u>** apply acids to neutralize alkalis and vice versa. Because adding acid to alkali results in harmful heat production.

3.ELECTRICAL BURNS

We know from Ohm's law in physics that <u>electric current</u> depends proportionally on the Voltage and inversly on the Resistance.

The human dody is formed of different tissues that vary in their resistance. **Nervous tissues, muscular tissues have the least resistance** so elecrtic current would easily pass through them causing maximal damage. Skin -especially when dry- has relatively high resistance, so its damage is relatively minimal.

The severity of burn depends also on the voltage, so it is more serious with high voltage current. (high voltage is defined as that more than 1000 volts).

The passage of electric current through different tissues within the body, and hence the burn damaging effect, is inversely related to the **tissue resistance** which varies among different tissues. Nerves, muscles, blood, and blood vessels have low

resistance, so they are affected most, while skin, and tendons, have high resistance, hence, they are less damaged. Although nervouis tissue is the most sensitive to electric injury, the major effect of electric burn involves the muscles due to their bulk, so we can say that electric burn is muscle burn!!.
It is very important to remember this fact, because a patient with massive electric burn may deceive the E.R. doctor due to minimal skin burn, not aware of the massive hidden muscle burn.

ELECTRIC BURN IS DECEIVING!!!

MANAGEMENT OF ELECTRIC BURNS:

1. **Nervous tissue injury may involve the central or peripheral nervous system.**
   so pateints should be assessed for head injury and peripheral nerves damage.
2. **Involemement of cardiac muscles may lead to cardiac arrythmias.**
3. **Due to the skeletal muscle damage, myoglubin is released from the damaded muscles leading to myoglobinemia and myoglobinuria that caused acute kidney injury. good hydration, and alkalization of urine are measures to be used to prevent this renal impairment.**
4. **Also, due to the muscle damage, patients are liable for compartment syndrome.**

   COMPATRMENT SYNDROME
   An increase in the pressure inside a skeletal muscle compartment above the capillary pressure (32 mm/Hg), thatleads to decreasing capillary perfusion and muscle ischemia.

   Clinically it is characterized by severe undue pain in the affected limb along with paresthesia and numbness. The affected limb is tense. At the beginning the pulses may still be palpable (because in compartment syndrome the intra-compartmental pressure is above the capillary pressure which is 32 mm/Hg, not enough to close an artery).
   Pressure should be releived by fasciotomy within 6 hours to avoid permanent muscle ischemic necrosis.
5. **Due to severe muscle contraction patients may have bone fractures.**

The severity of the electrical burn is not evident, and can not be estimated, as in the case of thermal burn, which depends on the percentage of the burned skin, so fluid management could not be based on a calculated Parkland's formula as in thermal injury, but on close clinical observation, urine output, serial hematocrit values, and CVP readings.

ASSESSMENT OF THE SEVERITY OF BURN (Depth and Percentage)

1. The depth of burn damage (degree): determinns the **local management and outcome** of the burn wound
2.The surface area involved in burn, This is the percentage of the burned area to the total body surface area.**This determins the prognosis (mortality rate) and the systemic management and complications,** Initially fluid resuscitation depends on the percentage of burn injury, later the percentage of burn determinnes the systemic complications as sepsis, catabolism and decreased immunity.

DEGREE OF BURN

This determines the local management of the burn wounds , In partial thickness burn, part of the dermis containing skin appendages is preserved, from these epithelial elements, the burn wound would heal by **REGENERATION**, within weeks, hence the local treatment of the burn is **conservative (no skin grafts)**. While in full thickness burn all the dermis with the epithelial elements are lost, so the burn wound would naturally heal by **FIBROSIS**, a process usually takes longer period, and leaves an unstable scar, with all its **functional**, and **cosmetic** complications, to avoid this unfavorable fate, full thickness burns, should be treated by **skin grafting**, better sooner than later. According to the previous discussion, the deeper the burn is, the more the scarring would be, and the more time is taken to heal.

Classification of the depth of burn injury:

1.First degree burn, thermal necrosis is limited to the epidermis, clinically there is pain, and erythema, it takes 1-6 days to heal and leaves no scars.
2.Second degree burn (partial thickness), necrosis of the epidermis and a varying depth of the dermis, characterized clinically by pain (due to irritation of the dermal sensory nerves), erythema, blisters(bullae), the burned area is wet with exudate (weeping), blanching denoting intact dermal vascularity, and preservation of skin elasticity. It takes 1-4 weeks to heal and leaves minimal scarring.
3. Third degree burn (full thickness), necrosis of the whole skin (epidermis and dermis) and its skin appendages, clinically there is an *eschar* which is simply (the burned necrotic skin) , it is insensitive, leathery, hard, inelastic, and may show thrombosed dermal vessels. It takes months to heal and leaves significant scarring and post burn joint contractures.
To avoid scarring it should be skin grafted after removal of the necrotic skin (the eschar).

Note that the deeper the burn the more dermis is necrotic so:

- **Less pain due to damage of dermal nerves.**
- **Healing is by fibrosis rather than regeneration. So leaving more post burn contractutes**
- **More loss of skin elasticity, so it compresses the limbs that needs escharotomy.**

ESTIMATION OF THE PERCENTAGE OF BURN:

This determines the prognosis (mortality rate), and the systemic complications and the systemic management of the burn victim.

A. **The percentage of burn deretmines:**
B. The mortality rate (mortality rate increases as percentage increases).
C. Degree of hypovolemic shock (fluid deficit) and hence the fluid resuscitation.
D. Degree of malnutrition, Hypermetabolism, catabolism and protenn breakdown.
E. The propability of decreased immunity, sepsis, septic shock and their systemic complications as multi-organ failure increase with the increase in burn percentage.

☒ **The percentage of burn is the percentage of the burnt skin surface/ total body surface. First degree burn is not calculated. We add areas with second to those with third degree burn.**

☒ **There are three methods of TBSA estimation:**

1. **Rule of nines: the body is divided into 11 nines; Head &neck (9%), Upper limbs (9% each), Anterior trunk (18%), Posterior trunk (18%), Lower limbs (18% each) and the remaining 1% for the genitals.**
2. **Special accurate charts: are used for accurate estimation of the burn percentage, because**
   A. **The rule of nines is rough and not very accurate.**
   B. **And because the children have different body proportions compared with adults: for axample, the surface area of the head and neck of the neoborn is around (20%) and decreases with age, while the percentage of the surface area of the lower limbs of the neoborn is 14% and increases with age.**
3. **For small burns, the palm of the hand equals 1% of the body surface area.**

MANAGEMENT OF BURN

When the percentage of burn is significant, we should look at the burn injury as a systemic (disease) or syndrome affecting all the systems of the body, at some stage of the hospital stays.
Regarding the respiratory system, burn victim may have upper respiratory tract obstruction, in the first 24 hours, smoke inhalation syndrome in the initial 2-3 days, and later may develop respiratory infections, or ARDS.
The cardiovascular, renal, gastrointestinal, endocrine, immune, systems may be affected by burn that increases the metabolic rate, and results in negative nitrogen balance and malnutrition.

***Management of burn is divided into*:**

1.Acute or emergency stage.

2.Local management of burn wounds.
3.Treatment of complications.

ACUTE OR EMERGENCY MANAGEMENT

Like in any trauma, we follow the ATLS (**A**dvanced **T**rauma **L**ife **S**upport) rules, which dictates treatment of life threatening conditions in the first minutes , before full screening and diagnosis of the injuries, so we follow the, A, B, C, rules.

AIRWAY: patients involved in flame burns may suffer from upper airway obstruction, due to soft tissue edema of the oropharynx and vocal cords, resulting from direct thermal injury to the upper respiratory tract, by inhalation of flame and hot gases. This obstruction may not be evident initially, but appears in the first 24 hours. Direct inspection of the oropharynx and the vocal cords , by either direct laryngoscopy, or better by bronchoscopy is indicated. Endotracheal intubation , to secure a patent airway, should be performed before obstruction is complete. Signs of impending obstruction include:
Tachycardia, progressive hoarseness, and difficulty to clear bronchial secretions.

CARBON MONOXIDE POISONING: This is due to occupation of the oxygen carrying sites of hemoglobin by CO, which has 210 times higher affinity to hemoglobin than oxygen. The condition is diagnosed by estimation of carboxyhemoglobin level in the blood, the PO2 level may be normal, as this is an estimation of the oxygen dissolved in the plasma. The treatment is by administration of 100% oxygen in order to displace the tightly bound CO from hemoglobin.

FLUID MANAGEMENT OF BURNED PATIENT.

Total Body Water

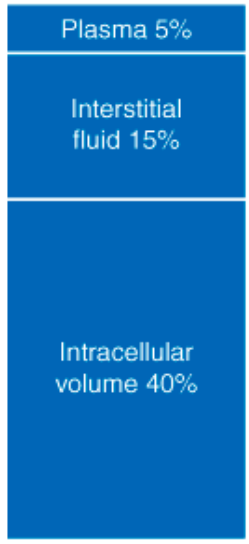
Water constitutes approximately 50 to 60% of total body weight, Lean tissues such as muscle and solid organs have higher water content than fat and bone. In an average young adult male 60% of total body weight is TBW, whereas in an average young adult female it is 50%. The lower percentage of TBW in females correlates with a higher percentage of adipose tissue and lower percentage of muscle mass in most The highest percentage of TBW is found in newborns, with approximately 80% of their total body weight comprised of water. This decreases to approximately 65% by 1 year of age and thereafter remains fairly constant.

Fluid Compartments

In a male adult with weight=70kgs, 70 KgsX60%= 42 Kgs of water= 42 liters=42000 ml. This TBW is divided into three functional fluid compartments:

1. INTRA-CELLULAR (ICF) = 2/3 of TBW= 28 liters.
2. EXTRA-CELLULAR (ECF) = 1/3 of TBW= 14 liters.
    A. INTRA-VASCULAR FLUID (PLASMA) = ¼ of the 1/3= 3.5 liters.

B. EXTRA-VASCULAR INTERSTITIAL= 3/4 of the 1/3= 10.5 liters.



Volume of TBW	Male (70 kg)	Female (60 kg)
Extracellular volume	14,000 mL	10,000 mL
Plasma	3500 mL	2500 mL
Interstitial	10,500 mL	7500 mL
Intracellular volume	28,000 mL	20,000 mL
	42,000 mL	30,000 mL

Source: Brunicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Matthews JB, Pollock RE: *Schwartz's Principles of Surgery, 9th Edition:* http://www.accessmedicine.com

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Composition of Fluid Compartments

The main cation of the ECF compartment is **sodium**, and the main anions are **chloride and bicarbonate.** The composition of the plasma and interstitial fluid differs only slightly in ionic composition.

The main cations of the intracellular fluid (ICF) are **potassium and magnesium**, and the main anions are **phosphate and proteins**.

Although the movement of ions and proteins between the various fluid compartments is restricted, **water** is freely diffusible. Water is distributed evenly throughout all fluid compartments of the body; so that a given volume of water increases the volume of any one compartment relatively little. **Sodium**, however, is confined to the ECF compartment, and because of its osmotic and electrical properties, it remains associated with water. Therefore, sodium-containing fluids are distributed throughout the ECF and add to the volume of both the intravascular and interstitial spaces. Although the administration of sodium-containing fluids expands the intravascular volume, it also expands the interstitial space by approximately three times as much as the plasma.

Osmotic Pressure

The movement of water across a cell membrane depends primarily on osmosis. To achieve osmotic equilibrium, water moves across a semipermeable membrane to equalize the concentration on both sides. This movement is determined by the concentration of the solutes on each side of the membrane. Osmotic pressure is measured in units of osmoles (osm) or milliosmoles (mOsm) that refer to the actual number of osmotically active particles. For example, 1 mmol of sodium chloride contributes to 2 mOsm (one from sodium and one from chloride). The principal determinants of osmolality are the concentrations of sodium, glucose, and urea (blood urea nitrogen, or BUN):

$$\text{Calculated serum osmolality} = 2\,\text{sodium} + (\text{glucose}/18) + (\text{BUN}/2.8)$$

The osmolality of the intracellular and extracellular fluids is maintained between 290 and 310 mOsm in each compartment. Because cell membranes are permeable to water, any change in osmotic pressure in one compartment is accompanied by a redistribution of water until the effective osmotic pressure between compartments is equal. For example, if the ECF concentration of sodium increases, there will be a net movement of water from the intracellular to the extracellular compartment. Conversely, if the ECF concentration of sodium decreases, water will move into the cells. Although the intracellular fluid shares in losses that involve a change in concentration or composition of the ECF, an isotonic change in volume in either one of the compartments is not accompanied by the net movement of water as long as the ionic concentration remains the same. For practical clinical purposes, most significant gains and losses of body fluid are directly from the extracellular compartment.

BODY FLUID CHANGES

Normal Exchange of Fluid and Electrolytes

The healthy person consumes an average of 2000 mL of water per day.

INPUT:

SINSIBLE:

1. ORAL INTAKE (75%) = 1500 ml.
2. SOLID FOOD (25%) =500 ml.

INSINSIBLE: WATER OF OXIDATION= 250 ml.

OUTPUT;

SINSIBLE:

1. Urine: 800–1500 ml.
2. STOOL: 0–250 ml.
3. SWEAT.
4. Pathologic GIT losses.

INSINSIBLE:
Lungs and skin: 600 ml.

Classification of Body Fluid Changes
Disorders in fluid balance may be classified into three general categories: disturbances in (a) volume, (b) concentration, and (c) composition. Although each of these may occur simultaneously, each is a separate entity with unique mechanisms demanding individual correction.
Isotonic gain or loss of salt solution (solutions containing sodium) results in **extracellular volume changes**, with little impact on intracellular fluid volume. If free water is added or lost from the ECF, water will pass between the ECF and intracellular fluid until solute concentration or osmolarity is equalized between the compartments.
Unlike with sodium, the concentration of most other ions in the ECF can be altered without significant change in the total number of osmotically active particles, producing only a **compositional change**. For instance, doubling the serum potassium concentration will profoundly alter myocardial function without significantly altering volume or concentration of the fluid spaces because potassium level= 3.5-5 mEq/L in the extra-cellular fluid, so it has little effect on ECF osmolarity and volume.

Disturbances in Fluid Balance (volume)
Extracellular volume deficit is the most common fluid disorder in surgical patients.
It can be divided into either acute or chronic.
Acute (Hypovolemic shock): acute volume deficit is associated with cardiovascular and central nervous system signs.
Chronic (dehydration): chronic deficits display tissue signs of dehydration, such as a decrease in skin turgor and sunken eyes, in addition to cardiovascular and central nervous system signs
Laboratory examination: significant ECF losses may be associated with:

1. Elevated blood urea nitrogen level.
2. Urine osmolality usually will be higher than serum osmolality.
3. Urine sodium will be low, typically <20 mEq/L.

Volume changes may be associated with normal, high or low sodium concentration.
Causes of fluid losses in surgical patient:

1. The most common cause of volume deficit in surgical patients is a loss of GI fluids from nasogastric suction, vomiting, diarrhea, or enterocutaneous fistula.
2. Sequestration (third space losses) secondary to soft tissue injuries and inflammation burns, and intra-abdominal processes such as peritonitis, pancreatitis, intestinal obstruction, or prolonged surgery can also lead to massive volume deficits.
3. Hemorrhage.

FLUID MANAGEMENT(resuscitation) OF BURNED PATIENT.

In the last decades, the understanding of the pathophysiology of fluid derangement in burn patients, and their proper management has decreased the mortality of burn related to shock and its sequels as renal failure.
In burns, there is a major shift of fluids from the INTRAVASCULAR compartment, which is responsible for direct tissue perfusion, to the INTERSTITIAL compartment. The cause of this shift is the **increase capillary permeability**, or loss of the capillary integrity, so the capillary membrane which is normally semi-permeable sieving proteins inside the circulation to exert oncotic pressure, becomes fully permeable, so proteins will leak to the interstitium, dragging the intra-vascular water with it.
The shifted fluid called **THIRD SPACE LOSS**, causes edema in the intestitium.

hemodynamically, the depletion of the intra-vascular compartment will cause hypovolemic shock, and its severity depends on the percentage of burn. **Practically, burn shock is seen in adults with burns greater than 15-20% and in children with burn more than 10-15% .**
The causes of loss of the capillary integrity(increased capillary permeability) in the burned tissues are:

1. Direct thermal damage to the capillaries,
2. And the released vaso-active inflammatorymediators.

However it is important to note that edema, and third space loss are not limited to the burned areas only, the non-burned tissue are affected as well, the cause in this case is the resulting generalized hypo-proteinemia and possibly the circulating vasoactive mediators.

Fluid management in major burns is critical, the following guidelines are important in planning the fluid replacement:

1 The lost capillary membrane integrity with increased permeability, has two implications:
Firstly: most of the fluids administered, would leak into the interstitium causing more tissue edema , which is harmful to the tissue as it increases tissue hypoxia , and secondly, huge amount of fluids is needed to maintain a functional , perfusing, intra-vascular compartment
2.**Amount of fluid given should be just adequate to perfuse tissue**; over-perfusion is at the expense of edema.

3.Although there are so many formulas, to estimate the amount of fluid to resuscitate a burned patient, there is no ideal, magic one that you apply and go to sleep! This means that the amount of fluid needed vary among patients, and the only way to insure that the optimal amount of fluid is given is by close monitoring by the following ways:

A.Clinically by observing, the general condition of the patient, and the vital signs.

B. Urine output, which is the most sensitive indicator of tissue perfusion, this should be 0.5-1 ml / kg / hour, higher urine output may indicate that, extra fluid is given, that increases tissue edema.

C. Serial PCV readings, in which, high PCV indicates, hemoconcentration, where more fluid is to be administered, and low PCV means, hemodilution, in which the rate of fluid administration is to be lowered.

D. Swan-Gans or CVP lines may be indicated in some patients, especially those with border line cardiac reserve, like the elderly.

1. Regarding the type of fluids to be given, because the capillaries are leaky initially, it is wise to give crystalloids, in the first 16-24 hours, and to give colloids thereafter.
2. All formulas are based on, burn percentage and patient weight. Parkland formula , for example states that :
   Fluid in the first 24 hours = 4 X Weigt. X % of burn

   An adult weighing 70 Kgm , with 50% burn, should receive :
   4x 70x 50= 14000 ml of Ringer lactate
   Half of this amount is administered in 8 hours , and the remaining half over the next 16 hours.

ESCHAROTOMY

In full thickness burns , the skin which is normally elastic, is transformed into eschar (dead or necrotic skin) , with loss of elasticity, so in circumferential full-thickness burns of the limbs , the eschar would act as a tourniquet. when the burned tissues develops edema ,the pressure inside the limb increases above the capillary pressure level (32 mm/ Hg) leading to tissue ischemia. The picture is similar to compartment syndrome.

Management of this condition consists of:

1. Elevation of the affected limbs.
2. Observation of the circulation (capillary filling , color , temperature) and sings of ischemia (pain , paresthesia paralysis)

   It is important to mention that: Presence of distal pulses does NOT rule out the condition

   .
3. If ischemia is suspected, **ESCHAROTOMY** is indicated. This means incising the eschar of the affected limbs and fingers, on both, the medial and lateral aspects, to release the high pressure inside the limb.

Note that escharotomy is different from eschectomy which means excision or debridement of the eschar.

Eschaotomy is not limited to the limbs: we do eschrotomy to release pressure on the neck or chest wall to improve breathing.

ANTIBIOTICS

Are used to treat infections, but not prophylactically

Prophylactic antibiotics are contra-indicated in burns, for the following reasons:

1. Studies did not prove that prophylactic antibiotics decrease the incidence of sepsis.
2. Antibiotics increase the incidence of fungal infections.
3. Antibiotics increase the incidence of bacterial resistance.

ANALGESIA AND SEDATION:

A sort of pain and anxiety relieve, is needed in the burn victim, even in those with full thickness burn, the following guidelines are to be applied:
1.In patients with low tissue perfusion, the drugs should be administered by the intra-venous route to avoid accumulation of the drug.
2. Given in increments of small doses, till the required dose is reached.
3.Head injury, hypoxia, and shock all have the same symptomatology of pain, so these should be ruled out before treating pain.

INDICATIONS OF ADDMISSION TO HOSPITAL

1. burns that need fluid resuscitation: Adults>15%, children>10%).
2. Full-thickness burns> 2%
3. Burns of special areas: face, hands, perineum.
4. Elecrtic and chemical burns.
5. Inhalation injury.
6. Old age and co-morbidity.
7. Suspected child abuse.

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LOCAL MANAGEMENT OF BURN WOUND.

PARTIAL THICKNESS BURN

In partial thickness burns, healing occurs within weeks, by regeneration of the dermal skin appendages, contained in the remaining dermis, the more superficial the burn is, the quicker the healing, and the better the result would be. So basically, the treatment in conservative, aiming at providing the optimal conditions for this regeneration to occur, this is by protecting the wound from dryness, infection, and trauma.
Practically, this means keeping the burn wet, covered with local antibiotics, and changing the dressing gently as required.
Infection of partial thickness burn, would damage the epithelial elements, and change the burn to full thickness one.

FULL THICKNESS BURN

Naturally, this heals by fibrosis which takes long times and leaves bad scars.
To avoid this fate, these wounds should be skin grafted.
The eschar (dead skin), is adherent to the underlying sub-coetaneous tissue. As time goes by, bacteria invade the eschar, and produce enzymes that separates the eschar

gradually from the deeper tissues, within two to three weeks, the eschar is spontaneously separated, at this time the deep tissue is covered by granulation tissue, At this stage **split thickness skin graft** is harvested from unburned areas, and applied to the burn wound.

The modern treatment of burn, evolved in the last decades, is to excise the eschar early (**early escharectomy**) and cover the burn wounds by skin graft, rather than waiting for the natural, bacterial assisted spontaneous separation of the eschar, the **Advantages of early escharectomy and grafting are:**

1. Decrease the duration of hospital stay.
2. Decrease the incidence of burn wound sepsis, by elimination of the dead tissue and bacteria.
3. Helps early mobilization of the patient, decreasing joint cotractures.
4. Shortens the catabolic state, minimizing the protein breakdown, and malnutrition.
5. Better cosmetic outcome.

However, early burn wound excision is associated with the following problems:

1. The eschar is adherent to the underlying tissues, so surgical excision results in massive blood loss, and hypo-thermia.
2. When the burned area is large (i.e.>60 %burn), excision would leave a large exposed wound that we can not cover by the patients own skin.

The first problem is solved by, better blood banking, better ICU care, hypotensive anesthesia, and staged excision.
The second problem is dealt with by, temporary coverage of the excised areas, with biological dressings: These are either, allografts (homografts), taken from cadavers, or heterografts, taken from animals, they are applied as temporary dressing to the excised burn wounds.
So after eschar excision, we cover as much as we can of the excised areas with split thickness skin graft (autografts), the remaining areas are covered temporarily with biological dressing . After around two weeks, when the donor areas heal, we take skin grafts again from the same donor areas, (reharvesting) and apply them to new areas after taking off the biological dressing.