

# Burn Injury in Pregnancy: Review

## Gebelikte Yanık Yaralanması

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**ABSTRACT** The burn injuries during pregnancy are different from ordinary time considering as fundamental approach. In this study, our aim is to clarify the features and management strategies of burn injuries during pregnancy. The pregnancy creates many special maternal physiological changes, and the burn wound places additional great stress on systems that are already highly modified. Adequate management of pregnant burn victims requires the physicians to consider and understand the unique changes in physiology during pregnancy. In addition, adequate burn care requires a team approach in which almost every healthcare discipline is represented.

**Key Words:** Burns; pregnancy; fetus

**ÖZET** Gebelik döneminde oluşan yanık, normal zamanda oluşan yanıktan temel yaklaşım açısından farklılık göstermektedir. Bu çalışmadaki amacımız, gebelik döneminde oluşan yanık yaralanmalarının özelliklerini ve tedavi yaklaşımlarını ortaya koymaktır. Gebelik, maternal pek çok özel fizyolojik değişiklik oluşturur ve yanık yaraları büyük oranda değişime uğramış maternal fizyolojik sisteme fazladan stres yükler. Yanıklı hamile hastaların yeterli biçimde tedavi edilebilmesi için hamilelik esnasında meydana gelen özgün fizyolojik değişikliklerin bilinmesi ve iyi anlaşılması gerekir. Ayrıca, yeterli yanık bakımı için neredeyse tüm sağlık disiplinlerinin katılımı gereklidir.

**Anahtar Kelimeler:** Yanık; gebelik; fetus

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Burns are physiologically, emotionally, and cosmetically devastating injuries. The literature suggests that approximately 5-7% of women of reproductive age treated for large burns were pregnant.<sup>1-4</sup> Thermal injuries during pregnancy requires special management considerations for the care provider. The presence of a fetus creates many special maternal physiological changes, and the burn wound places additional great stress on systems that are already highly modified.<sup>5,6</sup> The medical literature contains very few reports on the problems of burn pregnant patients.<sup>7-9</sup>

In this review, our aim is to investigate the prognostic features and management strategies of burn injuries during pregnancy for reducing the morbidity and mortality of this problem.

## HEMODYNAMIC CHANGES IN PREGNANT BURN PATIENT

Pregnancy initiates many physiological changes that may affect the normal responses to trauma. Pregnancy is associated with a hyperdynamic cardiovascular state and an expanded total body plasma volume to supply the placental vascular bed. General, there are mild increases in heart rate (10-15 bpm) and mild decreases in blood pressure (5-15 mmHg), starting in the second trimester.<sup>7,10,11</sup> While red blood cell volume increases by 20-30%, plasma volume increases by approximately 50%.<sup>12</sup> The large increase in plasma volume leads to the “physiological anaemia of pregnancy” in addition, maternal haemorrhage and fluid loss may be compensated for by decreased uterine blood flow, so that maternal hypovolaemia may first be manifest as foetal distress.<sup>9,13</sup>

After a burn, there is increased capillary permeability and accelerated fluid loss which may cause the patient to become hypovolemic.<sup>5,14</sup> Even if the burned area is only 15 percent of total body surface area (TBSA), sufficient fluid loss may occur for the patient to become hypovolemic.<sup>14,15</sup>

Fluid loss may result in decreased uteroplacental circulation and result in acute ischemic changes in the placenta and in fetal hypoxia. Although the risk of preterm labor increases with increasing TBSA burned, the best way to avoid it and fetal demise is to assure the good health of the mother by preventing hypovolemia, sepsis, hypoxia, and electrolyte imbalances.<sup>4</sup>

## PULMONARY CHANGES IN PREGNANT BURN PATIENT

Pulmonary function may be directly or indirectly affected by thermal injury. Direct inhalational injury is usually manifested as upper airway edema, which may lead to life-threatening airway obstruction. Inhalation injury is significantly associated with maternal and fetal mortality following thermal injury.<sup>16</sup>

The other cause of maternal mortality is acute respiratory distress syndrome (ARDS), secondary to severe inhalation injury, which is similar to the non-pregnant population.<sup>17</sup>

Especially, pregnant women with facial burns should be monitored carefully for breathing difficulties. Dyspnea and wheezing may develop but often are not seen during the first 12 to 48 hours postburn. Continuous pulse-oximetry is helpful in assessing oxygenation. Exposure to carbon monoxide in utero may affect cardiac development and may produce fetal cardiac edema.<sup>18</sup> Bronchopneumonia, pneumothorax, pulmonary edema, and atelectasis may all compromise respiratory function, and they should be considered in cases of hypoxia.<sup>4</sup>

## MORBIDITY AND MORTALITY

Burns may add an extra risk to the life of both the fetus and the mother. Most pregnant women sustaining a thermal injury are young and in good health, but pregnancy itself induces a hypermetabolic state and can exaggerate common complications. Multiple factors influence morbidity and mortality resulting from burn injuries during pregnancy. These factors include the depth and size of the burn, the pregnant woman's underlying health and age, and the estimated gestational age of the fetus.<sup>16,19</sup>

It is possible that the burn toxin, the lipo-protein complex liberated from the destroyed cell membranes in the eschar, plays a major role in intoxication of the mother and the fetus. In addition, the part of the body involved in a burn, associated inhalation injury and development of other significant secondary complications also influence maternal and fetal outcomes.<sup>17</sup>

A burn injury during pregnancy presents two important problems: spontaneous uterine activity and intrauterine fetal demise. Hyponatremia and acidosis also may cause uterine activity and preterm labor.<sup>15</sup> The increased prostaglandin E<sub>2</sub>, released from the burned tissue causes uterine contractility, which increases premature labour and abortion. Furthermore, the high risk of fetal mortality in pregnancy burn can be attributed to severe maternal anaemia of burn, leading to placental insufficiency.<sup>17</sup>

## THE FETAL COMPLICATIONS AND THE MATERNAL PERCENTAGE OF BURNED BODY SURFACE AREA

There is a significant correlation between fetal complications and the maternal percentage of bur-

ned body surface area (BSA).<sup>4</sup> For severely burned women, fetal prognosis is poor. A 40% BSA burn is found to be critical to the finding of fetal death.<sup>2</sup> Usually the woman enters labour spontaneously within a few days to a week, and always delivers a still born infant. Rayburn and colleagues and Akhtar and co-workers observed that there was a 50% maternal and fetal loss in the 40-60% total body surface area burn group compared with 11% fetal and a 0% maternal loss with a 20-40% BSA burn.<sup>3</sup>

Rode and associates gave a maternal mortality of 70% for burns exceeding 50% TBSA.<sup>12</sup> Taylor et al., Champagnie and Matthews stated that major burns occurring in pregnancy adversely effects both mother and fetus.<sup>11,20</sup> In this respect, fetal risk has been shown to correspond to maternal well-being.

## THE FUNDAMENTALS OF TREATMENT

All female burn patients of childbearing age should be tested for pregnancy unless the pregnancy is obvious. Early recognition of the pregnancy will help to minimize teratogenic medications and ionizing radiological studies. Thermal injuries during pregnancy can present special management considerations for the care provider. The presence of a fetus creates many special maternal physiological changes, and the burn wound places additional great stress on systems that are already highly modified.<sup>6</sup>

All pregnant patients should be evaluated by the obstetrician within 6 hour of admission and primarily admitted to the burn unit, according to the extent and depth of the burn. Pregnant burned females with TBSA more than 15 percent, are admitted to the burn unit, whereas those with TBSA less than 15 percent are admitted to the obstetric ward, in a special care room.<sup>17</sup>

Treatment includes fluid resuscitation, topical antimicrobial agents, moist occlusive dressing, and if indicated, escharotomy, debridement, tangential excision, and skin grafting as soon as the patient's general condition allows.<sup>17</sup> All patients are given tetanus prophylaxis if their vaccination record is not up to date or is unknown. Systemic antibiotics are used only when clinically indicated, and the choice of the agent is guided by microbial culture results.<sup>5,12</sup> Inadequately resuscitated, the mother

may develop systemic hypotension, which may lead to placental insufficiency, fetal ischemia, hypoxia, and acidosis.<sup>9,13</sup>

Both hyponatremia and hypokalemia may result from a serious burn injury and its mistreatment. Hyponatremia may result as a consequence of pronounced hormonal responses or improper fluid or tube feeding therapy. Hypokalemia also can result from chronic potassium losses through the wound.<sup>4</sup> These women remain stationary for prolonged periods, heparinization therapy should be considered. Although there are no prospective studies showing a benefit to heparinization in the pregnant burn patient who is not ambulatory, a reasonable option would be to use subcutaneous heparin, 5000 units every 12 hours until the patient is ambulatory.<sup>21</sup> All surgical procedures are performed under general anesthesia.<sup>5</sup>

Burn victims, especially the pregnant female, should have early excision of the burn eschar, in order to decrease the amount of prostaglandin E, and burn toxins liberated in the circulation, thus decreasing the risks of both maternal and fetal loss.<sup>17</sup>

Around 10 percent TBSA wound excision and skin grafting is done on the first setting. Priority is given to abdominal, perineal and breast wounds to allow subsequent delivery and lactation. When smoke inhalation injury is suspected, bronchoscopy is performed at time of admission.<sup>5</sup>

Management guidelines regarding premature termination of pregnancy have not been formally established due to the limited number of burn cases in pregnancy. Decision to terminate pregnancy depends upon the fetal life and gestational age.<sup>8,22</sup>

Patients with intrauterine fetal death has termination of pregnancy as soon as possible, ranging from 8 h after admission to 24 h. When there are extensive medical complications, including a total body surface area burn of more than 50 percent, delivery is strongly encouraged for a fetus with an estimated gestational age >26 weeks due to the high maternal and perinatal morbidity and mortality rate.<sup>15</sup> If the fetus is in the second trimester, fetal survival is highly dependent on maternal survival, and ex-utero survival is poor. Therefore, tocolysis may be considered if maternal conditions permit.<sup>7</sup> Pa-

reneral magnesium sulfate is a better choice than beta mimetic agents in this setting because it has less vasodilatory and metabolic effects.<sup>23</sup>

Conservative management should be complemented with fetal monitoring for the first week following the injury and frequent ultrasonic examinations thereafter.<sup>24</sup> However, if there is maternal distress, emergency caesarean delivery is indicated.<sup>23</sup>

Pregnant patients who reaches term, should have induction of labour as soon as their condition is stabilized, ranging from 36 to 72 h after admission. Patients other than the previous two groups should be followed up on a daily basis until their wounds heales completely, and then should be followed up until delivery.

The mode of delivery in the pregnant burn patient is decided by obstetrical indications. Vaginal deliveries are possible even in cases of extensive perineal burns, and grossly infected perineal burns seem to have no effect on neonatal survival. When a full-thickness perineal burn occurs, the tissue loses its elasticity and an episiotomy might be required.

When indicated, a birth by caesarean delivery may be performed over a burned abdomen.

Ventilatory assistance should not be delayed when smoke inhalation injury is clinically suspected. Combined with the increased demand of oxygenation by the presence of the fetus, the care provider should have a low threshold for implementing ventilatory support.<sup>5</sup>

## CONCLUSION

Thermal injuries during pregnancy may require special management considerations. Our management recommendations are;

- Early pregnancy test for all female patients of childbearing age,
- Prompt and aggressive fluid resuscitation,
- Early supplemental oxygen and low threshold for mechanical ventilatory support,
- Early delivery of the fetus if the pregnancy is in the third trimester,
- High suspicion for venous thrombosis and sepsis, with early and aggressive treatment.

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