Burn and Pregnancy


ABSTRACT

Burns in pregnant women, although rare, can be serious, and therefore can be life-threatening for the mother and fetus. Morbidity and mortality are influenced by factors related to the burn, such as the depth and the TBSA burned, and patient-related factors, such as age, pre-existing medical conditions, associated injuries, and the term of the pregnancy. The fetal prognosis is generally good when the mother does not develop severe complications such as sepsis, hypotension, or hypoxia.

The management’s goal is maternal and fetal rescue. The treatment protocol must be well codified, requiring the establishment of a multidisciplinary team involving plastic surgeons, reanimators, and obstetricians. Treatment including aggressive hydro-electrolyte resuscitation, oxygen therapy, thromboprophylaxis, and early and effective antibiotic prophylaxis, are effective measures for both maternal and fetal management. Early excision of deep lesions and skin grafts is the cornerstone of the management of burnt pregnant women, in order to reduce the amount of prostaglandin and cytokines released into the circulation. As part of the fetal rescue, labor induction is imperative if pregnancy is in the third trimester for extraction from the toxic environment, otherwise, tocolysis and obstetrical monitoring to reach the third trimester.

We present a case series of burns occurring in pregnant women treated at the National Center for Burns and Plastic and Restorative Surgery.

Keywords: Burn, complications, fetus, pregnancy, treatment.

I. INTRODUCTION

Pregnancy involves multiple modifications. The burn puts additional stress on systems already highly modified by the presence of a fetus [1], [2].

Burns in pregnant women, although rare, can be serious, and therefore can be life-threatening for the mother and fetus. The treatment protocol must be well codified [3].

We present a review of four cases of burns occurring in pregnant women admitted to the National Center for Burns and Plastic and Restorative Surgery.

II. CASE REPORT

A. Case 1

A 33-year-old woman, pregnant in her 16th week of gestation, was admitted recently to our center at the 3rd hour of thermal burns by butane flame in the context of an individual domestic accident.

On admission, the patient was hemodynamically, neurologically, and respiratorily stable, with no evidence of smoke inhalation. Locally, she had second and third-degree burns affecting the face, trunk, and circular on the 2 upper limbs, and involving 36% of her total body surface area (TBSA) (Fig. 1).

The patient was hospitalized in intensive care, after conditioning and stabilization on a general level (venous route, filling, urinary catheter, monitoring, oxygen therapy, corticosteroid therapy for her face burn), we made discharge incisions for the 2 upper limbs, then we covered the lesions with a vaseline dressing.

The opinion of the obstetricians was sought, who, after ensuring the viability of the fetus, recommended tocolysis...
and regular monitoring of the pregnancy, daily at the beginning, then weekly.

The therapeutic decision for the mom was a salvage by aggressive hydro-electrolytic resuscitation and a debridement and skin graft, which was performed early and in 2 operative steps (day 4 and day 20).

The evolution was marked by bacterial skin infection with a systemic passage that was controlled by local care and adapted antibiotic therapy, a candidal infection present in several sites (urinary, vaginal, oral) with probable systemic passage (negative blood cultures) treated with antifungals.

After 37 days of hospitalization, the patient left the hospital with her burn wounds almost completely healed.

B. Case 2

A 24-year-old woman, occasional smoker, pregnant at 24 weeks of amenorrhea, was admitted to our center at the 4th hour of thermal burns by a diluent flame in the context of an attempt at autolysis following a marital conflict.

The patient was hemodynamically, neurologically, and respiratorily stable with no evidence of smoke inhalation on admission. Locally she had second and third-degree burns affecting the face, neck, trunk, and circula on the 2 upper limbs and involving 29% of her TBSA (Fig. 2).

A hydro-electrolytic resuscitation was started on admission, with oxygen therapy and corticosteroid therapy for her facial burn. We made discharge incisions for the 2 upper limbs, then we covered the lesions with a vaseline dressing.

The opinion of obstetricians was sought, who noted good fetal heart activity, and recommended tocolysis and regular monitoring of the pregnancy.

For the mother, the therapeutic decision was a rescue by an aggressive hydro-electrolytic resuscitation, and by a debridement and skin graft which was performed early and in 3 operative steps (day 3, day 17, and day 43).

During her hospitalization, the evolution was marked by a fetal death on day 6 of the burn despite tocolytic measures, a bacterial skin infection with a systemic passage that was controlled by local care, and adapted antibiotic therapy.

C. Case 3

A 29-year-old woman, without any particular pathological history, pregnant at 38 weeks of amenorrhea, was admitted to our center at the first hour of thermal burns by flame following a domestic accident (gas leak).

On admission, the patient was hemodynamically, neurologically, and respiratory stable. Inhalation injury was suspected based on the history of the accident and clinical findings (wheezing, burned nostril hairs). Locally, she presented with deep dermal burns on the face, forearms, ankles, and forefeet, estimated to cover 14% TBSA (Fig. 3).

A hydro-electrolytic resuscitation was started on admission, with oxygen therapy. We made discharge
incisions for the 2 upper limbs, and the wounds were dressed with gauze and vaseline tulle.

We planned for early excision of the burns and autologous skin graft. After consultation with the obstetricians, we decided on early delivery of the fetus by cesarean section in the same stage. The amnion chorion membrane was used to cover the skin graft and the remaining more superficial burns that needed no excision.

Post-operative follow-up was favorable. The hospital stay was 17 days. The baby and the mother were doing well at discharge.

D. Case 4

A 20-year-old woman, without any particular pathological history, pregnant at 16 weeks of amenorrhea, was admitted at the first hour of thermal burns by a diluent flame in the context of an attempt at autoxolysis following discovers her illegitimate pregnancy.

On admission, the patient was hemodynamically, neurologically, and respiratorily stable. Locally, she presented with deep dermal burns on the trunk and the neck, and superficial burns on the hands estimated to cover 12% TBSA (Fig. 4).

A hydro-electrolytic resuscitation was started, with oxygen therapy, then we covered the wounds with a vaseline dressing. We planned for early excision of the burns and autologous skin graft for the neck and the trunk. We noted a good evolution of the wounds, and a good fetal evolution, pregnancy carried to term without problems, with the delivery of a newborn in good health.

III. DISCUSSION

Burns during pregnancy are relatively rare, the exact incidence is not well known. They significantly increase maternal and fetal mortality and morbidity [3], [4]. Therefore, the severity and risk of fetal and maternal death are influenced by factors related to the burn such as the depth and the TBSA burned, patient-related factors such as age, pre-existing medical conditions and associated injuries, and the term of pregnancy [5].

The pre-existing co-morbidities such as diabetes, arterial hypertension, or cardiac disease constitute a poor prognosis for burns [5].

Maghsoudi and al. found that maternal and fetal mortality rates were related to inhalation injuries [8].

Gestational age affects fetal prognosis [9]. The survival of a fetus with a gestational age of fewer than 32 weeks is possible when the mother recovers from the inflammatory phenomena following the burn [5], [10]. After 32 weeks of amenorrhoea, the fetal prognosis becomes independent of the maternal prognosis, because the fetus acquires a pulmonary maturity favored by the stress generated by the burn [5], [11].

Probable complications include abortion, intrauterine fetal death, preterm labor, stillbirth, and escalated maternal mortality and morbidity [3], [6]. These complications are most likely to appear during the first week postburn [4].

The Emergency management of thermal effects in pregnancy is essential for maternal and fetal well-being [5], [10].

Prostaglandin, which is one of the mediators of inflammation, is secreted in large quantities. Its secretion is triggered by inflammation and infection of the burned tissues, leading to stimulation of the myometrium and therefore its contraction, thus giving rise to fatal obstetric complications. Hence the interest of tocolysis [2], [5].

Data from the literature on the physiopathology of burns in pregnant women explain the poor prognosis in the mother and the fetus [5]. The treatment should be aggressive, with the goal of maternal and fetal rescue [9], including hydro-electrolyte resuscitation, oxygen therapy, thromboprophylaxis, early and effective antibiotic prophylaxis, and appropriate local management [5], [13].

After a burn, there is an increase in capillary permeability and an acceleration of fluid loss, which can lead to hypovolemia in the patient. Inadequately resuscitated, the mother may develop systemic hypotension, and thus the blood is diverted from the gravid uterus and fetoplacental unit to provide volume support to the maternal central circulation and vital organs. This decreases uteroplacental perfusion, resulting in fetal hypoxia and acidosis, increasing the risk of preterm labor or spontaneous abortion. Extreme care should, therefore, be taken to initiate resuscitation therapy as soon as possible since the mother’s intravascular space is in equilibrium with the amniotic fluid [1], [2], [4], [14].

Pregnancy is associated with hypercoagulability which can be aggravated by burning, which also activates the coagulation system through the release of cytokines. Hemoconcentration associated with fluid loss may further increase the risk of thrombosis [14]. Hence the interest of thromboprophylaxis [1].

Similarly, immunological changes associated with pregnancy may predispose the pregnant burn patient to be more susceptible to systemic dissemination of infection [15]. Topical antibiotics applied to the wound, close monitoring with frequent microbial cultures, and routine antibiotic therapy guided by laboratory and bacteriological findings are very important [1], [12]. Commonly used topical and systemic drugs (aminoglycosides, ciprofloxacin, sulfonamides, and vancomycin) have teratogenic effects [2].

Since administration of systemic antibiotics is unavoidable in many cases, possible side effects to the fetus are a major
concern [3]. Silver sulfadiazine can be absorbed through wounds, and the amount absorbed is related to the area and duration of application. Its application on a large surface should be avoided in pregnant women suffering from burns because the absorption of sulfonamides is linked to kernicterus [12]. In our patients, the local care of burns was carried out with topical treatments based on fusidic acid. Systemic antibiotics were used only when clinically indicated, and agent choice was guided by microbial culture results.

The needs of the fetus are best served by avoiding drugs and anesthetics, especially during the first trimester, due to the increased risk of birth defects. During the first trimester of pregnancy, it is necessary to consider very seriously whether general anesthesia should be administered or whether early excision should be postponed until a more appropriate time due to the risk of congenital malformations [9].

Pregnant women with burn injuries should benefit from early excision of deep lesions to reduce the amount of prostaglandin and cytokines released into the circulation [2], [12], [16]. An excised surface without coverage can lead to infection, metabolic complications, or death from multi-organ failure. Excision implies definitive coverage, or in the case of extensive burns (limited resources) where no skin or organ bank exists, temporary coverage.

As part of the fetal rescue, early delivery of the fetus is recommended when the pregnancy is in the third trimester and the mother has an extensive burn injury. If the pregnancy is in the second trimester, fetal survival is highly dependent on maternal survival, and ex-utero survival is low, tocolysis may be considered if maternal conditions permit. Conservative management should be supplemented by continuous monitoring of fetal heart activity in the first week after the burn and frequent ultrasound examinations thereafter [1], [17].

Patients on oxygen therapy can give birth vaginally, even in the presence of perineal burns. Cesarean section may be indicated in case of maternal distress [1], [4], [18].

The prognosis of burns in pregnant women remains very reserved, hence the importance of multidisciplinary management involving plastic surgeons, reanimators, and obstetricians [5], [9]. Therefore, it is relevant that the fetus is considered the second patient when developing the individualized care plan knowing that the intervention for the mother can have a profound effect on the fetus [2].

### IV. Conclusion

Since the well-being of the fetus is dependent on the mother, care should be taken to maximize the chances of fetal survival by treating the mother properly. Adequate management of burns during pregnancy requires a multidisciplinary team involving plastic surgeons, reanimators, and obstetricians.

### Conflict of Interest

The authors declare that they do not have any conflict of interest.

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**References**