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# Gunshot wound to the pregnant uterus: case report

*Ferimento por tiro em útero gravido: relato de caso*

## Case Report

### Keywords

Wounds, gunshot  
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### Palavras-chave

Ferimentos por arma de fogo  
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### Abstract

Crime and violence have become a public health problem. Pregnant women have not been the exception and gunshot injuries occupy an important place as a cause of trauma. An important fact is that pregnant women, who suffer trauma, are special patients because pregnancy causes physiological and anatomical changes. Management of these patients should be multidisciplinary, by the general surgeon, the obstetrician and the neonatologist. However, even trauma referral centers could neither have the staff nor the ideal training for these specific cases. In this context we present the following case.

### Resumo

Crime e violência tornaram-se um problema de Saúde Pública. As mulheres grávidas não constituem exceção e ferimentos por arma de fogo ocupam um lugar importante como causa de trauma. Um fato importante é que as mulheres grávidas que sofrem um trauma são pacientes especiais, porque a gravidez provoca modificações fisiológicas e anatômicas importantes. O manejo dessas pacientes deve ser multidisciplinar, realizado pelo cirurgião geral, pelo obstetra e pelo neonatologista. No entanto, até mesmo centros de referência de trauma poderiam nem ter o pessoal nem a formação ideal para esses casos específicos. Neste contexto, apresentamos o seguinte caso.

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## Introduction

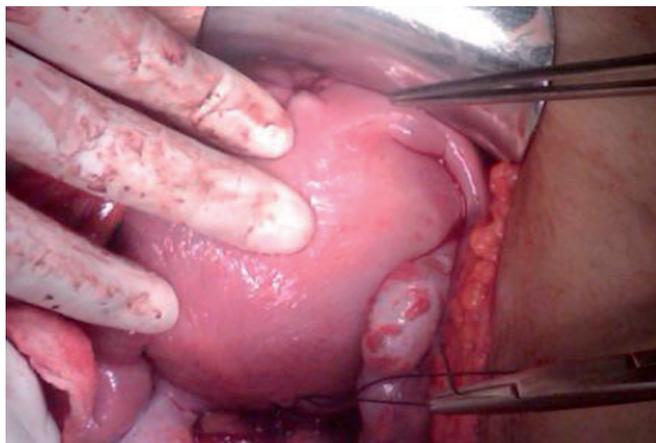
Crime and violence have become a public health problem, and the firearm injuries are included as a very important cause of morbidity and mortality<sup>1</sup>. Pregnant women have been no exception because when they take a more active social role, they are more likely to be victims of trauma<sup>2</sup>. Ideally the management of these injuries should be multidisciplinary, and the general surgeon, the obstetrician and the neonatologist must participate in order to provide the best outcome for the mother and child. But in reality, there is a dispersion and variability of the teams who treat these patients<sup>3,4</sup>. Consequently, there is not always the right staff, or does not have the specific training for the care of these cases, even in specialized trauma centers.

## Case description

A 20-year-old woman who has the antecedent: caesarean section with transverse situation two years prior to the admission.

She was admitted after sustaining a gunshot wound to the abdomen. The precise time of injury was unknown, but according to the emergency medical service the patient arrived to the hospital within minutes of the accident.

The patient was alert, distressed with ethyl breath and did not cooperate to the interrogation neither the examination. Vitals recorded were T 36.0°C, HR 116, BP 80/50, RR 28, and saturating 92%. Physical examination showed paleness of teguments, cardiopulmonary uncompromising, and in the abdomen, due to poor cooperation, it was only perceived tenderness, peritoneal irritation and a penetrating wound on right flank and exit wound on left flank. At that time, the grown uterus was not noticed.



**Figure 1.** The surgical instruments point the right anterolateral penetrating wound and the left posterolateral exit wound

The patient was admitted with clinical data of hypovolemic shock; so, she was taken emergently to the operating room for exploratory laparotomy. Once a Foley catheter was placed, there was no gross hematuria. Upon examining the abdomen, the general surgeons found 700 mL of clotted blood, intestinal perforation and gravid uterus with right anterolateral penetrating wound and left posterolateral exit wound (Figure 1). Intestinal resection, entero-enteral anastomosis and caesarean section were performed. The fetus had a penetrating hole on the face and an exit hole on the thorax (Figure 2).

The patient progressed properly, tolerating diet on the fifth day post operatively. She was discharged well the next day. During her recovery she was examined by the service of Gynecology and Obstetrics from another unit, which only recommended suppression of physiologic lactation. It is worth mentioning that the patient did not specify the last menstrual period but the product's age was 20 weeks of gestation approximately.

## Discussion

Women have increasingly been playing a more active role in society, this also had carried risks such as accidents and aggressions, which is the first cause of mortality under 45 years of age according to international reports<sup>5</sup>. Within this group there are women in childbearing age, this must be considered always as potential pregnant women. According to reports from centers of excellence in trauma, in 5.4–8% of patients attended by trauma, an undiagnosed pregnancy was found<sup>6</sup>. In many countries of the world, the women who are mainly subjected to violence by males are the ones who belong to the active population or are at childbearing age<sup>7-9</sup>. In addition it is estimated that during their pregnancy, about 5–10% of pregnant women suffer trauma<sup>3,10,11</sup>; fetal loss occurs in



**Figure 2.** This photograph shows the penetrating hole in the face and an exit hole in the thorax

0.03–0.09% of these cases<sup>10</sup>, and it is estimated that there are 4.1 hospitalizations related to injury in pregnant women per 1000 deliveries in the United States<sup>12</sup>. Although its precise incidence is not known, trauma is estimated to complicate approximately one in 12 pregnancies and is the leading nonobstetrical cause of maternal death<sup>11,13,14</sup>.

Within these injuries, traffic accidents are one of the 10 leading causes of mortality of adult women (20–59 years of age) all around the world<sup>15</sup>. This mortality is estimated at 6.7 in women and 26.1 in men per 100 000 habitants<sup>16</sup>. In addition, motor vehicle accidents are the most common cause of nonobstetric trauma<sup>14</sup>, and account for up to 80% of trauma in pregnancy<sup>17</sup>. In a recent review, the overall incidence rate of motor vehicle crashes during pregnancy has been estimated at around 207 cases per 100 000 pregnancies<sup>14</sup>, estimations for maternal deaths from motor vehicle accidents range from 5–34%<sup>10</sup> and mortality rates of 1.4 per 100 000 pregnancies<sup>14</sup>. Such accidents are the leading cause of fetal death associated with maternal trauma<sup>18</sup> and are associated with a perinatal death rate of approximately between three and six per 100 000 live births in high-income countries<sup>17</sup>. The incidence of fetal death by trauma stands at 3.7 deaths per 100 000 births per year<sup>14</sup>, or 5.4 fetal trauma deaths for each 1000 fetal deaths<sup>18</sup>.

Other information that should be noted is that up to 16–43.5% of pregnant women with trauma gave a positive response to drug test (psychotropics, opiates, etc.)<sup>14,19</sup>.

Gunshot wounds are the second leading cause of trauma in general population, only after car accidents<sup>3</sup> but penetrating injuries are exceedingly uncommon in pregnant population<sup>11</sup>. In a retrospective analysis, penetrating trauma accounted for 9% of all pregnant trauma admissions. Of those, 73% were gunshot, 23% stab wounds and 4% shotgun-related. Penetrating trauma in pregnancy is associated with a maternal mortality of 3.9–7% and with an increased fetal mortality (as high as 73%)<sup>3,11</sup>. In the second half of pregnancy, the vast majority of penetrating injuries to anterior abdomen are associated to uterine injury<sup>11</sup>. Gunshot wounds to the uterus cause, frequently, fetal injuries in 60–70% of the cases. Such lesions are associated with fetal death in 40–65%<sup>3,11</sup>.

Management of penetrating injuries will depend largely on the entrance location of the wound and the gestational age. Visceral injuries are less likely when the entry site is anterior and below the uterine fundus<sup>14</sup>.

Homicides and intentionally inflicted injuries occupy an important place within the aggressions and trauma suffered during pregnancy. According to the data collected by the Panamerican Health Organization, in Mexico and Brazil in the period from 2000 to 2007, the rate of mortality by homicide and injury intentionally inflicted to women was 2.3 and 5.3, respectively<sup>16</sup>. In the United

States, murder is one of the leading causes of death during childbearing age as well as during pregnancy<sup>20</sup>. Palladino et al.<sup>21</sup> estimated that the rates of suicide and homicide in pregnancy were about 2.0/100 000 and 2.9/100 000 live births, respectively. Suicide and homicide during pregnancy are often associated with domestic violence and intimate partner violence (IPV). Similarly, domestic violence/IPV may be a contributing factor in up to 54% of cases of suicide among pregnant women<sup>21,22</sup>.

The literature about violence during pregnancy indicates that 4–8% of women suffer abuse during pregnancy, most of the perpetrators are their intimate partners, violence is often directed towards the pregnant women's abdomen<sup>23</sup> and 80% of these attacks occur at home<sup>18,24</sup>. This determines that many women do not denounce their abusers resulting in a problem for epidemiological indices because these denunciations are the only available source of this information<sup>23,25</sup>. The common causes of not reporting are: the woman's insecurity regarding the confidentiality of her report, current relationship with the partner causing the aggression, a feeling of fear in relation to the partner causing the aggression and the protection that the woman gives to the partner because of her desire to maintain the relationship, especially if this partner is the father of the child. This IPV is considered by many authors to be a serious public health problem and a complex phenomenon that may have very negative consequences for the health of the mother, fetus and child<sup>9,23,26</sup>.

Pregnant women, who suffer a trauma, are special patients because pregnancy causes physiological changes and alterations in anatomical relationships that involve the whole body. These changes can affect the evaluation and alter the signs and clinical features caused by trauma<sup>4,11</sup>. During pregnancy woman presents physiological changes such as increased blood volume by 50% and an expansion of plasma volume by 40%, which causes a dilutional effect known as physiological anemia<sup>4,27</sup>. Heart rate increases up to 15 beats per minute and a state of hypotension prevails because of the vasodilator effect of progesterone<sup>4,28</sup>. These changes allow a loss of up to 30% of circulating volume or 1200–1500 mL without changes in vital signs; however, this bleeding can be reflected in fetal distress. There are reports that up to 80% of pregnant women who survive hemorrhagic shock, suffer the death of the fetus<sup>4,27</sup>.

The presence of a gravid uterus does alter the pattern of injury<sup>14</sup> because the growing uterus moves cephalic in all the viscera and in penetrating trauma acts as a protective barrier, therefore, is more likely to be injured. A great amount of energy of the projectiles or trauma is absorbed by the uterine musculature, amniotic fluid and fetus. This reduces the force of the impact and the possibility of damaging other organs. The results in the fetus

are frequently discouraging, causing direct impact up to 60–90%. In these cases maternal mortality is around 7–9% and the fetal is approximately 70%<sup>3,4,11</sup>.

Diagnostic radiologic imaging in pregnant trauma patients should be undertaken if clinically indicated and not be withheld or delayed because of unfounded fears of fetal effects<sup>29</sup>. In the pregnant trauma patient, ultrasound is often easily accessible in an emergency department and can provide crucial information<sup>14</sup>.

In the management of pregnant woman with trauma, it must be considered as two patients, the adequate treatment of the mother will be the best treatment for the fetus, so the initial management is focused on resuscitation and stabilization of the pregnant patient because the life of the fetus depends entirely on the mother's condition. In essence, the treatment is the same as in any situation of trauma<sup>4,14,30</sup>. So, the initial maternal evaluation (primary survey) should follow nonpregnant guidelines and include a full trauma history and vital signs assessment. Once life-threatening injuries have been addressed, the secondary survey of fertile female should include assessment of potential pregnancy, fetal edge and his possible extra-uterine survival<sup>11</sup> and, when possible, joint evaluation of the patient by both the trauma and obstetrical team should be undertaken<sup>14</sup>. When the fetus is deemed viable, continuous fetal monitoring should be initiated as soon as possible, as long as it does not interfere with essential maternal diagnostic tests or therapy<sup>14</sup>.

In 1996, Morris et al.<sup>31</sup> defined the criteria for “salvageable infant”; it includes equal or greater gestational age than 26 weeks and fetal heart tones present at the time of admission. If the fetal heart tones are absent, the pregnancy must be ignored and the treatment must be focused in the mother. The fetal distress was also established as indication of emergency caesarean section; it means fetal heart tones lower than 100 beats per minute as well as recurring or prolonged decelerations<sup>31</sup>.

For some specialists, conservative care is indicated when: the entrance wound is below the uterine fundus, the fetus is pre-viable or dead, abdominal examination is negative and the urinalysis is negative for blood. Otherwise, surgical intervention is the standard care<sup>32</sup>. For others, this type of injury requires routine laparotomy<sup>27</sup> and is mandatory when the penetrating wound is upper or rear, and if the fetal or maternal commitment is evident<sup>28</sup>.

Peritoneal lavage can be performed during pregnancy and an open technique is recommended after placement of a nasogastric tube and a Foley catheter<sup>14</sup>.

Caesarean section should be done only if: the maternal resuscitation fails, the uterus interferes with the examination and repair of the maternal injuries, the product is mature and is suspected of having direct injury<sup>28</sup>, maternal shock, threat to life from exsanguinations from any cause, irreparable uterine injury, fetal distress in a viable fetus, unstable thoracolumbar spine injury, pregnant near-term and in case of cardiac arrest of the mother<sup>11</sup>. Regarding to this last indication, perimortem caesarean delivery (PMCD) is defined as a caesarean delivery initiated after cardiopulmonary resuscitation has been instigated. PMCD should be performed with a gestational edge greater than 24–25 weeks and within 5 minutes of maternal cardiopulmonary arrest<sup>33</sup>. Although recent reviews conclude that despite being reports of 20 years supporting PMCD, they fall far from proving that it improves maternal and neonatal outcomes<sup>34</sup>.

The caesarean section increases blood loss, surgical time and future obstetric risks, so if the fetus is not viable or is dead, there is no indication to perform it. The induced or spontaneous delivery in patients with conservative care is well tolerated<sup>2</sup>.

In our particular case, caesarean section should not have been performed because the fetus was pre-viable, dead and there was no other indication supporting it. Conservative treatment of the uterus must be accomplished with subsequent delivery.

In our hospital, we do not count with specialists in Pediatrics, Gynecology and Obstetrics so we usually neither attend pregnant women nor children. And despite being a trauma referral hospital with personnel trained in advance trauma life support, it neither has the appropriate personnel nor the appropriated resources to respond to these kinds of patients.

In conclusion, the management of these special patients should be multidisciplinary but even trauma referral centers could neither have the training for these specific cases nor the ideal staff, like obstetricians and neonatologists. For this reason, specific training focused on basic maternal resuscitative measures is necessary for all trauma and emergency physicians, even if the likelihood of having to manage a pregnant woman is very low.

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