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Trauma during Pregnancy: A Review of 38 Cases

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Abstract

Introduction: **The emergency care of trauma patients who are pregnant is challenging due to the anatomy and physiological changes during pregnancy. Maternal trauma is the leading non-obstetric cause of fetal death. The objective of this study was to review the problems and to present findings, decision making and management.**

Materials and Methods: **Medical records of 38 trauma women with secondary diagnosis of pregnancy admitted to Suratthani Hospital during September 30, 2002 and September 30, 2005 were reviewed. Vital signs, coma scores, fetal heart rates, diagnostic peritoneal lavage (DPL) results, operative findings and clinical courses were extracted. Information on pregnancy outcome and the use of seat belt were obtained. An injury severity score (ISS) was calculated in all patients. Gestational age was determined. DPL was employed using a supraumbilical approach.**

Results: **The mean age of 38 pregnant women was 21 years. Ten percent were in the first trimester, 40% in the second trimester and 50% in the third trimester. The majority was blunt trauma. Thirty pregnant women obtained collision injuries (19 by motorcycle and 11 by automobile), 5 from fall and 3 from gunshot wound, body assault, and snake bite. The mean ISS was 10.5. There were 4 maternal deaths (10.52%). Four fetal deaths were in utero (FDIU). The pregnancy outcome could be recorded in 31 (81.5%) of 38 patients; 9 of 31 fetuses were dead (4 FDIU with maternal death and 5 spontaneous abortions). Fetus was alive in 22 patients (71%). The outcome could not be evaluated in 7 of 38 patients due to loss of follow-up.**

Six patients were admitted with evidence of shock resulting in 4 maternal and 4 fetal deaths (66.6%). There was no maternal mortality in patients with normal vital signs, however, fetal loss occurred in 5/32 (15.6%). DPL was performed in 6 patients suspected of having blunt abdominal trauma. DPL was considered positive in 5 patients (83.4%) and negative in 1 patient (16.6%). All positive results were confirmed by laparotomy finding.

Information on the use of seat belt was available in 11 automobile collisions; 3 patients (27.3%) were wearing restraints, 8 patients were unrestraint and 4 of them (50%) died. Moreover, uteroplacental injuries were noted in patients who were wearing belts and one injury was reported in the unbelted occupants.

Helmet wearing was reported in 19 patients. Four patients with helmets use were significantly injured. Among 15 patients who did not use helmet, 3 patients sustained major injury, 6 patients had minor injury and other 6 patients had significant injury. The GCS of all 19 patients were 15 which were not significantly different.

Conclusions: **The net effect of trauma on pregnancy outcome depends in a great extent on physicians' awareness of the altered intra-abdominal injury pattern in pregnant women. Moreover, the outcome also depends on the awareness of the hematological changes of pregnancy and, most importantly, the physician's ability to promptly diagnose and treat maternal injury. The overriding principle in the management of injured pregnant woman is that maternal well being is paramount. The best chance for fetal survival is to assure the maternal survival.**

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Introduction

The emergency care of pregnant trauma patients is very challenging to many physicians. The reason is that the anatomy and physiological changes during pregnancy can mask the symptoms and lead to misinterpretation. This often delays correct diagnosis and prompt treatment resulting in maternal complications and fetal death.

The true incidence of trauma during pregnancy is not known.[1] Maternal trauma is the leading non-obstetric cause of fetal death and increasing proportion of both maternal and fetal mortality.[2] Many studies reviewed the scope of injury, the decision management and the evaluation of the results from that decision-making.

This review is an effort to give a general overview of the problems and to present decision management that may be used as practical guidelines. Maternal and fetal outcome is analyzed with the presence or absence of maternal shock, the use of seat belt and safety helmet. The accuracy of DPL is also evaluated.

Materials and Methods

Medical records of all trauma women with secondary diagnosis of pregnancy admitted to Suratthani Hospital from September 30, 2002 to September 30, 2005 were retrospectively reviewed. Thirty-eight patients were identified. They were all proved to be pregnant during the admission. Vital signs, coma scores, fetal heart rates, DPL results, operative findings and clinical courses were extracted from each chart and recorded. Information on pregnancy outcome and the use of seat belt were obtained. An injury severity score (ISS) was calculated in all patients.[3] Gestational age was also determined by history and physical examination. The first trimester was considered to be between the 1st and 12th week of gestation, the second trimester between 13th and 24th week of gestation and the third trimester greater than 25th week of gestation. Pregnancy outcome was categorized as successful if infant survived in the neonatal period, and unsuccessful if spontaneous abortion, stillbirth, fetal death in uterus or neonatal death happened as a result.

Diagnostic peritoneal lavage was considered to be positive using standard criteria by the American College of Surgeons. Open or semi-open technique was employed using a supraumbilical approach.[4] Criteria of the maternal shock included the systolic blood pressure of less than or equal to 90 mmHg, pulse rate greater than 110/min or less than 60/min, fetal heart rate greater than 160/min or less than 120/min. Late deceleration was considered to be the evidence of fetal distress. Fisher's exact test was used for statistical analysis and it was considered to be significant difference if $P < 0.05$.

Results

The mean age of 38 pregnant trauma women was 21 years (range 16-47 years). Four patients (10%) were in the first trimester, 15 (40%) in the second trimester and 19 (50%) in the third trimester. There were no multiple gestations. The majority of patients had blunt trauma. Thirty pregnant women obtained collision injuries; 19 patients by motorcycle, 11 by automobile. Five were from fall and the other 3 from gunshot wound, body assault, and snake bite. The mean ISS was 10.5 (range 1 to 57) (Table 1).

There were 4 (10.52%) maternal deaths. Three of them were in the second trimester and 1 in the third trimester (ISS 25, 32, 48 and 57). All 4 fetal deaths were in utero (FDIU) (Table 2). The pregnancy outcome could be recorded in 31 (81.5%) of 38 patients. Nine (29%) of 31 fetuses were dead; 4 FDIU with maternal death and 5 spontaneous abortions. Fetus was alive in 22 (71%) patients. The outcome could not be evaluated in 7 of 38 patients due to loss of follow-up.

Six patients were admitted with evidence of shock. This resulted in 4 maternal and 4 fetal deaths (66.6%). In patients with normal vital signs, there was no maternal mortality, however, fetal loss occurred in 5/32 (15.6%). This difference was statistically significant (Table 3).

Table 1 The causes of injury in 38 pregnant women, majority were blunt trauma

Causes of injury	No. of patients (%)
Motorcycle accident/collision	19 (50%)
Automobile accident/collision	11 (29%)
Fall	5 (13.2%)
Gunshot wound	1 (2.6%)
Body assault	1 (2.6%)
Snake bite	1 (2.6%)

Table 2 Details of 4 maternal deaths (4 fetal deaths in utero)

Maternal death						
Mechanism of injury					Fetal outcome	Organ injuries
Patient	PS	Causes	ISS	Trimester		
1	0.4895	MVC	25	2	Dead	- severe head injury
2	0.5126	MVC	48	2	Dead	- rupture liver - fracture pelvis - uteroplacental injury
3	0.7715	MVC	57	2	Dead	- severe head injury - exsanguination
4	0.8708	MVC	32	3	Dead	- kidney laceration - rupture spleen - fracture pelvis

PS = Probability of survival, ISS = Injury Severity Score, MVC = Motor vehicle collision

Table 3 The results of shock on admission, maternal and fetal death

	Abnormal blood pressure on admission N = 6 (patients)	Normal blood pressure on admission N = 32 (patients)
Maternal death (rate)	4 (66.6%)	0 (0%) P<0.001
Fetal death (rate)	4 (66.6%)	5 (15.6%) P< 0.02

Table 4 Results of DPL in 6 patients

Patients	Trimester	ISS	GCS	DPL	Laparotomy findings	Fetal outcome	Maternal outcome
1	2	25	5	-ve	-	Dead	Dead
2	3	32	11	+ve	- kindney laceration - ruptured spleen - fractured plesvis	Dead	Dead
3	2	48	9	+ve	- ruptured liver - fractured pelvis - uteroplacental injury	Dead	Dead
4	2	57	5	+ve	(sever head injury) - exsanguinations	Dead	Dead
5	2	16	15	+ve	- ruptured liver	Alive	Alive
6	3	16	15	+ve	- ruptured spleen	Alive	Alive

ISS = Injury severity score, GCS = Glasgow Coma Score, DPL = Diagnostic peritoneal lavage

Table 5 Information on the use of seat belt

	Seat belt being used	Seat belt not being used
Number of patient (%)	3 (27.3%)	8 (72.7%)
Mean ISS	16	33.5
Maternal deaths (%)	0 (%)	4 (50%) p = 0.236
Uteroplacental injuries (%)	0 (%)	1 (12.5%) p = 1.00

Table 6 Severity of injury in patients wearing and not wearing helmets

	Helmet used (N = 19)	No helmet (N = 15)
Major injury	0	3
Minor injury	0	6
Significant injury	4	6

Diagnostic peritoneal lavage was performed in 6 patients suspected of having blunt abdominal trauma. All patients were in the second and third trimester. DPL were considered positive in 5 (83.4%) patients and negative in 1 (16.6%) patient. All positive results were confirmed by laparotomy finding (Table 4).

Information on the use of seat belt was available in 11 patients. Three patients (27.3%) were wearing restraints. Eight patients were unrestraint and 4 of them (50%) died. This difference was not statistically significant (Table 5). Moreover, uteroplacental injuries were not noted in patients who were wearing seat belts and one injury was reported in an unbelted occupant.

Helmet wearing was reported in 19 patients of which 4 were severely injured. Among 15 patients who did not use helmet, 3 patients sustained major injuries, 6 patients had minor injuries and other 6 patients had significant injuries. The Glasgow Coma Score of all 19 patients were 15 which were not significantly different (Table 6-8).

Table 7 Details of major injury in 9 patients

Patient	Trimester	ISS	Findings
1	3	166	Ruptured spleen
2	2	16	Ruptured liver
3	3	22	Posterior hip dislocation Fractured pelvis Colles' fracture
4	2	48	Tear of mesentery, small bowel and colon
5	3	32	Ruptured spleen Kidney laceration
6	2	48	Ruptured liver
7	2	57	Sever head injury
8	2	25	Cerebral contusion and edema
9	2	9	Separation of pelvic rami

Table 8 Details of minor injury in 6 patients

Patient	Trimester	ISS	Finding
1	3	9	Fractured tibia
2	3	13	Facial laceration
3	3	13	Fracture of right parietal bone
4	3	4	Lacerated wound right thigh
5	2	4	Colles' fracture
6	2	4	Lacerated wound of head

Discussion

The incidence of trauma during pregnancy requiring hospitalization has been reported to be about 7%.[5] Motorcycle and automobile accident were common causes of blunt trauma in pregnancy, whereas severe trauma was less common in pregnant women.[6] In one series of blunt trauma, 20% of patients were reported to have sustained major injury.[7] The ISS was reported in these patients and the maternal death rate in this series was 10.52%. Half of these maternal deaths were due to severe head injury which were similar to other previous reports.[7-9]

Moreover, the fetal loss occurred in 29% where the outcome was known. Other reviews reported the rates of fetal loss ranging from 4% to 61% in pregnant women with trauma depending on the mechanism and severity of injury.[7-9]

In addition, evidence of shock in pregnant trauma patients is a prognosticator of poor outcome to both mother and fetus. Therefore, the absence of this condition resulted in low rate of fetal loss which was statistically different from results in patients who were unstable (66.6%).

The anatomic and physiologic changes that occur during pregnancy can modify the response to hemorrhage and trauma.[10] These varying changes in each trimester and position can make it difficult to make the diagnosis and to determine degree of maternal shock. Moreover, the reduction of uterine blood flow up to 20% can occur without changes in maternal blood pressure.[11] Hoff et al.[12] had also documented the unreliability of maternal blood pressure and pulse rate in predicting fetal loss. Thus, the evidence of hypovolemia in stable mothers should always receive aggressive treatment. Further-more, fluid replacement and supplement oxygen therapy should be instituted even in minor injury and apparently stable patients.

Diagnostic peritoneal lavage was found to be safe and accurate in pregnant patients. It can be illustrated that the majority of procedures were performed in the later stage of pregnancy. The accuracy rate was high with no false negative and no complications. Other reviews also confirmed the safety and accuracy of this procedure in pregnant patient.[13,14] In addition, the use of seat belts has been shown to reduce mortality and severity of injury in occupant patients involved in

collision.[15,16] The maternal death was reduced by 50% in patients using seat belt as compared to unbelted patients who had higher risk of maternal death and utero-placental injury. Nevertheless, there are questions about the effect of seat belt use in pregnancy. Crosby and Costiloe found that fetal and maternal death rates were significantly reduced when unbelted mothers were not ejected from the vehicle.[17] Furthermore, the three point restraints have been shown to significantly reduce the fetal death in pregnant baboons compared with those that use lap belts alone.[18]

Although, the helmet wearing was reported to significantly reduce major and minor head injuries, unfortunately, it cannot reduce major abdominal, pelvis and extremity trauma.

Conclusions

Accidental injury in pregnancy is of great concern and unique, not only because 2 lives are involved, but also because of the alterations in the nature of and response to injury in pregnancy. Maternal mortality and morbidity are primarily related to the severity of maternal injury. The net effect of trauma on pregnancy outcome depends in a great extent on physicians' awareness of the altered intra-abdominal injury pattern in pregnant women. Moreover, the outcome also depends on the awareness of the hematological changes of pregnancy and, most importantly, the physician's ability to promptly diagnose and treat maternal injury.

The overriding principle in the management of injured pregnant woman is that maternal well being is paramount. The best chance for fetal survival is to assure the maternal survival.

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