Chinese Journal of Traumatology 20 (2017) 343–346

Contents lists available at ScienceDirect

Chinese Journal of Traumatology

journal homepage: http://www.elsevier.com/locate/CJTEE

Original Article

Seatbelt paths of the pregnant women sitting in the rear seat of a motor vehicle

Masahito Hitosugi*, Takeshi Koseki, Yuka Kinugasa, Tomokazu Hariya, Genta Maeda, Yasuki Motozawa

Department of Legal Medicine, Shiga University of Medical Science, Shiga 520-2192, Japan

ARTICLE INFO

Article history:
Received 25 April 2017
Received in revised form
1 June 2017
Accepted 11 July 2017
Available online 4 November 2017

Keywords:
Pregnant women
Rear seat
Seatbelt
Anthropometry
Motor vehicles

ABSTRACT

Purpose: Seatbelt use during pregnancy is important to improve maternal and fetal survival after motor vehicle collisions. However, because the rear seatbelt of a motor vehicle tends to make contact with the neck, even if it is adequately used, some pregnant women sitting in the rear seat opt not to fasten the belt. The purpose of this study is to explore seatbelt–neck contact for pregnant women sitting in the rear seat of a motor vehicle.

Methods: We carried out an anthropometric study. Japanese women who were ≥30 weeks pregnant ($n = 12$) sat in the left side of the rear seat of a typical mid-size passenger sedan and fastened the seatbelt. Seating posture was investigated by measuring the coordinates of the anthropometric data points of the pregnant women (head, shoulder, hip joint, and knee joint). The belt path was analyzed by measuring the clearance between the belt and the sternum or navel.

Results: Among the 12 pregnant women at 33.9 week ± 3.3 week gestation, the shoulder belt deviated to the right side and subsequently contacted to the neck in four pregnant women (Contact group). The height of the Contact group was significantly shorter than that of Non-contact group (152.3 cm ± 3.0 cm vs. 159.0 cm ± 3.3 cm, $p = 0.008$). Regarding the relative position of the seatbelt to the subject's body, the distances from the top of the sternum to the center of the shoulder belt were significantly shorter in Contact group (3.9 cm ± 3.5 cm) than that in the Non-contact group (8.0 cm ± 1.6 cm, $p = 0.03$). However, no significant difference was found for the distance from the umbilicus to the center of the lap belt.

Conclusion: Our findings show that because of short height and late term of pregnancy with protrusion of the abdomen, the shoulder belt deviates to the right or left, avoiding the protruded uterus, and subsequently makes contact with the neck. Seatbelt systems for rear seats need to be developed to improve passenger safety, especially for pregnant women.

© 2017 Daping Hospital and the Research Institute of Surgery of the Third Military Medical University. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Introduction

With 13 million deaths worldwide, motor vehicle collisions (MVCs) are a leading cause of death, and the largest cause of accidental death and disability among pregnant women.[1] A recent study performed at Sapporo City in Japan revealed that 2.9% of women with 35–37 weeks pregnant had experienced MVC as an occupant during their pregnancy.[2] According to previous reports about traffic injuries among pregnant women and fetal or neonatal outcomes, severe maternal injury was associated with a higher risk of fetal loss.[3] Therefore, to improve safety for both mothers and fetuses, it is important to prevent or reduce the severity of injuries from vehicle collisions. Seatbelts are widely recognized as an effective preventive tool and seatbelt use is legally required in many developed countries. Because seatbelt use reduces the risks of fatal injuries for pregnant women and their fetuses in vehicle collisions, seatbelt use by pregnant drivers and front seat passengers is legally required in Japan.[4] Since 2008 in Japan, seatbelt use has become legally mandatory for all rear seat passengers. After this traffic law revision in Japan, although the rate of seatbelt use among rear seat passengers increased, only 36.0% and 71.8% of rear seat passengers wore seatbelts on normal roads and highways, respectively, in 2016.[5]

Real-world accident data analysis from the United States shows that properly restrained pregnant occupants involved in motor vehicle crashes had a significantly reduced risk of MVC-related adverse fetal outcomes, including pregnancy loss, compared with unrestrained pregnant occupants.[6] Therefore, the American College of Obstetricians and Gynecologists recommends seatbelt use to

* Corresponding author.
E-mail address: hitosugi@belle.shiga-med.ac.jp (M. Hitosugi).
Peer review under responsibility of Daping Hospital and the Research Institute of Surgery of the Third Military Medical University.

https://doi.org/10.1016/j.cjtee.2017.06.007
1008-1275/© 2017 Daping Hospital and the Research Institute of Surgery of the Third Military Medical University. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

improve maternal and fetal survival after MVCs for pregnant women seated in rear seats.

Despite the legal requirements, some pregnant women tend not to fasten seatbelt when sitting in the rear seat of a vehicle because of discomfort caused by the seatbelt making contact with the neck. Seatbelt–neck contact might also lead to adverse events during a MVC. Therefore, to confirm that seatbelt–neck contact in rear seats affects the safety of pregnant women and their fetuses, we carried out an anthropometric study on Japanese pregnant women. According to the results of this study, we propose measures to improve and develop seatbelt systems for rear seats passenger safety, especially for pregnant women.

Subjects and methods

The protrusion of a pregnant woman's abdomen increases according to the week of gestation; therefore, we opted to measure women who were in later terms of pregnancy. An open call for volunteers was issued, and 12 pregnant women, all of whom were 30 or more weeks pregnant were chosen as participants. Prior to the study, a physician gave the participants full verbal and written explanations of the purpose and method of the study. The participants then provided written consent. The Ethics Committee of the Dokkyo Medical University School of Medicine approved this study. The participants sat in the left side of rear seat of a typical mid-size passenger sedan (2008 Honda Accord Inspire). Next, the pregnant women fastened their seatbelts, and then, measurements were taken with water levels and flexible rulers. During the course of measurements, the following items were assessed.

Basic information

Age, height (cm), weight (kg), gestational age, and abdomen circumference and width (cm) were measured.

Seating posture

The position of the head, shoulders, knees, and pelvis were measured relative to the reference points in the vehicle. The door switcher and the upper face of the side sill were both used as the vehicle's X-coordinate reference point and Z-coordinate reference surface, respectively (Fig. 1). The measurement points on the head, shoulder, pelvis, and knee were as follows: the center of the external acoustic opening, center of the shoulder joint (the midpoint of the greater and lesser tubercles of the humerus), greater trochanter, and center of the knee joint (the tip of the lateral femoral condyle), respectively. To compare the seating posture among individuals and groups, the positions of each body part, relative to the X- (longitudinal axis, mm) and Z-coordinates (vertical axis, mm) of the vehicle, were measured and plotted as a schematic representation of the seating posture.

We also measured the horizontal length between the most protruded position of the abdomen and the X-coordinate reference points, as well as the width of the hip of the pregnant women.

Relative position of the seatbelt to the subject's body

The position of the seatbelt was measured after being fastened. The following parameters were measured: (1) the distance from the top of the sternum to the center of the shoulder belt (cm); (2) the distance from the center of the shoulder belt to the umbilicus (cm); and (3) the distance from the umbilicus to the center of the lap belt (cm).

Statistical analysis

A Mann–Whitney test was used to examine the differences in the values between the two groups. Differences with a p-value less than 0.05 were considered statistically significant.

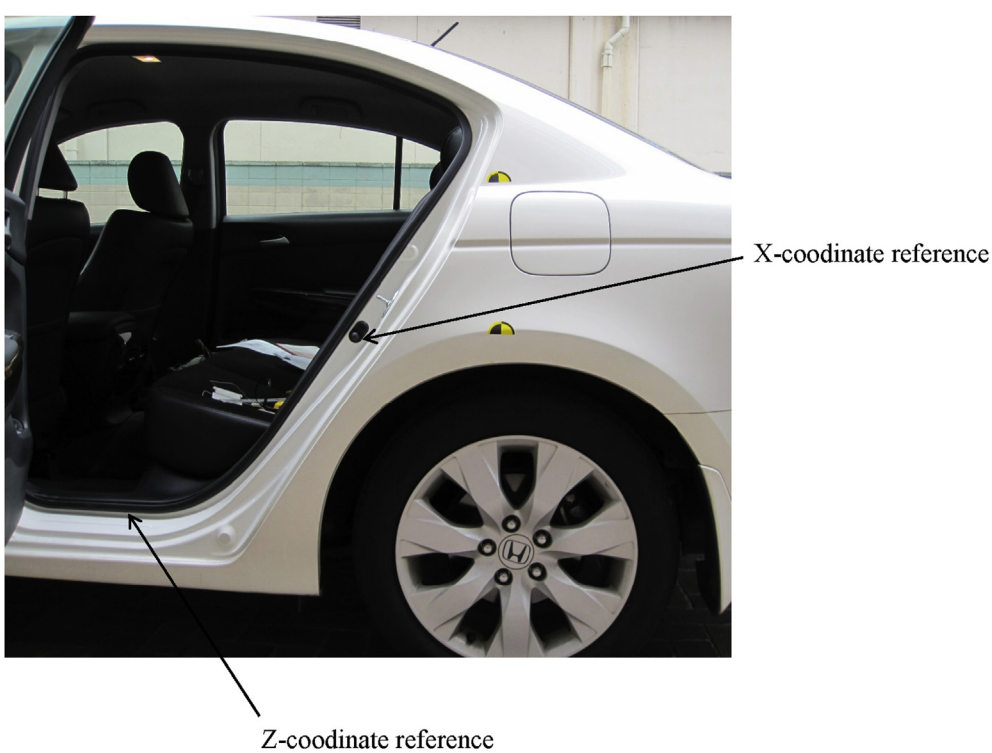

Fig. 1. Interior of the vehicle used in the measurement. The door switcher and upper face of the side sill were used as the vehicle's X-coordinate reference point and Z-coordinate reference surface, respectively.

Download English Version:

https://daneshyari.com/en/article/8694931

Download Persian Version:

https://daneshyari.com/article/8694931

Daneshyari.com