

EFFECTS OF LATCH VERSUS AVAILABLE SEATBELT INSTALLATION OF REAR FACING CHILD RESTRAINT SYSTEMS ON HEAD INJURY CRITERIA FOR 6 MONTH OLD INFANTS IN REAR END COLLISIONS

AUTHORS

JAMIE R. WILLIAMS, Ph.D., ROBSON FORENSIC, INC.,
354 North Prince Street, Lancaster, PA 17603
jwilliams@robsonforensic.com

CARRIE A. O'DONEL, B.A., ROBSON FORENSIC, INC.,
354 North Prince Street, Lancaster, PA 17603
codonel@robsonforensic.com

PETER J. LEISS, P. E., ROBSON FORENSIC, INC.,
354 North Prince Street, Lancaster, PA 17603
pleiss@robsonforensic.com

Presented:

59th Annual Scientific Conference
**Association for the Advancement of
Automotive Medicine**
October 2015

Published:

Journal: Traffic Injury Prevention, Volume: 16, Issue:
S2, pages 17 - 24.

ABSTRACT

The Lower Anchor and Tethers for Children (LATCH) system was introduced in vehicles made after September 1, 2002 and intended to make installation of rear and forward-facing child safety seats easier. Due to the lack of rear impact testing of RFCRS required per the Federal Motor Vehicle Safety Standards (FMVSS), the purpose of this study was to explore the effects, if any, of installation method of RFCRS on the performance of commonly purchased makes and models of RFCRS. Specifically, we hypothesize that in a 48 km/h (29.8 MPH) rear-end collision, installation of RFCRS using the LATCH system will result in higher Head Injury Criteria (HIC) values when compared to using the available lap/shoulder seatbelt (Emergency Locking Retractor - ELR or Automatic Locking Retractor - ALR).

The test matrix included 36 rear impact sled tests conducted using 3 installation methods on 3 models of RFCRS: the GracoSnugRide® with and without the base, the Britax Chaperone with base-mounted anti-rebound bar, and the Evenflo Tribute®, a model of convertible rearward/forward facing restraint system used in the rearward facing mode. The seats were installed using the LATCH system, ELR lap/shoulder belts, or ALR lap/shoulder belts in seating positions 4 and 6 on a vehicle buck mounted to the sled test base. The infant seat and 6 month old CRABI anthropometric test device (ATD) installation methods were in accordance with standards set forth in the National Highway Traffic Safety Administration's (NHTSA) FMVSS No. 213, Child Restraint Systems. All tests were conducted on pneumatic controlled acceleration sled (HYGE, Inc., PA, USA) at 48 km/h.

Installation of infant seat type RFCRS using the LATCH system resulted in higher HIC15 values when compared to using the available lap/shoulder seatbelt (ELR or ALR). The mean HIC15 values were most severe when infant seat type RFCRS were installed using LATCH (GracoSnugRide®HIC15= 394 and Britax ChaperoneHIC15=133) compared to using either ELR lap/shoulder belts (GracoSnugRide®HIC15= 218 and Britax ChaperoneHIC15=65) or ALR lap/shoulder belts (GracoSnugRide®HIC15= 194 and Britax Chaperone HIC15=78). The installation method did not result in a statistically significant difference in HIC for the convertible type RFCRS (EvenfloTribute®). In many of the tests, the ATD's head struck the seatback in which the RFCRS was installed. These head strikes resulted in the higher HIC15 scores recorded throughout the testing.

The results of this study suggest that LATCH does not offer equal protection to lap/shoulder belts from head injuries in rear impacts when used with infant seat type RFCRS.