

Abdominal Seatbelt Signs: The Predictive Value of CT Free Fluid in Determining the Need for Surgery

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Introduction

Seatbelt-associated trauma can lead to unique injury presentations, including hollow viscus injury, which can be challenging to detect with imaging modalities. One of these corresponding injuries is known as a seatbelt sign, which is ecchymosis in the corresponding shape or location of a lap or three-point seatbelt. This study aimed to evaluate the prevalence of intra-abdominal injuries in motor vehicle collision (MVC) patients with abdominal seatbelt signs, as well as the prevalence of intestinal injuries and delayed presentation of such injuries. Thereby, this will allow us to determine the predictive value of CT findings when taken in addition to this physical exam finding and help to refine clinical management guidelines.

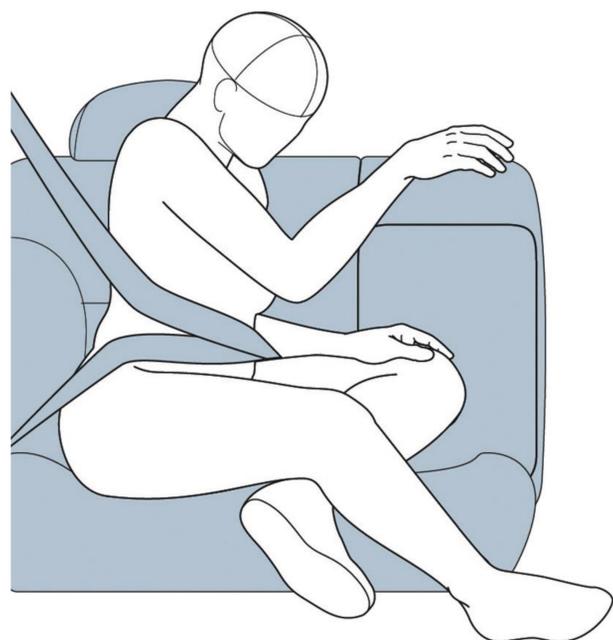


Figure 1. Image depicting mechanism of a seatbelt injury that can lead to presentation of characteristic seatbelt sign.



Figure 2. Image depicting corresponding ecchymosis of an abdominal seatbelt sign.

Methods

A retrospective chart review was conducted in an adult level 1 Trauma Center from February 2018 to May 2021. Information was gathered from electronic medical records of adult trauma patients with a documented physical exam finding of an abdominal seatbelt sign upon presentation. These patients were broken into 2 groups: those who underwent abdominal surgery (ABD SURG) and those that did not undergo any surgery (NO SURG). Univariate analysis was then performed.

Statistics

	ABD Surg + n= 24	No Surg - n= 234
CT fluid +	20	24
CT fluid -	4	210

Sensitivity	83%
Specificity	90%
Positive Predictive Value	45%

Table 1. Data displaying CT results of abdominal surgery patients (ABD Surg) and non-surgery patients (No Surg) for free fluid. Additional sensitivity, specificity, and positive predictive values for these criteria.

Results

258 patients presenting after an MVC were documented to have an abdominal seatbelt sign and were included in our study. The ABD SURG group comprised 24 of the 258 patients (9.2%), with 22 of the 24 patients (92%) found to have either a small bowel injury, large bowel injury, mesenteric injury, or some combination of these. CT free fluid was seen in 24 of the 210 (11%) of those patients in the NO SURG group. A CT scan showed free fluid in 20 of the 24 (83%) in the ABD SURG group, which was statistically significant in comparison to the NO SURG cohort ($P < 0.0001$). The remaining 4 patients were brought to the OR based on other radiologic findings necessitating surgery. In our analysis, free fluid on CT carried a 98% negative predictive value (NPV) for no hollow viscus injury (determined by no need for abdominal surgery) and a 90% sensitivity for predicting surgical intervention. Additionally, 88 of the 258 (34%) patients were discharged from the ED with no unplanned readmissions.

Conclusion

The findings in this study show abdominal seatbelt sign patients without evidence of CT free fluid, in an otherwise negative CT, may be safely discharged without surgical intervention. Further studies can be added to strengthen these findings and help to refine existing guidelines for managing this specific cohort of trauma patients.

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