Does an Admission for Major Trauma Increase the Risk of Infectious Complications in the Longer Term?

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Abstract

Introduction: There is little evidence regarding the effect of major trauma and the development of chronic immune dysfunction. We conducted a UK based cohort analysis to determine whether major trauma predisposes patients to developing infectious complications in the longer term

Methods: The analysis included 1302 trauma patients who were admitted to the Intensive Care Unit of the Queen Elizabeth Hospital between January 2016 and January 2020. Data was collected from TARN and ICNARC databases, with patients divided into major and minor trauma cohorts based on their Injury Severity Score. Patients were followed up over 3 years and rates of readmission for infectious complications and all causes of readmission were compared.

Results: There was no increased risk of readmission for infectious complications following major trauma (HR 0.952, 95% CI 0.155-7.904; p = 0.963). Also, despite major trauma being associated with an increased risk of readmission for all causes (HR 1.690, 95% CI 0.638-3.669), this too was not considered to be statistically significant (p = 0.212).

Conclusions: There were no long-term differences in rates of readmission for infectious complications and all readmission causes between major and minor trauma patients. Further research is needed in order to clarify the link between traumatic injury and prolonged immune dysfunction.

Introduction

There is little evidence regarding the effect of major trauma and the development of long-term immune dysfunction (1). However, it is thought that severe injury can contribute to an impaired immune response, leading to chronic immunosuppression, and thus, increasing the risk of subsequent infection and re-hospitalisation. This may be due to an alteration in the immunomodulatory molecules that characterise the systemic inflammatory response syndrome (SIRS) and the opposing counter anti-inflammatory response syndrome (CARS) (2) (3).

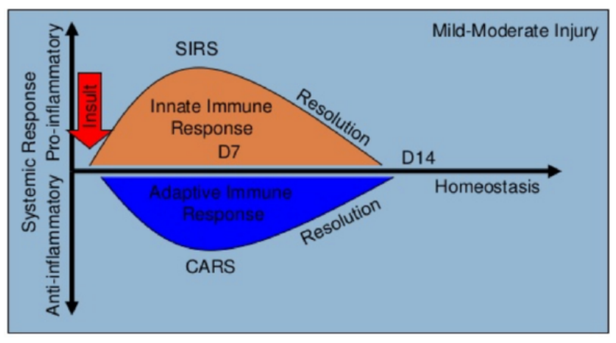

Figure 1: The SIRS/CARS model of inflammatory response after traumatic insult (3)

Objectives

1. To compare readmission rates for infectious complications between major and minor trauma patients
2. To compare readmission rates for for all causes of readmission between major and minor trauma patients. This included cardiovascular, gastroenterological, hepatic, neurological, infectious, renal, respiratory, and orthopaedic causes.

This was assessed at 3 months, 6 months, 9 months, 1 year, 2 years and 3 years.

Methodology

In this UK based cohort study, we analysed 1302 trauma patients who were admitted to the Intensive Care Unit of the Queen Elizabeth Hospital between January 2016 and January 2020. Data was collected from TARN and ICNARC databases, with patients divided into major and minor trauma cohorts based on their Injury Severity Score (ISS). Those with an ISS ≥ 15 were categorised into the major trauma cohort, and those with scores < 15 into the minor. Patients were followed up over 3 years and readmission rates for infectious complications were compared between the two cohorts.

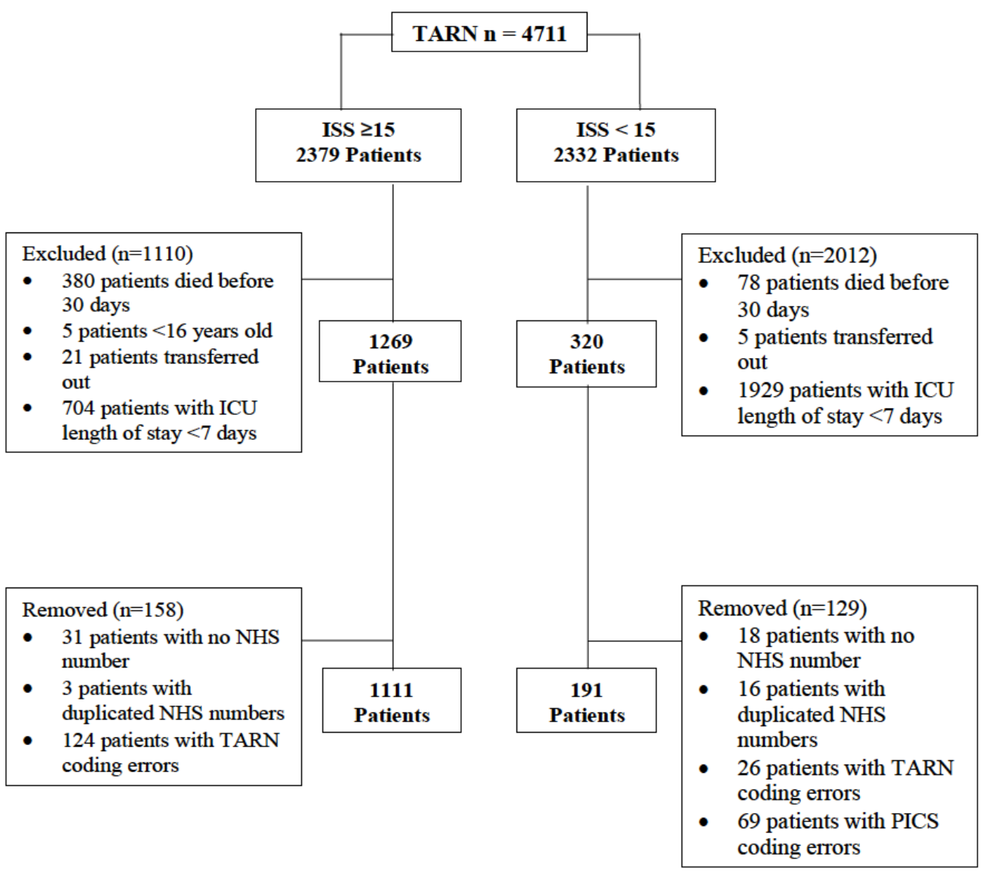

Figure 2: Consort diagram showing how patients extracted from the TARN database were selected.

From the 1111 major trauma patients, 64 were found to be readmitted to hospital, with 7 of these being specifically for infectious causes . From the 191 minor trauma patients, 7 were found to be readmitted to hospital, with only 1 of these being specifically for an infectious cause.

Results

Infectious causes

Univariable analysis showed that major trauma was associated with an increased risk of readmission but this was not statistically significant (HR1.548; 95% CI, 0.726-3.455; p = 0.248). Multi-variable analysis also proved major trauma to be associated with an increased risk of admission (HR 1.690, 95% CI 0.638-3.669) but this too was not considered to be statistically significant (p = 0.212). Kaplan Meier survival analysis also did not produce significant result (p = 0.244).

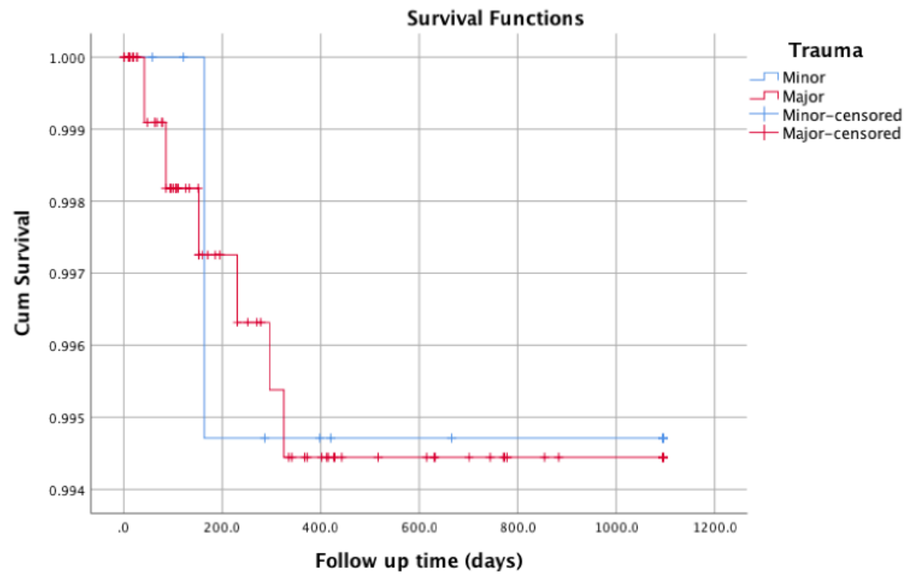

Figure 3: Kaplan Meier curve for infectious readmissions following traumatic injury, with follow-up (days) plotted along the x axis and cumulative survival plotted along the y axis.

All Causes of Readmission

Univariable analysis showed major traumatic injury not to be associated with an increased risk of readmission for infectious (HR 0.952, 95% CI 0.155-7.904; p = 0.963). Kaplan Meier survival analysis also did not produce statistically significant results (p = 0.963).

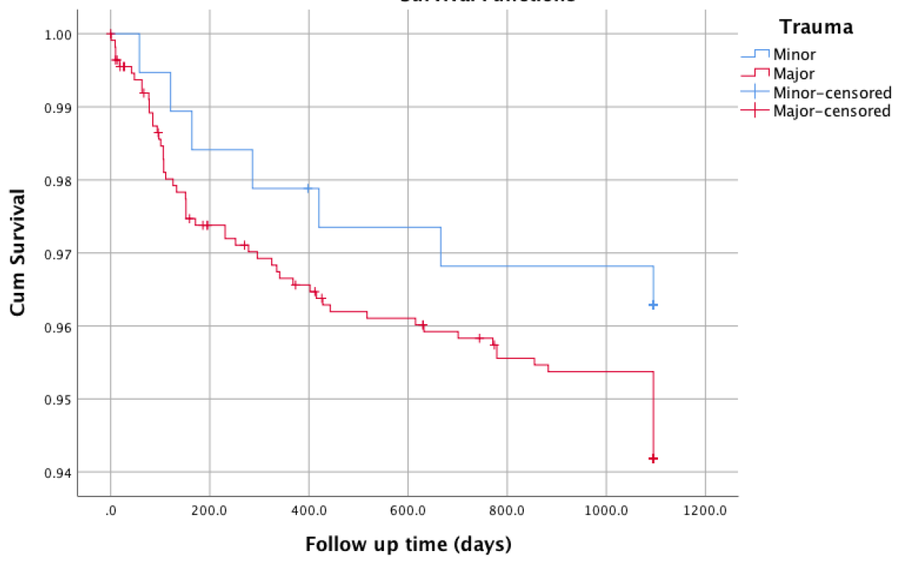

Figure 4: Kaplan Meier curve for all causes of readmissions following traumatic injury, with follow-up (days) plotted along the x axis and cumulative survival plotted along the y axis.

Conclusion

A higher number of major trauma patients were readmitted for infectious causes during the 3 year follow up period compared to patients of minor trauma. However, there were no long-term differences in readmission rates for infectious complications as well as all causes of readmission between the two groups, with no statistically significant results being produced in this study.

Limitations

Firstly, due to the retrospective nature of the study, it is difficult to determine direct causal factors and eliminate residual confounding variables. Secondly, this study had reduced power due to the particularly small sample size of readmitted patients, and more importantly, the small number of patients readmitted for infectious complications. This may have been due to the request from the TARN database not collecting all the patient data, or, due to patients with infectious complications being transferred elsewhere if readmission was required.

Lastly, this study only looked at rates of infectious complications that presented as readmission, ignoring those that did not require rehospitalisation. Although this made it easier to monitor and record rates of infectious complications, this meant that there may have been a number of patients who succumbed to infection post-hospital discharge who weren't accounted for.

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