

POSTER PRESENTATION

Open Access

# T-helper cell polarisation following severe polytrauma

HDT Torrance<sup>1,2,3\*</sup>, K Brohi<sup>2,3</sup>, G Warnes<sup>2</sup>, HC Owen<sup>1</sup>, CJ Hinds<sup>1,3</sup>, DJ Pennington<sup>2</sup>, MJ O'Dwyer<sup>1,3</sup>

From ESICM LIVES 2015

Berlin, Germany. 3-7 October 2015

## Introduction

Severe polytrauma induces an immunosuppressive response and is associated with a very high incidence of nosocomial infections. Previous studies have inferred that this detrimental immune response results from polarisation of the T helper (T<sub>h</sub>) response towards an anti-inflammatory, T<sub>H</sub>2 dominated, response at the expense of a bactericidal, T<sub>H</sub>1 response [1].

## Objectives

1) To define alterations in T<sub>H</sub> cell subsets following severe blunt polytrauma.

## Methods

Patients presenting to the emergency department within 2 hours of severe polytrauma were eligible if intubated either at the scene or in ED. Isolated head injuries and those not expected to survive 24 hours were excluded.

EDTA anti-coagulated blood was drawn at 0hr (within 2 hours of injury), at 24 and 72hrs. Samples were immediately lysed, washed, stained and analysed using a standardised human 8-colour T<sub>H</sub> 1, 2 & 17 panel [2] on an LSR II flow cytometer. A paired white cell count differential was obtained at each sampling point. Patients were followed until discharge or death. Data were analysed using non-parametric statistics, with results presented as median and IQR.

## Results

15 consecutive severe polytrauma patients requiring Intensive Care Unit (ICU) admission were recruited. Demographic and clinical data are outlined in Figure 1. Twelve (80%) lymphocytosis ( $3.3 \times 10^9/L$ , 2.5 -  $4.4 \times 10^9/L$ ) (Figure 2A). At 72 hours leukocytes had fallen ( $P < 0.01$ , figure 2A) such that 6 (54%) of those surviving were lymphopenic ( $0.9 \times 10^9/L$ , 0.6 -  $1.2 \times 10^9/L$ ). Circulating

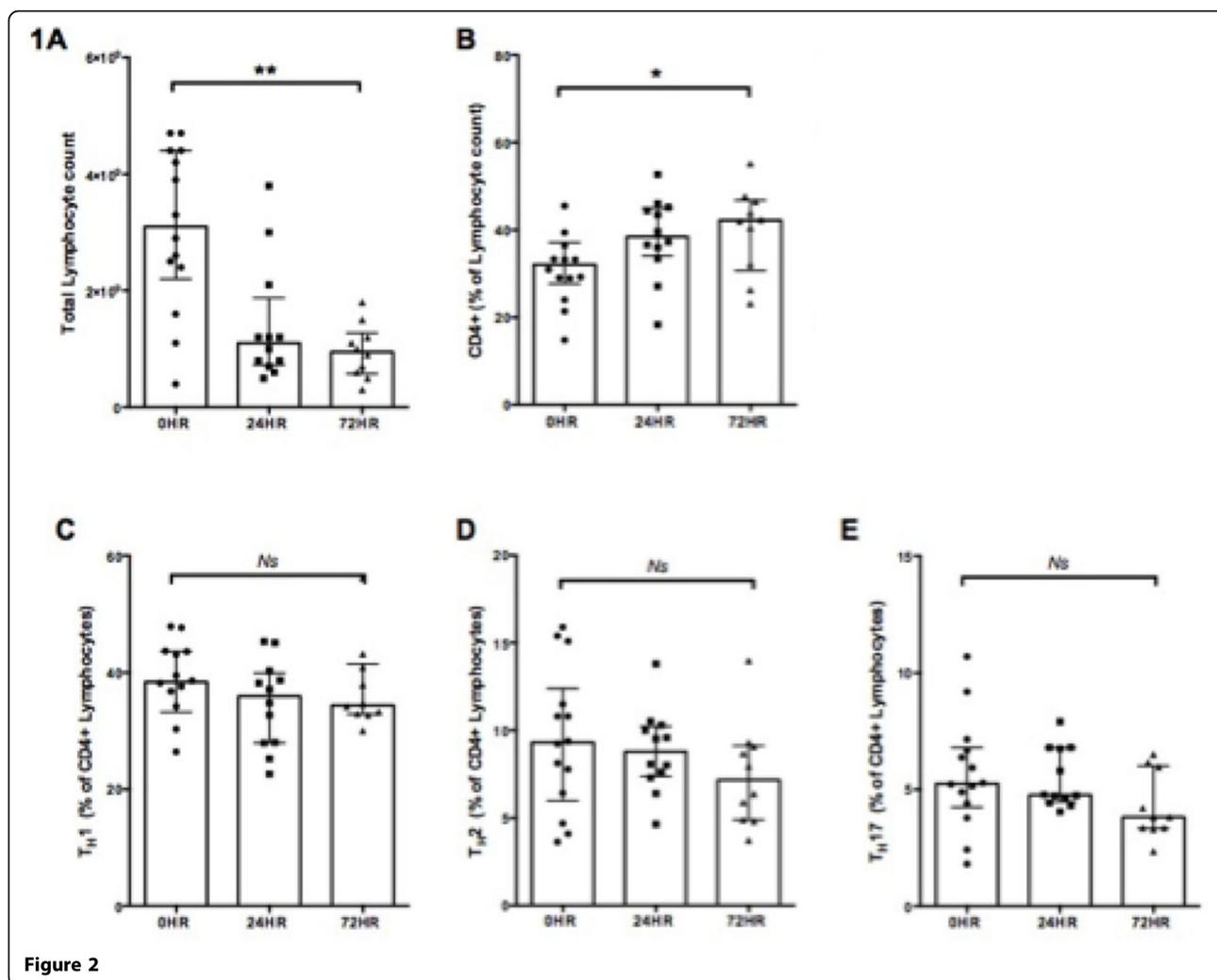
**Table 1. Patient demographics**

Age	33 (22 - 59.25)
Male	9 (60%)
Scene systolic BP	95 (56 - 127)
Admission pH	7.15 (7.00 - 7.29)
Admission BD	8.1 (4.3 - 19)
ISS	38 (29 - 51)
Blunt Injury	12 (80%)
PRBCs transfused over first 24hrs	15 (5 - 22)
28 day mortality	7 (47%)

*BP, Blood pressure; BD, Base deficit; ISS, Injury Severity Score; PRBCs, Packed Red Blood Cell transfusions over first 24 hours. Data expressed as median and interquartile range or number and percentage.*

**Figure 1**

<sup>1</sup>Barts & the London School of Medicine, QMUL, William Harvey Research Institute, London, United Kingdom  
Full list of author information is available at the end of the article



CD4<sup>+</sup> ( $P = 0.01$ ; Figure 2B) and CD4<sup>+</sup>CD25<sup>+</sup> ( $P < 0.05$ ) lymphocytes increased over 72 hours. When expressed as a percentage of total circulating lymphocytes no significant change in the proportions of the T<sub>H</sub> 1, 2 & 17 subpopulations was detected (Figure 2C-E).

### Conclusions

Severe polytrauma patients swiftly become lymphopenic. Although a failure to normalise this during the ICU stay correlates with higher mortality [3] our study of T<sub>H</sub> cell subtypes demonstrates no evidence of a switch to a detrimental anti-inflammatory T<sub>H</sub>2 subtype at the expense of the potentially protective bactericidal T<sub>H</sub>1 subtype.

### Grant Acknowledgment

Royal College of Surgeons of England, Barts & the London Charity.

### Authors' details

<sup>1</sup>Barts & the London School of Medicine, QMUL, William Harvey Research Institute, London, United Kingdom. <sup>2</sup>Barts & the London School of Medicine, QMUL, Blizard Institute, London, United Kingdom. <sup>3</sup>Barts Health NHS Trust, Trauma & Critical Care, London, United Kingdom.

Published: 1 October 2015

### References

1. Marik PE, Flemmer M: The immune response to surgery and trauma: Implications for treatment. *J Trauma Acute Care Surg* 2012, **73**:801-8.
2. Maecker HT, et al: Standardizing immunophenotyping for the Human Immunology Project. *Nat Rev Immunol* 2012, **12**:191-200.
3. Heffernan DS, et al: Failure to normalize lymphopenia following trauma is associated with increased mortality, independent of the leukocytosis pattern. *Crit Care* 2012, **16**:R12.

doi:10.1186/2197-425X-3-S1-A848

Cite this article as: Torrance et al: T-helper cell polarisation following severe polytrauma. *Intensive Care Medicine Experimental* 2015 **3**(Suppl 1):A848.