

TACO and TRALI: prevention, diagnosis and management

8th October 2014

Catherine E. Chapman

Consultant

NHS BT Newcastle

Introduction

A patient becomes breathless soon after transfusion:

- Underlying illness or linked to their transfusion?
- Possible causes of transfusion-related breathlessness:
 - Transfusion associated circulatory overload (TACO)
 - Acute transfusion reaction
 - Transfusion related acute lung injury (TRALI)
 - Incompatible red cell transfusion
 - Bacterial contamination

TACO and TRALI

Looking today at:

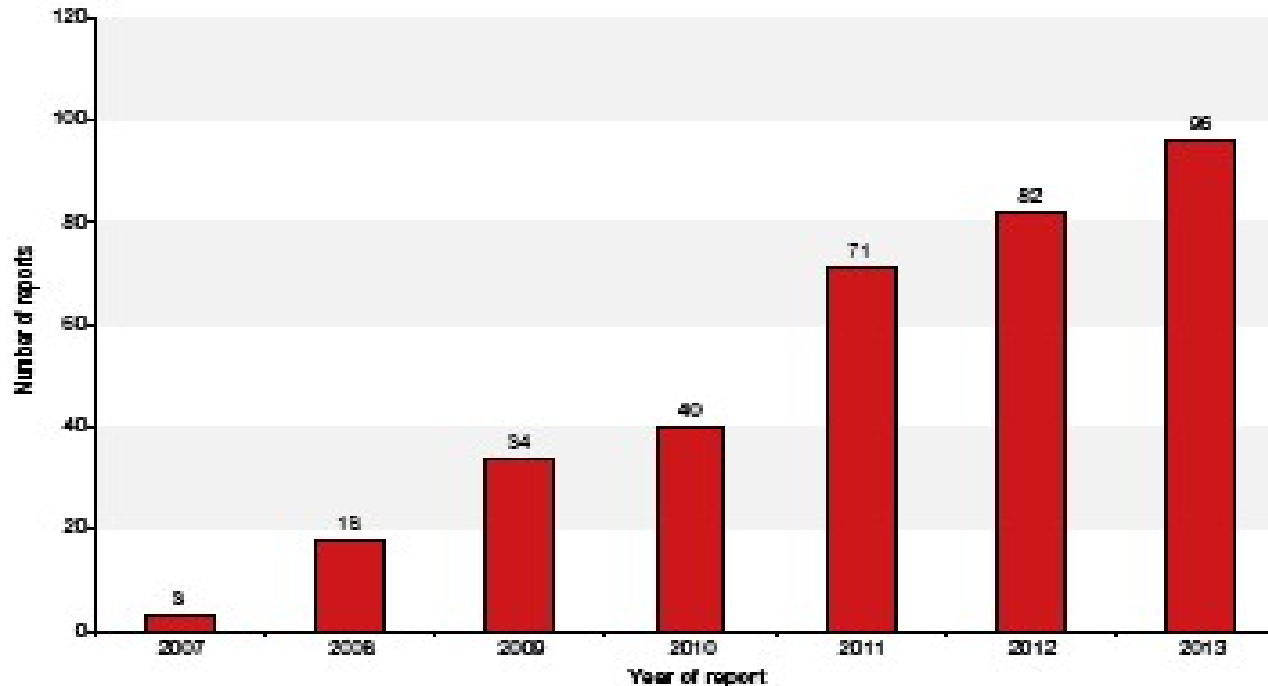
- Prevention
- Diagnosis
- Management

Beginning with some SHOT data

TACO annual reports to SHOT

Figure 23.1:
Number of cases of TACO reported to SHOT each year

In 2013 alone, 96 reports, including 12 deaths, in which TACO was causal or contributory



TACO

- SHOT data indicate TACO is reported much more frequently than TRALI
 - high reported morbidity and mortality
- In many cases TACO is preventable if patient is:
 - assessed carefully before transfusion
 - transfused appropriately
 - monitored during and after transfusion

Transfusion-Associated Circulatory Overload: International Society of Blood Transfusion definition

Any 4 of the following within 6 hours:

- acute respiratory distress
- acute or worsening pulmonary oedema
- tachycardia
- increased BP
- positive fluid balance

Definition currently under review by SHOT–
TACO can occur later and BP may drop

ITU admission for TACO following red cell transfusion for chronic anaemia

- An 80 year old male with renal impairment, chronic anaemia, Hb 91 g/L, and a history of angina and previous myocardial infarction, became acutely breathless part way through the second unit of a two unit red cell transfusion. He had not been given diuretic cover.
- The first unit was begun at 06:20 and transfused over 3 hours. The second unit was begun at 10:30 and stopped at 11:30 because he had become acutely breathless. His respiratory rate rose from 20 to 26 per minute, his oxygen saturation fell from 98% to 79%, with his pulse 114 and 120 and his BP 67/57 and 108/50 at baseline and at the time of the reaction respectively.
- He was in positive fluid balance (3800mL), with fluid input 4150mL and output 350mL. A chest X-ray showed pulmonary oedema. He was admitted to ITU where he received continuous CPAP and made a full recovery.

TACO

- is not confined to massive transfusion
- majority of cases reported to SHOT had received relatively modest quantities of blood

Management: stop transfusion, provide respiratory support, diuretics and ITU

TACO patient risk factors

- Age >70 but can occur at any age
- Cardiac failure
- Renal impairment
- Positive fluid balance
- Hypoalbuminaemia/liver dysfunction
- Low body weight – 10g/L increment applies only to 70Kg weight
- Dose of 4ml/kg gives rise of 10g/L

Preventing TACO

- Avoid inappropriate or unnecessary transfusion
- Assess patient pre-transfusion
 - take account of patient risk factors
 - prescribe suitable rates of transfusion
 - maintain fluid balance
 - check Hb level before transfusion and increments
 - prescribe diuretics as required

TACO- SHOT Learning point 2013

- *Requests for transfusion for patients with anaemia due to iron deficiency or macrocytic anaemia due to haematinic deficiency should be challenged and referred to a Consultant Haematologist if necessary*

Moving on to TRALI

Transfusion-Related Acute Lung Injury

- potentially fatal transfusion reaction
- occurs during or within 6hrs after transfusion; most within 2 hours of completion
- severe respiratory distress
- usually requires ventilatory support

Differential Diagnosis

- Clinical diagnosis of TRALI is one of exclusion
- TACO
- Cardiac event (MI or arrhythmia)
- Other causes of acute lung injury
- Infection
- Other causes of bilateral shadowing on CXR

Serious Hazards of Transfusion (SHOT) TRALI definition

- Acute dyspnoea with hypoxia and bilateral CXR changes during or within six hours of transfusion, not due to circulatory overload or other likely cause

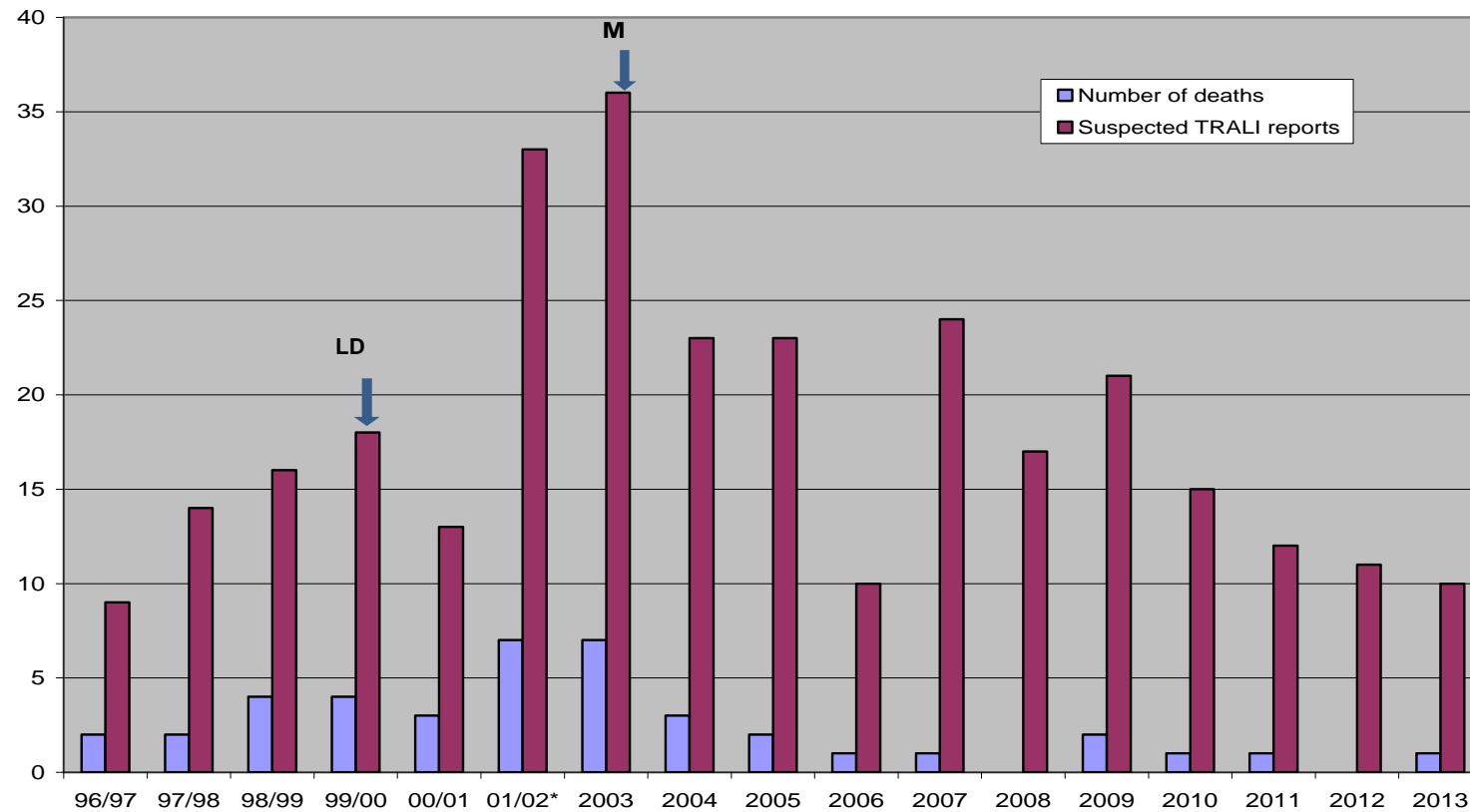
SHOT reports TRALI 1996 to 2013



Blood and Transplant

In 2013, 10 reports with 1 death
in which TRALI was contributory

Male
plasma



Year * 15 months in 01/02

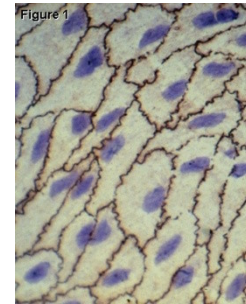
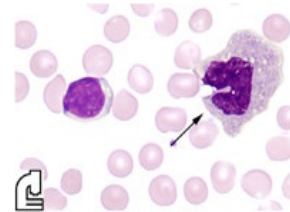
CE Chapman

What causes TRALI?

- Antibodies to white cells repeatedly implicated in TRALI since 1957
 - specificities include HLA class I, HLA class II and human neutrophil antigens (HNA)
- All series also have antibody negative cases ‘non-immune’.
 - other biological response modifiers implicated eg bioactive lipids. Less severe pulmonary reactions described
- Concordant antibodies support the diagnosis but are not diagnostic

How does it happen?

First step is usually antibody interacting with white cells.

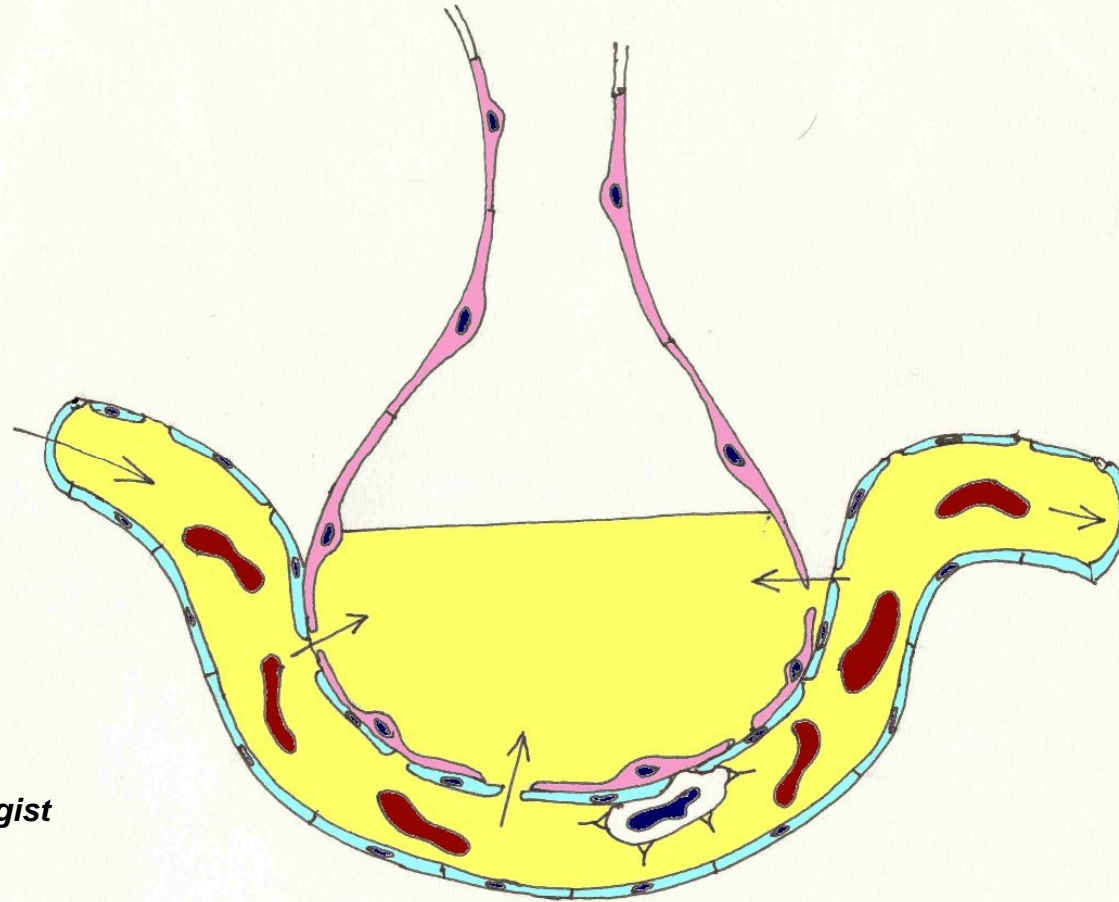


But endothelial cells may also be involved.

Inflammatory response follows causing :

- damage to capillary endothelium
- increased capillary leak
- protein rich fluid leaks into alveoli
- prevents effective oxygen exchange

Plasma leaks into alveoli



*Courtesy of
Dr Jonathan Wallis
Consultant Haematologist
FRH, Newcastle*

Which components?

Analysis of SHOT data from 1996 to 2003 showed TRALI risk per component 7 x higher after

- plasma rich components (e.g. FFP, platelets)
- compared with plasma poor (e.g. red cells in optimal additive solution)



TRALI risk reduction 2003

- Male plasma used as far as possible for FFP and plasma for platelet pooling
- National roll-out October 2003



NHSBT TRALI reduction

- 100% male FFP
- 100% male cryoprecipitate
- 100% male plasma used to suspend platelet pools
- Apheresis platelet donors are either
 - male or
 - females who have been screened and are negative for HLA and granulocyte antibodies



Avoiding female plasma

Followed by:

- reduced number of suspected TRALI reports to SHOT
- reduced number of TRALI deaths observed in UK, USA, Canada and Germany

A case report

- Teenage boy with history of liver disease transfused with female apheresis platelets before routine operation
- developed breathing difficulty, severe drop in oxygen saturation, drop in blood pressure and fever within 30 minutes of transfusion
- pulmonary oedema fluid through endotracheal tube
- needed full support on ITU but made complete recovery

TRALI management

- Usually requires ITU admission due to severity of respiratory impairment
- Often requires mechanical ventilation and usually resolves with supportive care
- May be hypotensive and require I.V. fluids

Donor Investigations for this case

- Both packs of apheresis platelets donated by same female donor
- Donor had multispecific HLA class I and class II antibodies including HLA-A2 and DR-11 concordant with patient

Conclusion: Immune TRALI due to HLA donor antibodies

Comparing TRALI v. TACO

- no single feature to differentiate these
- clinical detail of event is essential
- exactly what happened, to whom and when
- presence of donor antibodies not diagnostic of TRALI

Clinical features

FEATURE	TRALI	TACO
Temperature	↑ or no change	No change
BP	↓ or normal	Normal or ↑
Jugular venous pressure	No change	Can be raised
Auscultation	Crackles	Crackles +/- S3
ECHO	Normal	Abnormal
Ejection fraction	Normal or ↓	↓
PA pressure	≤ 18mm Hg	> 18 mm Hg
Pulm oedema protein	Exudate (high protein)	Transudate (low protein)
Response to diuretic	Worsens	Improves
WBC	Transient ↓	No change

Take home messages

- Transfusion associated breathlessness is more likely to be TACO than TRALI
- Accurate detailed assessment of patient and event is essential
- TACO is preventable in many cases
- TRALI is a diagnosis of exclusion
- Donor antibodies are not proof of TRALI