The Progression of Damage Control Resuscitation In Severe Penetrating Trauma: A Fourteen Year Experience In A Level One Trauma Center

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Introduction

Uncontrollable hemorrhage is the leading cause of preventable death in injury patients with penetrating trauma. They have been associated with massive transfusion and increase mortality. The approach to manage these patients has undergone major changes over the last several years. Accumulated experiences from war conflicts and trauma centers have generated significant modifications of many areas of resuscitation. The **objective** of this study is to compare major changes in trauma resuscitative management from two separate periods at a level one trauma center between the periods of 1998-2005 and 2006 -2013.

Methods

- Retrospective study on a large regional level one trauma center in Cali, Colombia during 1998-2013.
- Adult patients with penetrating trauma who required immediate operative intervention and transfusion of at least two units of packed red blood cells.
- Patients who died upon arrival to the emergency department were not included.
- We compared major changes in trauma resuscitative management from two separate periods, between 1998-2005 and 2006-2013.
- To determine differences, unpaired t test or Mann-Whitney test in quantitative variables and Chi-squared test or two-tailed Fisher exact test in qualitative variables were used.
- Due to the fact that several data points were lacking, 1,000 simulations were performed using the bootstrap method.
- Survival at 30 days was estimated using the Kaplan-Meier method.

Table 1. General characteristics

	1998-2013 (N=398)	1998-2005 (n=90)	2006-2013 (n=308)	p-value
Age in years				
Median [IQR]	27 [22.5-36.5]	31.5 [23.5-40]	26 [21.5-34]	0.002
Males (%)	369 (93)	86 (96)	283 (92)	0.230
Gunshot wounds (%)	333 (84)	75 (83)	258 (84)	0.900
Damage control resuscitation (%)	262 (66)	65 (72)	197 (64)	0.140
NISS				
Median [IQR]	34 [25-43]	34 [25-43]	34 [25-43]	0.260
Initial fibrinogen				
Median [IQR]	108 [75-163]	80 [50-121]	128.5 [81-178]	<0.001
Mortality (%)	60 (15)	25 (28)	35 (11)	<0.001

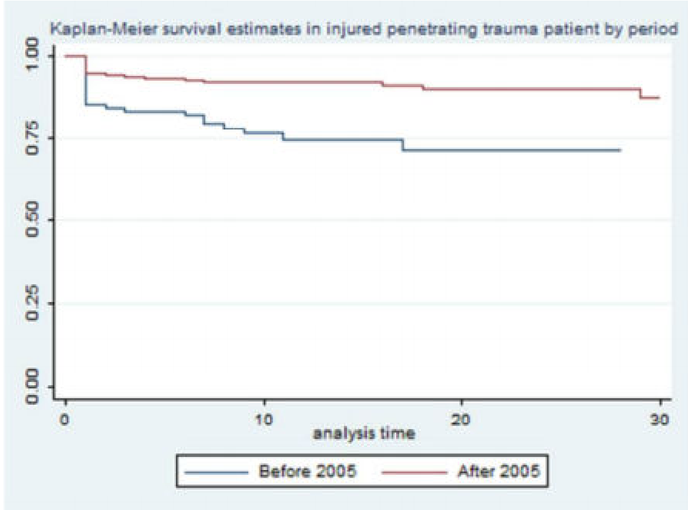
Table 2. Transfused units at ED and OR

	1998-2013 (N=398)	1998-2005 (n=90)	2006-2013 (n=308)	p-value
Packed red blood cells				
Median [IQR]	4 [2.5-7.5]	4 [2-8]	3 [2-6.5]	0.24
Fresh frozen plasma				
Median [IQR]	6 [4-9]	4 [6-8.5]	6 [4.5-9]	0.95
Platelets				
Median [IQR]	6 [6-14]	6 [8-13.5]	6 [6-14.5]	0.60
Cryoprecipitate				
Median [IQR]	6 [6.5-10.5]	6 [4-13.5]	8 [6.5-10]	0.14

Table 3. Comparisons of major changes in trauma resuscitative management

	1998-2013 (N=398)	1998-2005 (n=90)	2006-2013 (n=308)	p-value
Intravenous fluids infused				
Median [IQR]	5.5 L [3.5-8.2]	8.2 L [5.3-12.2]	5.1 L [3.4-7.2]	<0.001
Intra operative blood loss				
Median [IQR]	3 L [2-4.5]	3.4 L [2-5]	2.5 L [2-3.5]	0.002
Fresh frozen plasma (%)	273 (68)	59 (65)	214 (69)	0.480
Platelets (%)	218 (55)	42 (47)	176 (57)	0.070
Cryoprecipitate (%)	256 (64)	21 (23)	235 (76)	<0.001
Survival estimates* (%)		64 (71.2)	269 (87.4)	0.005

*Survival rates and numbers were estimated using the Kaplan-Meier method



Conclusions

Significant differences were identified between the two periods. The amount of crystalloids decreased and the use of "adjuvant" pro-coagulation interventions including the number of patients receiving cryoprecipitate increased since 2006. These changes were related with a decreased intra-operative bleeding and improved mortality.