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In Vitro Comparative Analysis of Clotting Factors and Inhibitors in Apheresis Platelet Concentrates During Five Day Storage Period

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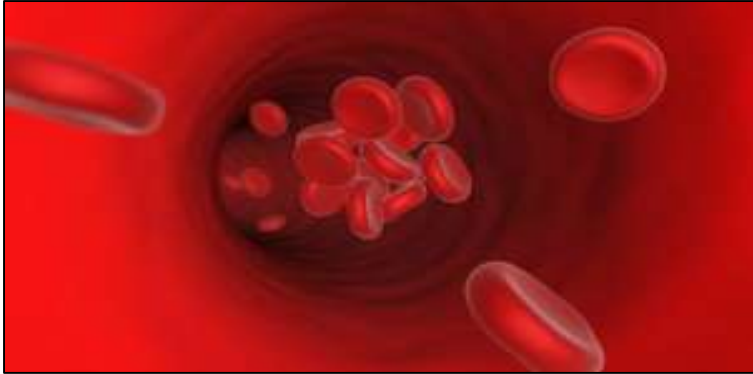
INTRODUCTION



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Hemostasis



Thrombosis



- ▶ Plasma
 - FFP
- ▶ Platelets
 - Platelets suspended in plasma



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PURPOSE OF STUDY



- Storage temperature
- Platelet-plasma interaction

Plasma phase

Platelets

- ▶ Possibility of utilizing clotting factors in plasma phase of SDP in massive transfusion scenario was proposed to be explored
- ▶ Very few international studies on the subject
- ▶ **To assess the effect of storage on the clotting factors and their natural inhibitors in stored Apheresis Platelet Concentrates (APC)**

MATERIALS AND METHODS



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MATERIAL & METHODS

- Ethical clearance obtained
- 45 APCs harvested on Fenwal Amicus, using the single needle plateletpheresis kit
- Anticoagulant:Blood ratio = 1:9
- QC of APC performed



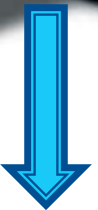
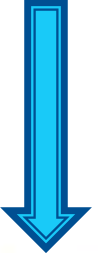
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DAY '0'



PPP Collected And Tested To Ensure Platelet Count < 10,000/ μ l

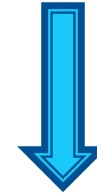


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**DAY '5' SAMPLES
COLLECTED**



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COAGULATION STUDIES

- ▶ PT, APTT
- ▶ vWF:Ag
- ▶ Fibrinogen, Factor II, Factor V
- ▶ Factor VII, Factor VIII, Factor IX
- ▶ Factor X, Factor XI, Factor XII
- ▶ Antithrombin, Protein C

- ▶ Free Protein S – ELISA

STA Compact,
STAGO



RESULTS



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VARIABLES SHOWING NORMAL DISTRIBUTION

VARIABLE	DAY '0'		DAY '5'		SIGNIFICANCE (PAIRED 'T')
	MEAN	SD	MEAN	SD	
PT ↑	13.78	0.76	15.92	0.44	< 0.001
APTT ↑	34.33	1.90	39.71	2.33	< 0.001
vWF : Ag ↑	100.96	24.23	118.89	27.70	< 0.001
FXII ↑	92.80	16.96	96.07	17.68	0.013



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VARIABLES SHOWING NORMAL DISTRIBUTION

VARIABLE	DAY '0'		DAY '5'		SIGNIFICANCE (PAIRED 'T')
	MEAN	SD	MEAN	SD	
PC ↓	118.36	16.03	113.00	13.97	0.004
FII ↓	90.49	12.76	85.16	13.70	< 0.001
FV ↓	83.89	2	62.91	3	< 0.001
FVII ↓	90.68	5	74.88	7	< 0.001
FVIII ↓	94.78	21.81	61.49	14.97	< 0.001
FX ↓	100.73	16.63	91.82	17.09	< 0.001



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VARIABLES NOT SHOWING NORMAL DISTRIBUTION

VARIABLE	DAY '0'		DAY '5'		SIGNIFICANCE (WSRT)
	MEDIAN	IQR	MEDIAN	IQR	
FBG ↑	235	8.5	242	9	0.591
AT ↓	96	2.5	94	2	0.002
PS ↓	84	2.07	81.20	1.87	< 0.001
FIX ↓	121	9.5	107	8	< 0.001
FXI ↓	113	6.5	110	5.5	0.793

DISCUSSION



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DISCUSSION

- ▶ Platelet transfusion has grown substantially over the last few decades
- ▶ Plasma forms an important constituent of the platelet concentrates
- ▶ Possibility of utilizing clotting factors in plasma phase of APCs as a supplement to the standard FFP transfusion for clotting factor replacement needs to be explored



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BASIC COAGULATION WORK UP

- ▶ PT and APTT of the APCs increased on day '5' as compared to day '0'
- ▶ Levels were still maintained within the normal range
- ▶ Vital clotting factors have maintained their activity adequately enough, to maintain these two parameters within their normal range



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FIBRINOGEN

- ▶ FBG levels in the APCs showed an increase on day '5' as compared to day '0'
- ▶ Increase in FBG could be attributed to the degranulation of α granules of the platelets
- ▶ Finding similar to studies by Weiss et al (2014) and Cookson et al (2015)



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NATURAL ANTICOAGULANTS

- ▶ Marginal fall in AT, PC and Free PS on day '5' as compared to day '0'
- ▶ PC – constituent of delta granules of platelets
- ▶ PS – activity is labile, over time
- ▶ All three findings corroborate with the two studies mentioned earlier



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FACTOR ASSAYS

- ▶ Statistically significant fall in FII, FX and FXI on day '5' as compared to day '0'
- ▶ Fall in FV – 25%, FVIII – 35% (Labile Factors)
- ▶ Fall in FVII – 17%
- ▶ In spite of fall in activity, all these factors were within normal range
- ▶ Findings corroborate with the two studies mentioned earlier



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FACTOR ASSAYS

- ▶ Increase in FXII activity and vWF:Ag levels
- ▶ Release from α -granules platelets
- ▶ Limitation – Multimer analysis of vWF not performed



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CONCLUSION



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CONCLUSION

- ▶ Reasonable hemostatic potential of the clotting factors is expected to be maintained in the APCs
- ▶ Plasma phase of the APCs can definitely supplement the activity of coagulation factors provided in the FFPs for MTP



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TAKE HOME MESSAGE

- ▶ An accurate clinical and laboratory assessment of the hemostatic potential of plasma phase of the APCs required



REFERENCES



- ▶ **Weiss D**, Franke D, Strasser E. von Willebrand factor, clotting factors and inhibitors in apheresis platelet concentrates. *Transfusion*. 2014;54:633–639
- ▶ **Cookson P**, Lawrie A, Green L. Thrombin generation and coagulation factor content of thawed plasma and platelet concentrates. *Vox Sanguinis*. 2015;108:160–168



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Thank you!



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