

Comparison of Spectra Optia and COBE Spectra apheresis systems' performances for Red Blood Cell Exchange procedures

Jaehyup Kim MD PhD
UT Southwestern Medical Center



COBE Spectra and Spectra Optia

- **COBE Spectra (Terumo BCT, Lakewood, Co) has been the mainstay cell separator for therapeutic apheresis**
- **Spectra Optia (Terumo BCT) is the next generation separator that will eventually replace COBE Spectra**
- **We have used Spectra Optia and COBE Spectra for therapeutic plasma exchange procedures since 2008**
- **In December 2013, FDA approved Spectra Optia for erythrocytapheresis**

RBC exchange using Spectra Optia

- Erythrocytapheresis procedures include:
 1. Standard RBC exchange (S-RBCx)
 2. RBC depletion
 3. Depletion/Exchange or Isovolemic Hemodilution - RBC exchange (IHD-RBCx) protocol, unavailable on COBE Spectra, is included in the Optia

Study Question

Our study aimed to compare the RBCx / IHD-RBCx performance characteristics of Spectra Optia to COBE Spectra



Study Design

- **Retrospective medical chart review**
- **Study duration from January 2013 to November 2014**
- **Patients selection criteria**
 - **Received same type of procedure using both Spectra and Optia**
 - **Cases with missing data points were excluded**
 - **Cases were matched based on pre-procedure hematocrits (Hct)**
- **Data was collected from procedure notes and flow sheets**

Parameters

Laboratory	Procedural
Pre-procedure Hct	Inlet volume
Mid-procedure Hct Target	Removed RBC volume
Mid-procedure Hct Actual	RBC replacement volume
Post-procedure Hct Target	NS replacement volume
Post-procedure Hct Actual	No. of RBC units used
Pre-procedure HbS	ACD-A volume
Post-procedure HbS	Rinseback volume
Pre-procedure Platelet	Total procedure run time
Post-procedure Platelet	FCR – calculated actual
Pre-procedure WBC	Hct - deviation from target
Post-procedure WBC	Platelet decrease (%)
	WBC decrease (%)
	Side effects

Results

- **392 RBCx procedures (45 patients) reviewed**
 - **COBE Spectra - between Jan 2013 and Sep 2014**
 - **Spectra Optia - between Feb 2014 and Nov 2014**
 - **86 procedures (21 patients) excluded due to incomplete data or insufficient number of procedures**
- **6 IHD-RBCx (3 Spectra and 3 Optia) in the same patient matched for pre-procedure Hct selected for paired analysis**
- **2 S-RBCx (1 Spectra and 1 Optia) in same patient selected for paired analysis**

Results

- **24 patients with a diagnosis of sickle cell disease (SCD) on chronic RBC exchange protocol met criteria**
 - **13 female (average age 28.0, 20-44)**
 - **11 Male (average age 25.4, 20-34)**
 - **5 patients received s-RBCx (10 procedures)**
 - **19 patients received IHD-RBCx (114 procedures)**

Statistical analysis

- **Holm-Bonferroni correction was performed to reduce family-wise error rate**
- **Significance level of 0.05 was used**

Performance comparison (1)

	S-RBCx		IHD-RBCx	
	Spectra (n=5)	Optia (n=5)	Spectra (n=57)	Optia (n=57)
Inlet Volume	3603.2± 677.8	3904.8± 147.8	4567.9± 734.9	4683.3± 809.8
RBC Removed	2591.4± 509.0	2679.0± 238.4	3252.0± 514.7	3315.9± 530.1
RBC replacement	2326.0± 462.8	2386.2± 244.7	2562.1± 375.3	2643.2± 418.4
RBC Units used	7.8± 1.5	7.4± 0.5	8.2± 1.4	8.4± 1.4
NS replacement	N/A	N/A	326.6± 105.2	296.1± 97.2
NS rinseback	345.0± 0	125.2± 5.0	337.1± 33.8	124.2± 8.9

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p=0.0295

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$p=1.2 \times 10^{-6}$

$p=2.8 \times 10^{-49}$

Performance comparison (2)

	S-RBCx		IHD-RBCx	
	Spectra (n=5)	Optia (n=5)	Spectra (n=57)	Optia (n=57)
Pre Hct	20.8± 2.7	20.6± 2.5	28.0± 3.3	28.2± 3.3
Mid Target Hct	N/A	N/A	22.2± 2.1	22.2± 2.2
Mid Actual Hct	N/A	N/A	21.2± 2.3	20.9± 2.4
Post Target Hct	31.4± 2.6	30.8± 2.2	33.0± 1.8	32.9± 1.9
Post Actual Hct	33.2± 4.5	31.3± 3.5	34.5± 2.7	34.3± 2.9
Post Hct deviation	2.4± 0.8	1.3± 0.5	1.8± 1.4	1.6± 1.3

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Performance comparison (3)

	S-RBCx		IHD-RBCx	
	Spectra (n=5)	Optia (n=5)	Spectra (n=57)	Optia (n=57)
Total AC	293.8± 57.6	310.4± 29.2	372.2± 53.8	392.4± 54.0
HbS Pre	38.4± 19.3	30.3± 4.4	39.2± 9.5	39.7± 8.0
HbS Post	8.0± 3.8	7.4± 1.7	10.9± 3.1	10.6± 2.6
Calculated FCR	22.2± 5.8	24.3± 2.5	28.0± 5.0	26.6± 3.9
Run Time	92.8± 18.1	104.4± 10.1	107.1± 15.9	123.8± 19.6

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$p=4.7 \times 10^{-5}$

Performance comparison (4)

	S-RBCx		IHD-RBCx	
	Spectra (n=5)	Optia (n=5)	Spectra (n=57)	Optia (n=57)
Platelet Pre	311.2± 119.7	351.8± 77.5	336.3± 80.2	356.0± 94.1
Platelet Post	155.6± 53.3	145.6± 28.5	139.2± 37.8	132.1± 29.6
Platelet decrease	47.7± 12.9	58.1± 5.9	57.9± 9.5	62.0± 5.7
WBC Pre	11.6± 4.1	13.9± 4.0	11.8± 3.9	11.5± 3.3
WBC Post	8.5± 1.5	10.8± 3.1	9.5± 3.0	9.3± 3.5
WBC decrease	16.5± 41.8	18.5± 25.0	15.1± 30.6	16.8± 31.3

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Performance comparison (4)

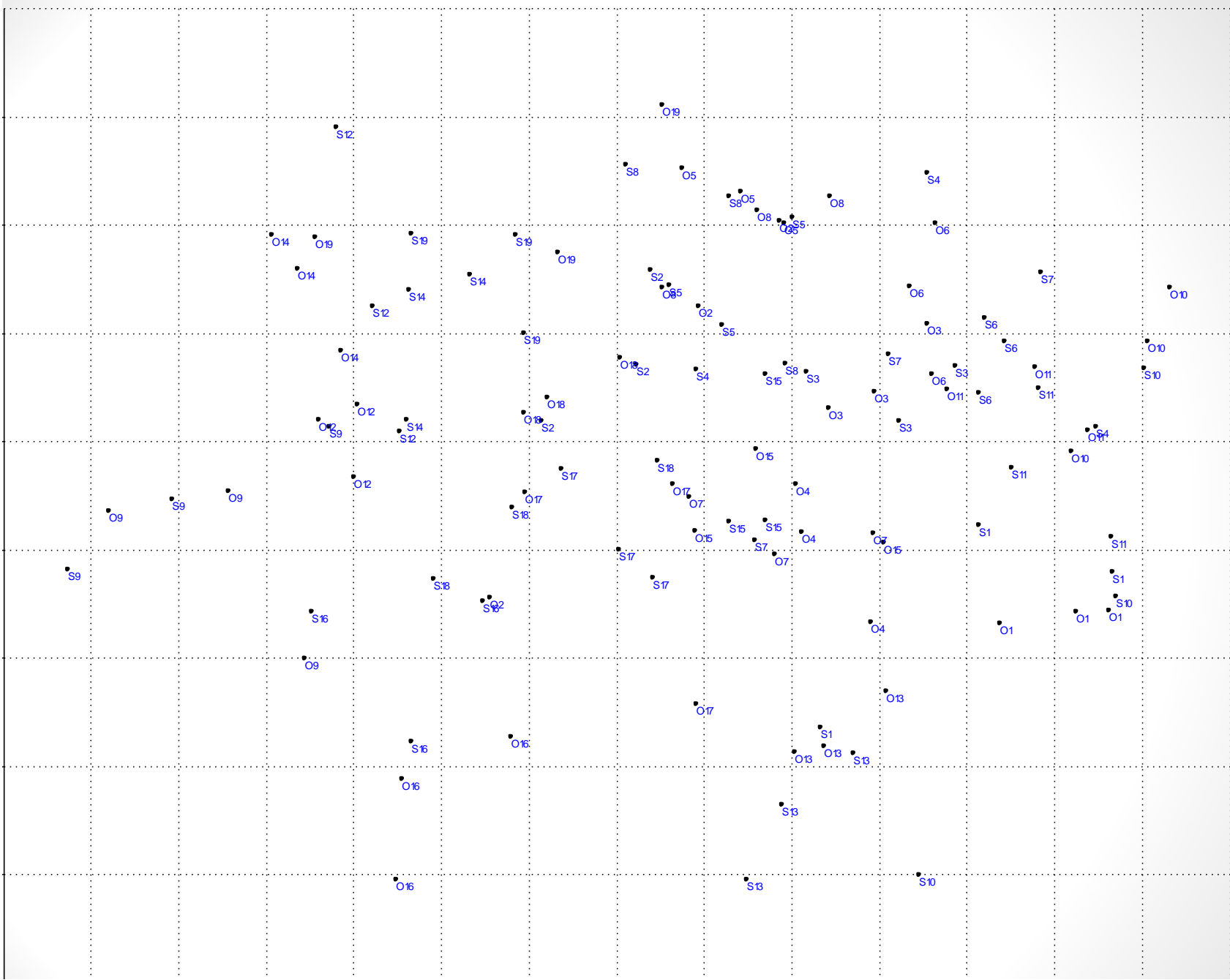
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Component 2 = 11.5% variance

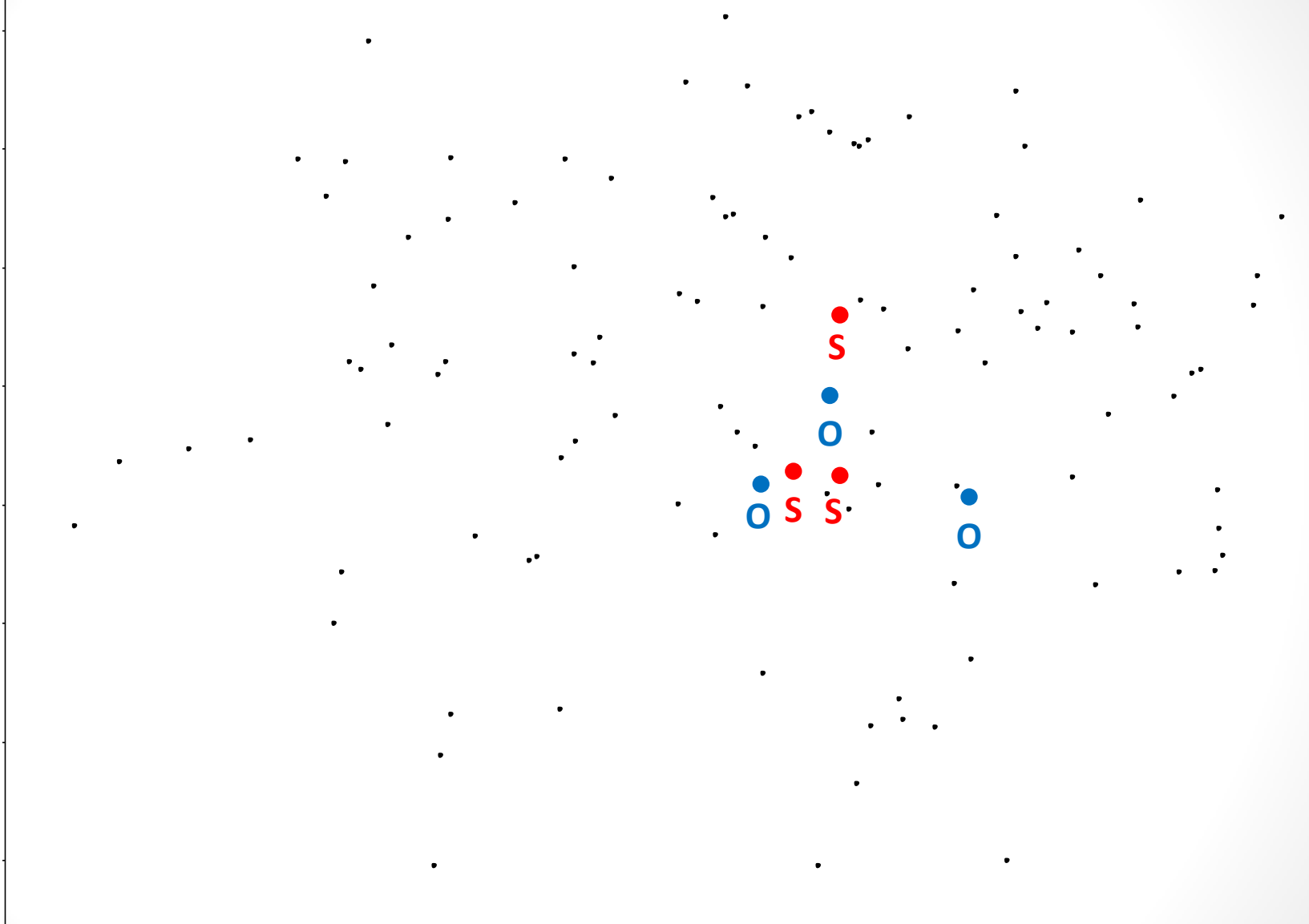
Component 1 = 38.9% variance



Patient 15

Component 2 = 11.5% variance

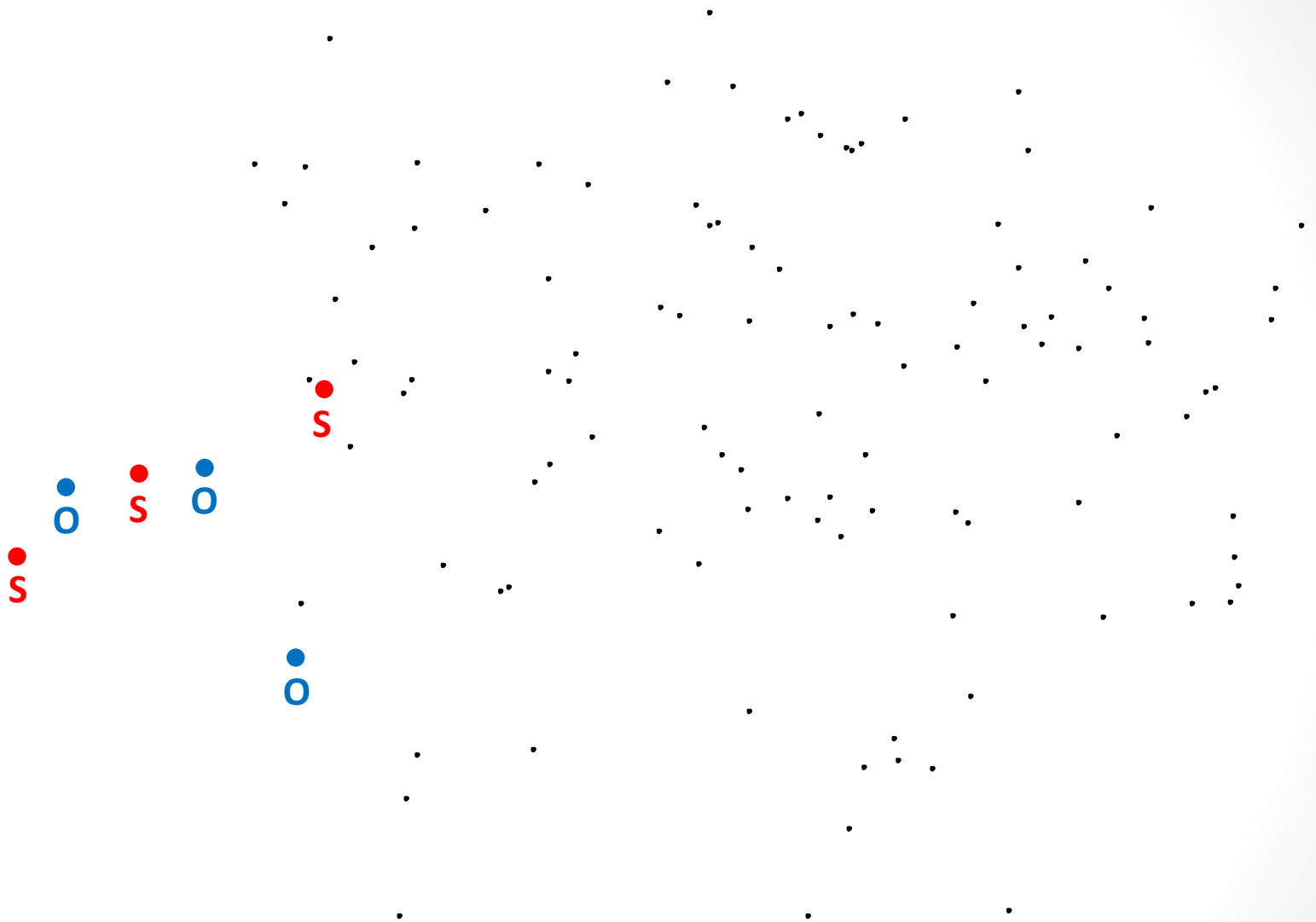
Component 1 = 38.9% variance



Patient 9

Component 2 = 11.5% variance

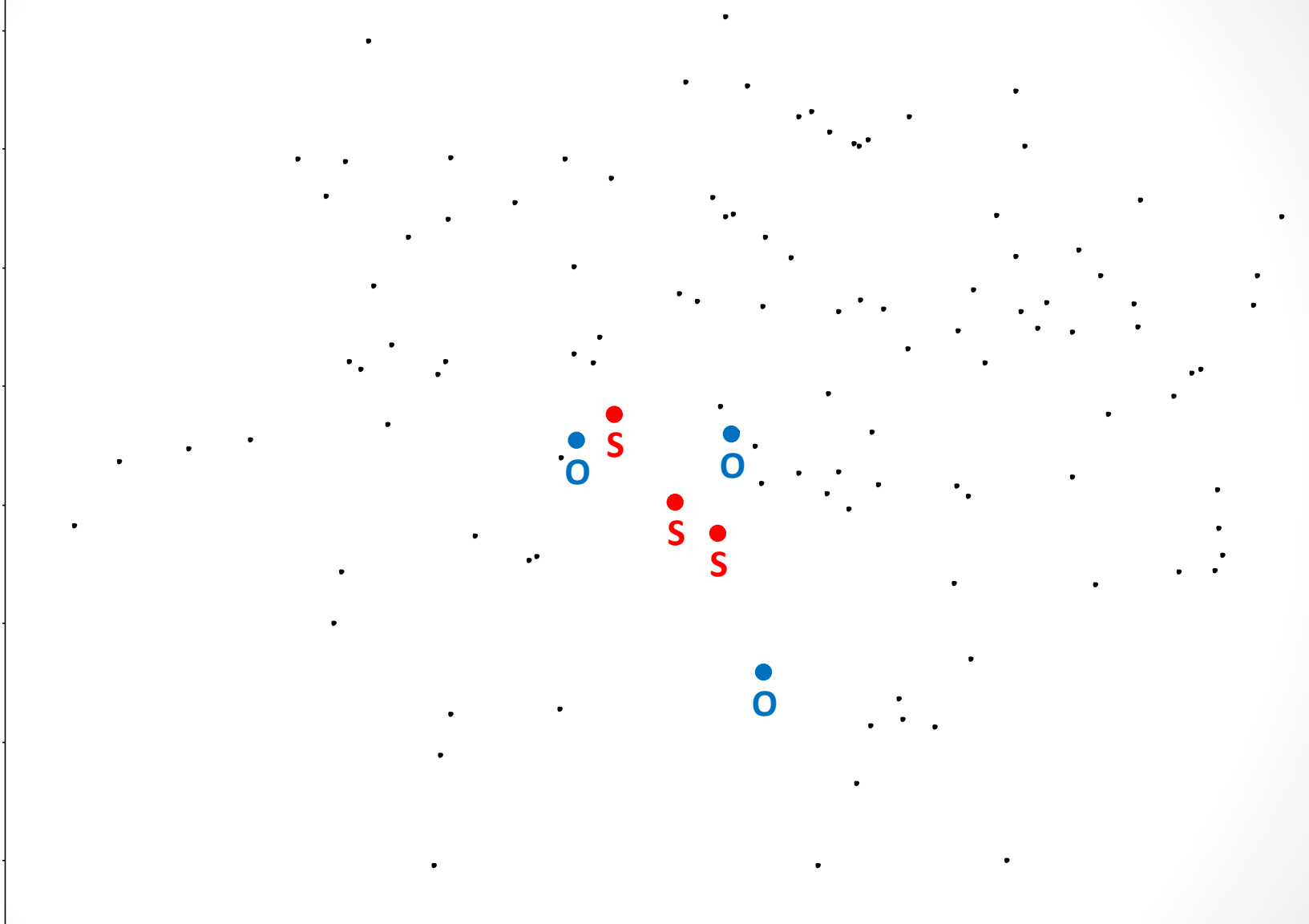
Component 1 = 38.9% variance



Patient 17

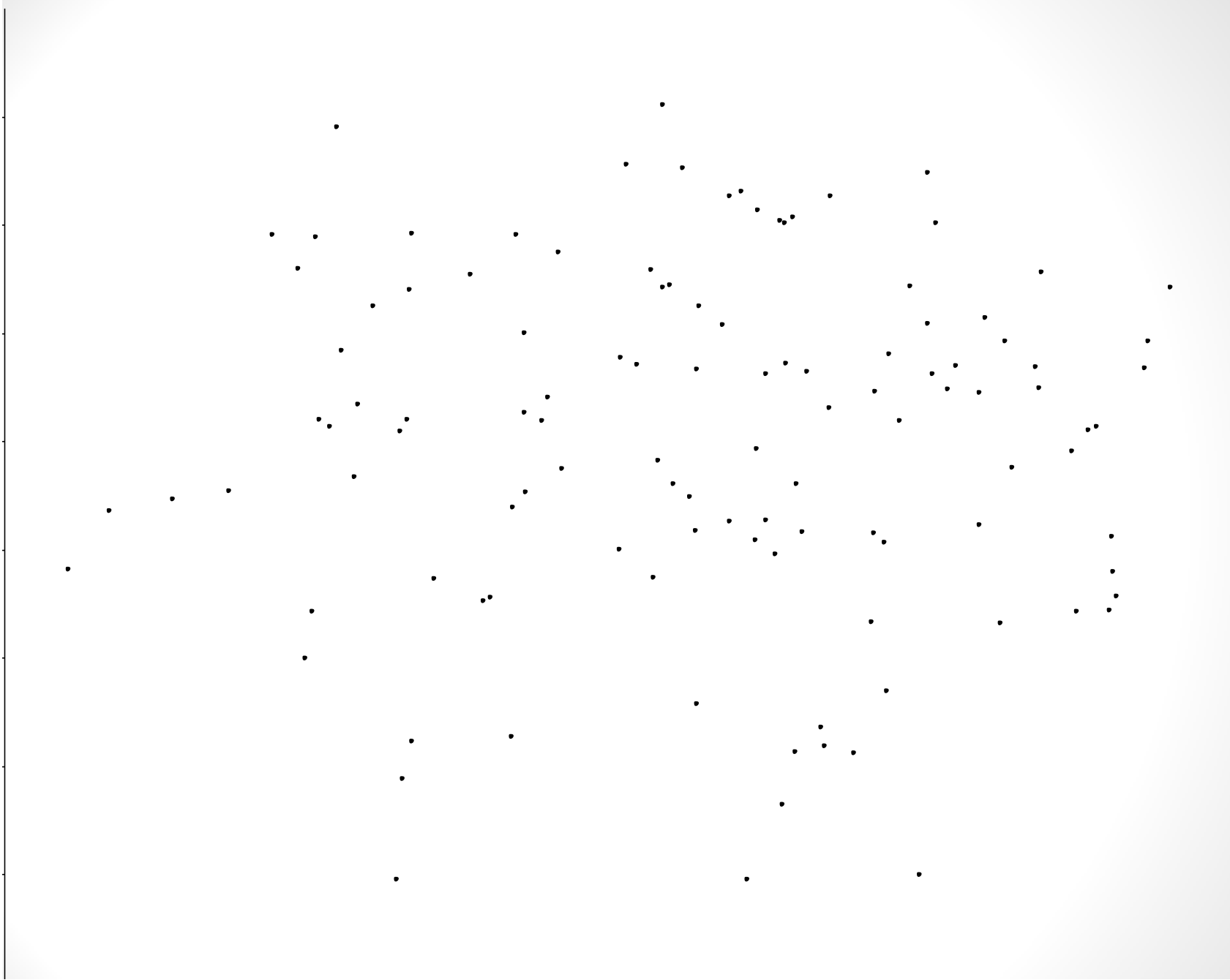
Component 2 = 11.5% variance

Component 1 = 38.9% variance



Component 2 = 11.5% variance

Component 1 = 38.9% variance



Side Effects

	Tingling	Itching	Hypotension
Spectra (n=62)	6.5% (n=4)	4.8% (n=3)	1.6% (n=1)
Optia (n=62)	4.8% (n=3)	1.6% (n=1)	6.5% (n=4)

Limitations of the study

- **Small number of standard RBC exchange procedures**
- **AC to patient information was incomplete**
 - **unable to compare the difference due to lack of data for Spectra**

Conclusions

- **COBE Spectra and Spectra Optia performed comparably in both s-RBCx and IHD/RBCx procedures**
- **Most procedure and laboratory parameters were comparable, except**
 - **Rinseback volume significantly lower in Optia**
 - **In IHD-RBCx procedures,**
 - **Lower NS replacement volume for Optia**
 - **Longer runtime for Optia**

Contributors

UTSW Apheresis team

Jeniffer Peterson, BSN RN

Martin Macias, BSN RN

Parkland Hospital Apheresis team

Mazen El Sharif, AS

Rebecca Jones, RN

Marisela Ulloa, RN

Jennifer Collazo

Ranjit Joseph, MD

Ravi Sarode, MD

Karen Matevosyan, MD

UT Southwestern
William P. Clements, Jr.
University Hospital

The John and Cindy Edlich Pavilion



