

Cukurova University Medical Faculty, Adana, Turkey,
Kent Hospital, İzmir, Turkey
Conflict of Interest

ichern has received consulting, travel and accommodation support from Terumo BCT

Co-authors have nothing to declare
Red blood cell exchange (RCE)

- a cytapheresis procedure
- removal and replacement of abnormal/diseased erythrocytes with allogeneic RBCs
- most commonly performed for patients with sickle cell disease (SCD)
Automated RCE in SCD

- Patient’s gender, height, weight, initial and final Hct, fluid balance as well as FCR (fraction of cells remaining) and the average Hct of replacement

- FCR; the percentage of the patient’s original RBC volume desired to remain in the circulation at the end of the RCE

- Around 65% of the original RBCs can be discarded (35% FCR) with an exchange of one patient’s RCV

- Aim is to reduce Hb S to 30% or less while maintaining Hct at desired level
Adana;

- in southern Turkey
- the biggest city of the Cukurova Region
- over two millions inhabitants
- the frequency of HbS trait is around 6.4%

Our Experience

562
(Nr of RBCX procedures carried out between 2005 and 2012)
Since 2008, **COBE** has successfully been used to perform RCE procedures in our center.

After implementation of **Optia** apheresis system in our Unit in July 2010, the majority of the procedures were carried out using this separator.
Background

- Limited data exist comparing the performances of COBE® Spectra and Spectra Optia® apheresis systems in RCE procedures for SCD patients.
Objective

Our aim was to evaluate the use of Optia in RCE procedures, and to compare it with that of COBE.
The study compares 159 RCE procedures performed on Optia with 188 procedures performed on COBE.

Sickle negative, leukoreduced and fresh (≤5-7 days) packed RBCs were used except urgent procedures.

All patients were monitored carefully throughout the procedures by an apheresis nurse.
Materials & Methods-II

- Vital signs were measured and recorded every 15-30 mins.
- Patients’ symptoms, vascular access-related complications and technical malfunctions were also recorded.
- Hemoglobin electrophoreses and CBCs were performed before and after each procedure.
Primary outcome measures

- the ability to reduce Hb S concentration in the blood ($\leq 30\%$)
- the success in achieving the target Hct levels
Secondary outcome measures

- total processing time,
- total blood volume processed,
- number of packed red blood cell units needed,
- platelet reduction rate (%), and
- severe adverse events (AEs) which resulted in discontinuation of procedure.
Statistical analysis was first performed using Microsoft Excel program.

All data reanalyzed using XLStat.

Categorical variables were compared using the chi-square test.

Normally distributed variables were analyzed using t tests, while variables that exhibited non-normal distribution were analyzed using nonparametric Mann–Whitney U tests.

The significance level for all tests was set at .05.
Two hundred and thirty-two (232) SCD patients received a total of 347 RCE treatments.

One hundred and fifty-nine sessions were performed on 105 patients using Optia, and 188 procedures were carried out for 127 patients via COBE.

The characteristics of the patients in both groups were comparable.
## Patient Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Spectra OPTIA (n=105)</th>
<th>COBE Spectra (n=127)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>24.1±12</td>
<td>21.5±11.2</td>
<td>p=0.04</td>
</tr>
<tr>
<td>Total blood volume (mL)</td>
<td>3736±1191</td>
<td>3474±1224</td>
<td>p=0.0548</td>
</tr>
<tr>
<td>Preprocedure Hct (%)</td>
<td>24.5±8.9</td>
<td>24.2±4.2</td>
<td>NS</td>
</tr>
<tr>
<td>Target Hct (%)</td>
<td>27.3±2.3</td>
<td>26.9±2.0</td>
<td>NS</td>
</tr>
<tr>
<td>Preprocedure HbS (%)</td>
<td>73.4±20.1</td>
<td>73.9±20.0</td>
<td>NS</td>
</tr>
</tbody>
</table>

Data are presented as mean±SD, NS: Not statistically significant.
The mean reduction rates for Hb S levels were similar for both devices.

In both groups, we were able to reach the target Hct levels in the majority of procedures, and the platelet reduction rates were similar.

The difference between processed blood volumes was statistically significant, and slightly higher in COBE \( p=0.04 \).

The frequency of severe AEs between two groups was similar.
# Procedure Data I

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spectra OPTIA (n=159)</th>
<th>COBE Spectra (n=188)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood volume processed/TBV</td>
<td>1.2±0.3</td>
<td>1.4±0.4</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>RBC volumes exchanged/RCV</td>
<td>1.3±0.4</td>
<td>1.5±0.4</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>

Data are presented as mean±SD.
### Procedure Data-II

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spectra OPTIA (n=159)</th>
<th>COBE Spectra (n=188)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packed red cells (unit)</td>
<td>6.7±2.3</td>
<td>6.7±2.6</td>
<td>NS</td>
</tr>
<tr>
<td>Replacement Hct (%)</td>
<td>56.9±2.6</td>
<td>55.5±2.8</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Fraction of cells remaining (FCR, %)</td>
<td>28.9±6.1</td>
<td>25.7±7.6</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Processing time (min)</td>
<td>99±26.3</td>
<td>114±31.5</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Nr of severe AEs</td>
<td>3/159</td>
<td>0/188</td>
<td>NS</td>
</tr>
</tbody>
</table>

Data are presented as mean±SD, NS: Not statistically significant.
### Lab Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spectra OPTIA (n=159)</th>
<th>COBE Spectra (n=188)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postprocedure Hct (%)</td>
<td>28.1±4.2</td>
<td>27.5±3.2</td>
<td>NS</td>
</tr>
<tr>
<td>Postprocedure Hb S (%)</td>
<td>23.6±14.1</td>
<td>22.4±13.5</td>
<td>NS</td>
</tr>
<tr>
<td>Reduction rate for Hb S (%)</td>
<td>68.7±17.2</td>
<td>73.9±22.4</td>
<td>NS</td>
</tr>
<tr>
<td>Reduction rate for PLT (%)</td>
<td>53.5±13.8</td>
<td>51.8±20.4</td>
<td>NS</td>
</tr>
</tbody>
</table>

Data are presented as mean±SD, NS: Not statistically significant, Significance: $p<0.05$. 
Limitations

- Retrospective study
- Statistical analysis
Should we measure Hct level of each packed RBCs to assure the final Hct of patients even in Optia procedures?

Can we expect to achieve better results with Optia when we gain more experience (depletion+exchange)?
Conclusions

The Spectra Optia® system seems to be as efficient and safe and faster as COBE® Spectra in RCE procedures for SCD patients.

We conclude that both systems are sufficiently capable to reduce Hb S concentration in the blood while reaching the final HCT.
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