Sorin 6F Dual Experience

Dr. Tony Shackelford DHA, MHA, CCP, CCT
Chief Perfusionist
Perfusion Services Department
Medical University of South Carolina
Taking Care of Business

– Disclosures –

- The presenter has received a speaker honorarium from Sorin Group.

- The results and observations presented are the product of the Medical University of South Carolina Perfusion Team. They do not represent Sorin Group.

- Off label application of the Sorin Inspire™ 6F Dual oxygenator will be discussed.
Objective/Purpose

- To describe our clinical experience with the Sorin Inspire 6F Dual for our patient population.

- To relate our experience to current conceptions and practices in oxygenator-patient matching for cardiopulmonary bypass.

- To discuss our use of the sequestering feature of the Dual reservoir.
OK – so where have we been?

- Pediatric Perfusion:
  - Different size tubing, filters, oxygenators, etc.
  - Selection based on oxygen consumption demands of the patient.

- Adult: One size fits all…
  - Choices – Narrow Buffet

- \( \text{O}_2 \) Transfer accomplished with large surface area oxygenators
  - High primes (2500ml – 1991)
    - Low Hcts and High flows needed for adequate \( \text{O}_2 \) delivery
We are making progress...

- Approach requires
  - 3 oxygenators
  - 3 tubing packs
Well, Well, Well…

I'm sorry, I can't be perfect.
One Oxygenator - the Inspire 6F covers broad range of patients

377 patients, 35kg - 181kg
Observations:
1. The larger the BSA the lower cardiac index
2. $S_vO_2$ maintained over all BSA's
Observations:
1. Greater BSA typically had higher Hct (*obviously)
2. Lower Cardiac Index seen at Higher BSA
3. Nemesis – big patient with low Hct (Unicorn)
Dr. Shacks…

WHAT KIND OF SORCERY IS THIS?

memegenerator.net
It’s all about that Fick… ‘bout that Fick…

\[ \dot{V}_{o_2,\text{exp}} = \frac{2000 \times \text{BSA}}{\sqrt{A} + 9} \frac{37^2}{T^2} \]

This has to be handled with care

\[ \text{CO} = \frac{V_{O_2}}{C_a-C_v} \]

Example:

\[
\begin{align*}
\text{CO} &= \frac{250 \text{ ml/min}}{20 \text{ vol } \% - 15 \text{ vol } \%} = \frac{250 \text{ ml/min}}{5 \text{ \%}} \\
&= \frac{250}{0.05} = 5000 \text{ ml/min} = 5 \text{ l/m} \\
\end{align*}
\]

Normal O₂ consumption range = 180-290 ml/min.
Normal Ca-VO₂ range = 3–5.5 vol % (> 5.5 = ↓ CO).

2. Riley J, Heinemann S, Cavanaugh D
Technique to Give Relevance to Calculated Oxygen Transfer During Cardiopulmonary Bypass
JECT 1983;15:35-40
Observations:
1. The larger the BSA the lower cardiac index
2. $S_{v}O_{2}$ maintained over all BSA’s
Not all patients are “LEAN”...Does that effect predicting VO2?

Difference in Predicted vs. Actual Oxygen Consumption by BMI (Male Open Heart Patients)

\[ \dot{V}_{O_2, exp} = \frac{2000 \times BSA}{\sqrt{A} + 9} \cdot \frac{37^2}{T^2} \]

N=100

2010 data - non published, N=100
% Difference of Estimated and Lean Estimated VO2 vs Actual Oxygen by BMI in Female Open Heart Patients

N=100

2010 data - non published, N=100
If the Oxygenator fits...
Start Hct 35%

<table>
<thead>
<tr>
<th>Kg Range</th>
<th>35-77</th>
<th>78-119</th>
<th>120-140</th>
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</thead>
<tbody>
<tr>
<td>Flow</td>
<td>3.5-4.5</td>
<td>4.5-5.5</td>
<td>5.5-6.0</td>
</tr>
<tr>
<td>hct1 X</td>
<td>23.4%</td>
<td>27.6%</td>
<td>30%</td>
</tr>
<tr>
<td>hct1 Insp</td>
<td>22.8%</td>
<td>28.2%</td>
<td>30%</td>
</tr>
<tr>
<td>hct2 X</td>
<td>28.6%</td>
<td>30.0%</td>
<td>30%</td>
</tr>
<tr>
<td>hct2 Insp</td>
<td>28.2%</td>
<td>30.0%</td>
<td>30%</td>
</tr>
</tbody>
</table>

Vs. 1300ml

**Figure 1.** Flowchart depicts the selection process for the right-sized oxygenator, reservoir, and tubing arterial-venous loop. FX25 W40, FX15 W40, and FX15 W30 are Terumo trademark names for oxygenators and reservoirs. The volumes are minimal crystalloid circuit prime volumes before autologous priming.
Inspire’s Hct Impact

- Looking back - If same group of pt.
  - 19% would not have received blood
  - 44% would receive 1 less unit of blood
  - Savings translates approx. $1,000,000
We’ve come a long way....
Using the “Dual” Reservoir for Sequestration
## Sequestration

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Case</th>
<th>Remedy</th>
<th>NSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kratz = 3 vent but later pump sucker</td>
<td>Valve</td>
<td>Open During Cross Clamp - Closed after Clamp off</td>
<td></td>
</tr>
<tr>
<td>All Surgeons</td>
<td>CABG</td>
<td>Always closed unless Emergency</td>
<td></td>
</tr>
<tr>
<td>Ikon Toole Castillo Sang</td>
<td>Arch</td>
<td>Open During Cross Clamp - Closed after Clamp off</td>
<td></td>
</tr>
<tr>
<td>** If #1 becomes sucker</td>
<td></td>
<td>May consider detaching it and moving to back for</td>
<td></td>
</tr>
<tr>
<td>VAD</td>
<td></td>
<td>Open - probably</td>
<td></td>
</tr>
</tbody>
</table>

*** anytime there is a LV vent it is open OR... we should take #3 off of back portion and move to front
Summary for MUSC

- Able to sequester is good to have and easily accomplished

- BSA is not a good predictor of oxygen consumption in larger patients
  - Hence oxygenator selection based upon BSA indexed calculations for these patients is likely falsely high.

- 98% of MUSC adult patients are >40-140<kgs
  - 6F’s prime & performance makes it practical from a clinical and cost savings standpoint.
An *Inspire*...ational Word on Change and Improvement

1. We should never believe that we can’t do better

2. One day we all will be on the receiving end of what *we choose today*. Let’s choose (change) wisely!