Timing Guidelines

“The Timing Three”

Inflation
Goal: To produce a rapid rise in aortic pressure (optimize PDP/DA), thereby increasing O2 supply to coronary circulation.
1. Inflate just prior to DN which should result in PDP/DA > PSP

Deflation
Goal: To reduce aortic end diastolic pressure (afterload), thereby decreasing MVO2 while improving the CO (cardiac output).
2. BAEDP < PAEDP
3. APSP < PSP

Abbreviation Definition
PAEDP Patient Aortic End Diastolic Pressure
PSP Peak Systolic Pressure
PDP/DA Peak Diastolic Pressure/Diastolic Augmentation
BAEDP Balloon Aortic End Diastolic Pressure
APSP Assisted Peak Systolic Pressure (Systole after IAB deflation)
DN Dicrotic Notch

Recommended IABP Triggers

<table>
<thead>
<tr>
<th>Rhythm</th>
<th>Pattern</th>
<th>Peak</th>
<th>AFIB</th>
<th>V-Pace</th>
<th>A-Pace</th>
<th>AP</th>
<th>INT</th>
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</thead>
<tbody>
<tr>
<td>NSR</td>
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<tr>
<td>Cautery Interference</td>
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<tr>
<td>NSR with Premature Beats</td>
<td>(atrial)</td>
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<tr>
<td>NSR with Pauses</td>
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<td>PAT/SVT</td>
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<td>if severe</td>
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<tr>
<td>Atrial Flutter</td>
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<td>if irregular</td>
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<tr>
<td>Atrial Fibrillation</td>
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</tbody>
</table>

Note: No capture beat needed for trigger. * May be preferred for HR > 140 bpm.

Recommended IABP Triggers

| Description | The Balloon Pressure Waveform (BPW) represents helium movement from the console to the IAB catheter. It is shown as a calibrated, continuous waveform which allows objective assessment of the safety and effectiveness of counterpulsation.

| BPW Height | Reflects the pressure in the aorta, therefore the plateau pressure on the BPW should be within ±20mmHg of the PDP.

| BPW Width | Is approximately the duration in which the balloon is inflated.

**Balloon Inflation and Deflation**

### Electrical and Mechanical Relationship

**Recommended IABP Triggers**

- **24-Hour Intra-Aortic Balloon Product hotline: 800-447-IABP**
  - Worldwide: 617-389-8628

#### Early Inflation
- IAB is inflated well before actual DN. (aortic valve closure) Violates Rule 1 for inflation.

#### Early Deflation
- APSP = PSP Violates Rule 3 for deflation. May see “U” shape at BAEDP.
  - Result: No afterload reduction.

#### Late Inflation
- DN is visible between points PSP and PDP/DA. Violates Rule 1 for inflation.
  - Result: PDP/DA less than optimum. Decreased perfusion pressure and volume to coronary arteries.

#### Late Deflation
- BAEDP > PAEDP Violates Rule 2 for deflation.
  - Result: Increased workload of left ventricle. Increased MVO2. Decreased CO.

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<table>
<thead>
<tr>
<th>Rhythm</th>
<th>Pattern</th>
<th>Peak R-Wave Criteria</th>
<th>AFIB</th>
<th>Automatic R-Wave</th>
<th>V-Pace (%)</th>
<th>A-Pace (%)</th>
<th>AP (%)</th>
<th>INT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrial Pacing</td>
<td>* demand</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Ventricular Pacing</td>
<td>* demand</td>
<td>*</td>
<td></td>
<td>100% paced</td>
<td>*</td>
<td>*</td>
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<td>*</td>
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<tr>
<td>A-V Pacing</td>
<td>* demand</td>
<td>*</td>
<td></td>
<td>100% paced</td>
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<tr>
<td>RBBB, LBBB</td>
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<tr>
<td>Ventricular Tachycardia</td>
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<td>CPR</td>
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</tbody>
</table>
| **Bypass-Pulsatile Flow** System Test
|                     |                          |                      |      |                  |            |            |        |         |

*Note: No capture beat needed for trigger.

**ECG Pattern**
- The computer analyzes the QRS complex in the same manner as in the peak mode. The balloon will automatically be deflated whenever an ECG is sensed. The trigger mode of choice for rhythms with varying R-R intervals.

**AFIB Peak**
- The computer analyzes the QRS complex in the same manner as in the peak mode. The balloon will automatically be deflated whenever an ECG is sensed. The trigger mode of choice for rhythms with varying R-R intervals.

**V-Pace**
- The computer uses the ventricular spike as the trigger signal. Used with ventricular or AV paced rhythms. It is ESSENTIAL that the patient’s rhythm is 100% paced.

**A-Pace**
- The computer uses the atrial pacing spike as the trigger signal. This mode can only be used with 100% atrial paced rhythms.

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**Reduced Augmentation**

- **Low Plateau Pressure**
  - Check for:
    - Volume setting too low
    - Balloon too small for patient
    - Balloon too low in aorta
    - Low systemic vascular resistance

- **Baseline Elevated**
  - Check for:
    - Kinked catheter
    - Partially wrapped balloon
    - IAB in sheath
    - IAB too low in aorta
    - IAB too large
    - Overfill

- **Baseline Below Zero**
  - Check for:
    - Blood in catheter tubing
    - Possible leak in connections or tubing
    - Kinked catheter
    - CCF (cardiac flutter) beats

- **Possible Helium Loss**
  - Check for:
    - Partially wrapped balloon
    - Kink in catheter or tubing
    - Balloon too large for aorta
    - Balloon position too high or too low
    - Balloon in sheath

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**Poor Augmentation**

- **Wide Inflation and/or Deflation Artifact**
  - Check for:
    - Partial obstruction
    - Partial leak
    - Slow catheter or H-shaft speed
    - Very tortuous vessels

- **Squared or Rounded Plateau Pressure**
  - Check for:
    - Partially wrapped balloon
    - Kink in catheter or tubing
    - Balloon too large for aorta
    - Balloon position too high or too low
    - Balloon in sheath

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**Incorrect Timing States**

- **Rule 1**
  - Purge Failure
  - Check for:
    - Loss of trigger

- **Rule 2**
  - No triggered balloon
  - Check for:
    - Loss of helium

- **Rule 3**
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