

Thoracoabdominal Aortic Aneurysm Repair:

Case Report of Hemodynamic Monitoring in Hemorrhagic Shock

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Learning Objectives

1. Brief review of challenges and possible complications of major open vascular surgery
2. Review of expected hemodynamic changes associated with hemorrhagic shock
3. Utilization of pulse contour analysis devices during shock states

Introduction

Open Thoracoabdominal aortic aneurysm repairs are challenging cases requiring thoughtful planning and close communication between the anesthesiologist and surgeon

- Invasive monitors, including arterial lines, central venous pressure, and often pulmonary artery catheter are utilized in major vascular surgery
- In recent years, Pulse Contour Waveform Analysis Devices (PCA AHMD) have been used in place of pulmonary arterial catheter based management
- We present a case in which pulse contour waveform analysis was used in lieu of a pulmonary arterial catheter

Case Description

66yom presented for repair of a saccular perivisceral thoracoabdominal aortic aneurysm.

- Planned aorto-right renal/left renal/superior mesenteric arteries and celiac axis bypass grafting (highest clamp supraceliac)
- Standard ASA monitors, spinal drain, arterial line, MAC line with CVP monitoring, and pulse contour waveform analysis (PCA-AHMD)(Retia Medical, Argos©, Valhalla, NY)
- Uneventful anesthesia induction, line placement, beginning of case
- During Creation of retropancreatic tunnel between the supraceliac aorta and infrarenal aorta, noted hemodynamic change (please see figure 1) ultimately resulting in v-fib arrest
- Clips fell off renal artery stumps resulting in hemorrhagic shock and ultimately arrest
- ACLS resulted in ROSC in approximately 2 minutes and our institutional MTP was initiated
- The patient was resuscitated using the Argos monitor as guidance and the surgery was ultimately completed successfully
- He was brought to the SICU intubated, extubated the next AM, and was discharged from the hospital on day 9

Argos Monitor, Retia Medical

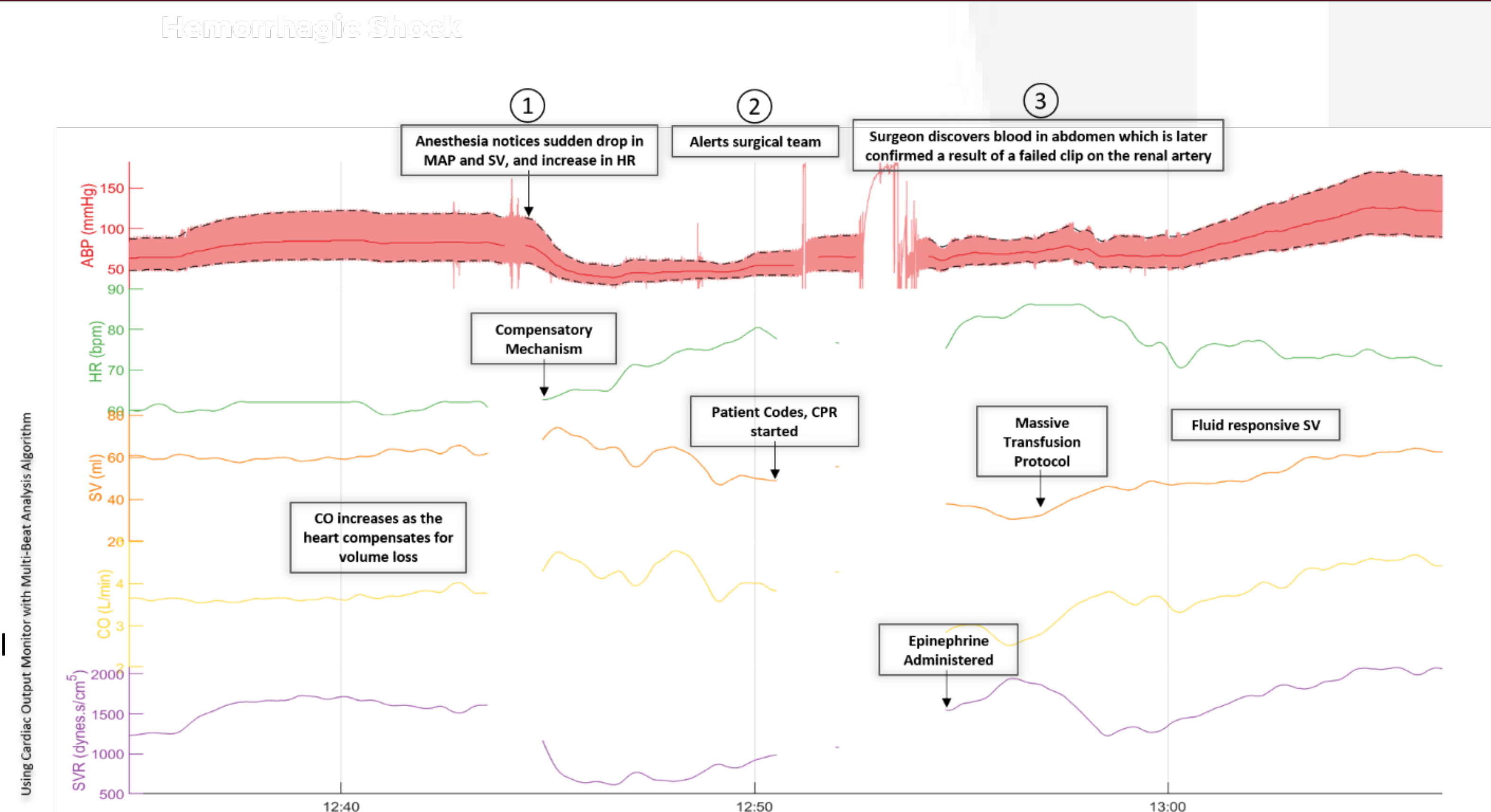


Figure 1:Select hemodynamic parameters generated with an arterial catheter and a pulse contour analysis based advanced hemodynamic parameter monitoring device in patient undergoing thoracoabdominal aortic aneurysm repair complicated by massive hemorrhage



Utilizes a Multi Beat Algorithm (MBA) which refreshes Clinical values every 20 seconds

CO, CI, SV, SVI, SVR, SVRI, PPV are all available to the Clinician as above

Discussion

Open Thoracoabdominal repair are challenging cases requiring close communication between surgeon and anesthesiologist

- Challenges include:

- Patient co-morbidities (severe vascular disease often overlaps with other major sources of morbidity, cardiac, neurologic)
- Sequential cross clamping of aorta
 - Increased cardiac work/strain
 - End Organ Damage (kidneys, liver, bowel, etc)
- Embolic disease
- Reperfusion
- Risk of major blood loss/hemorrhagic shock
- Aortic Rupture
- Spinal Cord Ischemia

- The MBA of the Argos Monitor effectively and in real time demonstrated expected hemodynamic changes associated with hemorrhagic shock
- This avoided placement of a pulmonary arterial catheter (arrythmias, risk of infection/endocarditis, pulmonary artery rupture among worst complications associated with PAC placement)

Operating room environment is ideal location for Pulse Contour waveform analysis devices (PCA AHMD)

- Work best when patient is supine, with minimal changes in breath-to-breath intrathoracic pressure
- Additionally, PCA AHMD will give inaccurate information and thus avoided in:
 - Severe pulse pressure hypertension
 - Severe Aortic Insufficiency
 - Non pulsatile blood flow (IABP, LVAD, ECMO, etc)
 - Dynamic Obstruction of LVOT (Systolic anterior motion of mitral valve)

Conclusions

- Major open vascular surgery has many potential complications requiring thoughtful pre-operative planning and Intraoperative management
- Utilizing advance monitoring techniques beyond standard ASA monitors is critical for these cases
- Pulse Contour Waveform analysis devices (PCA AHMD), such as the Argos Monitor by Retia Medical, can be used Effectively to diagnosed shock states and to guide resuscitation

References

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