Low Blood Pressure during laparoscopically-assisted myomectomy

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Healthy patient
laparoscopically-assisted myomectomy
IV induction, Intubation
Abdominal insufflation
Surgeons do their usual stuff
30 minutes OK
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30 minutes OK
Acute hypotension 60  HR 80  ETCO2 40
Sometimes no reading of NIBP
Healthy patient laparoscopically-assisted myomectomy IV induction, intubation Abdominal insufflation Surgeons do their usual stuff 30 minutes OK Acute hypotension 60 HR 80 ETCO2 40 Sometimes no reading of NIBP Phenylephrine boluses x 8, epi bolus, epi drip, call TL for help, Try to start A-Line
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Ask the surgeon if and when s/he gave vasopressin and request a clearer statement next time.
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Phenylephrine boluses x 8, epi bolus,
Epi drip, call TL for help, Try to start A-Line
Call for monitor that Surgeon says is better
GE Eagle monitor
But, it broke on way in to OR.
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Sometimes no reading of NIBP
Phenylephrine boluses x 8, epi bolus,
Epi drip, call TL for help, Try to start A-Line
Still low BP stable HR stable ET CO2 = 40
A-Line success, pressure reads 130/70
What’s going on?
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Still low BP stable HR stable ET CO2 = 40
A-Line success, pressure reads 130/70
What's going on?
No NIBP Measurement

1 Pressure too low to create pulsations
2 Arterial wall too stiff to allow volume changes

Probably # 2, and the Vasopressin did it

We have had 9 cases like this in the past 6 years
Arterial wall is too stiff to create arm volume pulses and NIBP cuff pressure pulses

Myomectomy injection of Arginine Vasopressin reduces pulse oximeter wave size measured on the ear (62%) but not on the finger.

Myomectomy injection of Arginine Vasopressin reduces pulse oximeter wave size measured on the ear and simultaneously reduces pulse wave amplitude measured in a NIBP Cuff on the arm dramatically.

Myomectomy injection of Arginine Vasopressin has led to Cardiac Arrest, possibly from aggressive treatment of artifactual hypotension.

At BWH myomectomy injection of Arginine Vasopressin preceded NIBP drop-out in 11 patients since 2009 including one patient March 2015.

2. Philip JH. Friedman B. Data collected at BWH; manuscript in preparation
Hypotension, factious or real

Life-threatening Hypotension after vasopressin injection

Pulmonary edema: a complication of local injection of vasopressin at laparoscopy,
Tulandi Fertility and Sterility, Vol 66, No 3, September 1996

Bradycardia and severe vasospasm caused by intramyometrial injection of
vasopressin during myomectomy
Butala, Saudi J Anesth. 2014 Jul-Sep; 8(3) 396

Severe Vasospasm mimics hypotension after high-dose intrauterine vasopressin

Bradycardia & arrest p intramyometrial vasopressin during laparoscopic myomectomy,
Hobo, Obstetrics and gynecology, vol 113, no 2, part 2, February 2009, page 484
Sphygmomanometer and Flow Detection to measure blood pressure

We apply an encircling BP Cuff, change and monitor its pressure, sense:
1. Cuff pulsations - oscillometer, oscillotonometer, used in monitors
2. Distal pulse – your finger, plethysmograph, pulse oximeter,
3. Auscultation – your ears - Korotkoff sounds
4. Doppler – ultrasound wall motion, possibly flow
Oscillometric NIBP used in monitors

Raw Cuff Pressure Signal

Pulse-Wave Oscillations in Cuff Pressure. Often measured via a second tube

Hose 1 inflates and deflates the cuff
Hose 2 senses tiny pulsations
Oscillometric NIBP used in monitors

Systole = first pulsation
Mean = maximum pulsation
Diastole = last pulsation

Raw Cuff Pressure Signal

Pulse-Wave Oscillations in Cuff Pressure

Hose 1 inflates and deflates the cuff
Hose 2 senses tiny pulsations
Oscillometric NIBP

Systole = 135
Mean = 100
Diastole = 83

Raw Cuff Pressure Signal

Pulse-Wave Oscillations in Cuff Pressure

What causes these pressure pulsations?
Volume change in the artery

What affects volume change in the artery?
Pulse Pressure
Stiffness of the artery

What affects stiffness of the artery?
Arteriosclerosis
Drugs that stiffen the arterial wall
Oscillometric NIBP

Systole = 135
Mean = 100
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Raw Cuff Pressure Signal

Pulse-Wave Oscillations in Cuff Pressure

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What effects stiffness of the artery?
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Drugs that stiffen the arterial wall

Vasopressin
How to monitor after vasopressin

Our usual Dinamap in our GE PDM (Patient Data Module) gives accurate readings but fails with a stiff artery. If the artery cannot expand, the BP cuff will not transmit pulsations.

15 year old GE Eagle monitors are very sensitive
So sensitive that they can gave readings when the cuff is under the pillow and off the arm.

GE revised NIBP algorithms to remove artifact readings
Monitor must be sure of a reading before reporting it
Now Dinamap is unable to measure NIBP after vasopressin injection

The newest GE software tries harder to measure BP but in this case, measured it inaccurately.
Standard GE PDM (Patient Data Module) on Solar 8000 or B850 monitor
Portable Eagle Monitor with sensitive NIBP measurement

We own two GE Eagle Portable Monitors. They have been discontinued by GE with RFID Tags. Stored in Zone F storage or OR 35. Find them using RFID Partners Applications: BWH Equipment Tracking. Tab - Find Favorite Equipment. Select Group - Anesthesia. Click on device - Eagle Monitor.
Connectors and cuffs are interchangeable for all monitors. Leave the connector accessible under the robot drape in case you need to change monitors.

Maybe put a pulse oximeter probe on a finger that is below the cuff, in case you need to see return of a pulse as the cuff pressure falls.
Myomectomy injection of Vasopressin Makes Blood Pressure Monitoring Difficult

We are working with our colleagues here and with our industry colleagues at GE to make noninvasive measurement better