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Cardiovascular: Blood Pressure Regulation

Printable Flashcards — Pre-Med Biology

BP equations, baroreceptor reflex, RAAS system, autonomic control, and vessel physiology.

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146 cards — Printable Flashcards

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1

Blood pressure (BP) is basically...

2

Units for blood pressure?

3

Systolic pressure is...

4

Diastolic pressure is...

5

Pulse pressure is...

6

Mean arterial pressure (MAP) is closest to... systolic or diastolic?

7

Quick MAP approximation formula (pre-med level):

8

If heart rate increases a lot, does diastole get shorter or longer?



2

mmHg.

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1

The pressure of blood pushing on artery walls.

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4

The lowest arterial pressure during ventricular relaxation.

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3

The peak arterial pressure during ventricular contraction.

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6

Diastolic (because diastole lasts longer).

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5

Systolic - diastolic.

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8

Shorter.

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7

MAP ~ diastolic + 1/3(pulse pressure).

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9

Blood flow is the same thing as blood pressure. True or false?

10

Most important BP relationship to memorize:

11

Cardiac output (CO) equals...

12

If CO goes up and TPR stays the same, BP goes...

13

If TPR goes up and CO stays the same, BP goes...

14

If TPR goes down (vasodilation) and CO stays the same, BP goes...

15

One-line summary: BP can be raised by increasing...

16

What vessel type mostly controls TPR?



10

BP (MAP) ~ Cardiac output (CO)
x Total peripheral resistance (TPR).

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9

False.

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12

Up.

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11

Heart rate (HR) x Stroke volume (SV).

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14

Down.

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13

Up.

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16

Arterioles.

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15

CO and/or TPR.

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17

Veins are mostly 'resistance vessels'. True or false?

18

Arteries are mainly for...

19

Stroke volume (SV) depends on 3 things:

20

Preload (simple):

21

Frank-Starling law (in plain words):

22

Afterload (simple):

23

Contractility means...

24

If venous return increases, preload goes...



18

Carrying blood away under high pressure.

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17

False. Veins are capacitance (volume) vessels.

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20

How much the ventricle is filled before it contracts (stretch).

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19

Preload, contractility, afterload.

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22

The pressure the ventricle must push against to eject blood.

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21

More filling -> stronger contraction -> bigger stroke volume (up to a point).

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24

Up.

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23

How strongly the heart contracts at a given preload.

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25

If afterload increases a lot, stroke volume tends to go...

26

Sympathetic stimulation does what to contractility?

27

Parasympathetic stimulation mainly affects... HR or contractility?

28

TPR mainly depends on... (the one factor that dominates)

29

Vasoconstriction does what to resistance?

30

Vasodilation does what to resistance?

31

Higher blood viscosity (thicker blood) tends to...

32

Longer vessel length (more total distance) tends to...



26

Increases it.

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25

Down.

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28

Vessel radius.

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27

HR (it slows the heart).

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30

Decreases resistance.

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29

Increases resistance.

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32

Increase resistance.

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31

Increase resistance.

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33

Fast BP control (seconds):
what reflex is the main one?

34

Where are the main baroreceptors?

35

Baroreceptors respond to... pressure or oxygen?

36

BP goes up. Baroreceptor firing rate goes...

37

BP goes down. Baroreceptor firing goes...

38

High BP -> baroreceptors fire
more -> sympathetic output goes...

39

Low BP -> baroreceptors fire less
-> sympathetic output goes...

40

Baroreceptor reflex raises BP
mainly by doing what 2 big things?



34

Carotid sinus and aortic arch.

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33

Baroreceptor reflex.

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36

Up.

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35

Pressure (stretch).

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38

Down.

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37

Down.

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40

Increase CO (HR/contractility) and
increase TPR (vasoconstriction).

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39

Up.

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41

Baroreceptor reflex lowers BP by...

42

Standing up quickly: what happens to BP in your brain for a moment?

43

If the baroreflex is slow or weak, standing up can cause...

44

Orthostatic hypotension is mainly a failure of...

45

Common trap: baroreceptors respond to blood volume directly. True or false?

46

Baroreceptor reflex is best for short-term or long-term BP control?

47

Chronic high BP: baroreceptors keep firing high forever and fix it. True or false?

48

Sympathetic stimulation does what to heart rate?



42

It drops (gravity pulls blood to legs).

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41

Lowering HR/contractility and dilating vessels (lowering TPR).

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44

Fast autonomic compensation (baroreflex).

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43

Dizziness/fainting (orthostatic hypotension).

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46

Short-term.

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45

False (they respond to arterial stretch/pressure).

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48

Increases it.

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47

False (they reset/adapt).

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49

Sympathetic stimulation does what to arterioles?

50

Parasympathetic stimulation does what to heart rate?

51

Parasympathetic has a strong effect on arterioles in most of the body. True or false?

52

What does 'sympathetic tone' mean?

53

Chemoreceptors mainly respond to changes in...

54

If CO₂ is high and pH is low, what happens to breathing?

55

Long-term BP control depends mostly on...

56

If blood volume increases, venous return tends to...



50

Decreases it.

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49

Constricts them (in many regions).

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52

A constant baseline sympathetic activity that keeps vessels partly constricted.

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51

False (sympathetic is the main vessel tone controller).

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54

Breathing increases to blow off CO₂.

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53

O₂, CO₂, and pH.

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56

Increase.

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55

Blood volume (controlled by kidneys).

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57

If blood volume decreases
(dehydration/bleeding), BP tends to...

58

Kidneys raise BP mainly by...

59

Kidneys lower BP mainly by...

60

RAAS is turned on when BP/volume is...

61

Renin is released by the
kidney when... (basic triggers)

62

RAAS pathway in order (high level):

63

Angiotensin II does what to blood vessels?

64

Angiotensin II also increases BP by...



58

Retaining Na^+ and water
(increasing blood volume).

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57

Drop.

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60

Low.

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59

Excreting more Na^+ and water
(decreasing blood volume).

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62

Renin \rightarrow angiotensin I \rightarrow
angiotensin II \rightarrow aldosterone effects.

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61

Low kidney perfusion/low BP
(and sympathetic stimulation).

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64

Stimulating aldosterone (Na^+ retention)
and thirst/ADH (water retention).

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63

Vasoconstricts (raises TPR).

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65

Aldosterone does what (simple)?

66

ADH (vasopressin) does what (simple)?

67

RAAS overall effect on BP:

68

Common trap: aldosterone directly constricts arteries. True or false?

69

Common trap: RAAS is the main fast second-to-second BP reflex. True or false?

70

ANP is released when blood volume is...

71

ANP overall effect on BP:

72

ANP vs aldosterone: which one makes you lose Na^+ ?



66

Makes kidneys retain water
(and can constrict vessels).

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65

Makes kidneys retain Na^+ (so water follows) -> increases blood volume.

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68

False.

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67

Increases BP.

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70

High (atrial stretch).

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69

False.

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72

ANP.

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71

Decreases BP.

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73

Autoregulation means...

74

Active muscle makes CO₂, H⁺,
heat. Local vessels usually...

75

Nitric oxide (NO) generally causes...

76

Endothelin generally causes...

77

Scenario: hemorrhage (blood
loss). What happens first to BP?

78

Hemorrhage: immediate
compensation (fast) is mainly...

79

Hemorrhage: longer-term
compensation (hours-days) is mainly...

80

Scenario: dehydration. What happens to RAAS?



74

Dilate to increase blood flow.

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73

Tissues locally adjust vessel diameter to keep blood flow appropriate.

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76

Vasoconstriction.

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75

Vasodilation.

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78

Baroreflex -> sympathetic activation.

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77

It drops.

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80

It increases (activates).

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79

RAAS + ADH + thirst (volume replacement).

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81

Scenario: you sprint. What happens to CO?

82

Exercise: if arterioles in muscle dilate, does TPR drop or rise?

83

Exercise: how can BP still rise even if TPR drops?

84

Scenario: fear/stress (sympathetic surge). What happens to BP?

85

Scenario: hot day, skin vessels dilate. What happens to BP if you don't compensate?

86

Trap: 'Vasoconstriction always decreases blood pressure.' True or false?

87

Trap: 'If resistance increases, flow always increases.' True or false?

88

Trap: 'High BP means high blood flow everywhere.' True or false?



82

Drop (overall).

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81

It increases a lot.

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84

Usually rises.

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83

Because CO increases a lot.

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86

False.

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85

It tends to drop.

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88

False.

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87

False.

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89

Trap: veins don't matter for BP. True or false?

90

Pulse pressure gets bigger with stiff arteries. Why?

91

Pulse pressure tends to increase with age because...

92

Baroreceptors respond most to...
absolute BP or rapid change?

93

BP (MAP) ~ _____ x _____

94

CO = _____ x _____

95

Main resistance vessels are:

96

Fastest BP regulation reflex is:



90

Less compliance -> systolic rises more for a given SV.

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89

False.

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92

Rapid change.

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91

Arteries get stiffer (less elastic).

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94

$HR \times SV$

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93

$CO \times TPR$

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96

Baroreceptor reflex

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95

Arterioles

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97

Long-term BP regulation depends mostly on:

98

BP rises if $\{\{c1::\text{cardiac output}\}\}$ increases or $\{\{c2::\text{TPR}\}\}$ increases.

99

$$\text{CO} = \{\{c1::\text{HR}\}\} \times \{\{c2::\text{SV}\}\}.$$

100

Baroreceptors: BP up \rightarrow firing $\{\{c1::\text{up}\}\}$ \rightarrow sympathetic $\{\{c2::\text{down}\}\}$.

101

Baroreceptors: BP down \rightarrow firing $\{\{c1::\text{down}\}\}$ \rightarrow sympathetic $\{\{c2::\text{up}\}\}$.

102

RAAS: low BP/volume \rightarrow renin \rightarrow angiotensin II \rightarrow $\{\{c1::\text{vasoconstriction}\}\}$ + $\{\{c2::\text{aldosterone}\}\}$.

103

BP number (like 120/80) is measured in... arteries or veins?

104

Why is arterial pressure pulsatile but capillary pressure smoother?



98

BP rises if cardiac output increases or TPR increases.

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97

Kidneys (blood volume)

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100

Baroreceptors: BP up -> firing up -> sympathetic down.

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99

$CO = HR \times SV.$

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102

RAAS: low BP/volume -> renin -> angiotensin II -> vasoconstriction + aldosterone.

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101

Baroreceptors: BP down -> firing down -> sympathetic up.

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104

Arteries are elastic and arterioles dampen the pulse.

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103

Arteries (typically brachial artery).

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105

If arterioles constrict, what happens to capillary hydrostatic pressure downstream (general)?

106

If venous return drops, what happens to preload and SV?

107

What helps venous return when you're moving?

108

Why do you faint sometimes from standing still too long? (basic)

109

Thirst helps BP regulation because it...

110

ADH is often released when...

111

Why do we care about MAP more than systolic alone?

112

Flow to an organ depends on... (super basic)



106

Preload drops -> SV drops.

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105

It tends to decrease (less pressure reaches capillaries).

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108

Blood pools in legs -> venous return drops
-> CO/BP drop -> brain perfusion drops.

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107

Muscle pump + one-way valves.

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110

Osmolarity is high and/or volume is low.

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109

Increases water intake -> increases blood volume.

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112

Pressure difference / resistance (Flow = $\Delta P / R$).

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111

MAP is the driving pressure for organ perfusion (blood flow to tissues).

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113

If MAP falls a lot, what happens to brain perfusion?

114

Systolic pressure is most influenced by... (big picture)

115

Diastolic pressure is most influenced by...

116

Pulse pressure gets larger when... (two classic reasons)

117

If TPR increases a lot, which pressure tends to rise more: systolic or diastolic?

118

If stroke volume increases a lot, which pressure tends to rise more?

119

Exercise: systolic BP usually goes...

120

Exercise: diastolic BP usually stays about the same or goes...



114

Stroke volume and arterial compliance.

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113

It drops (and you can faint).

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116

Stroke volume increases or arteries get stiffer.

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115

TPR (arteriole resistance) and heart rate.

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118

Systolic.

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117

Diastolic (often).

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120

Down slightly.

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119

Up.

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121

Venoconstriction does what to venous return?

122

Sympathetic activation increases BP using heart + arterioles + also...

123

Why do veins have valves?

124

Carotid sinus baroreceptors are in the...

125

Carotid body is mainly a...

126

Carotid sinus massage increases baroreceptor firing. BP/HR tend to...

127

Seconds-to-minutes BP control is mostly...

128

Hours-to-days BP control is mostly...



122

Veins (venoconstriction).

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121

Increases it.

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124

Carotid artery (near where it splits).

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123

To prevent backflow and help return blood to the heart against gravity.

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126

Drop.

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125

Chemoreceptor (O₂/CO₂/pH).

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128

Kidneys + hormones (RAAS, ADH, ANP).

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127

Autonomic nervous system reflexes (baroreflex).

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129

Angiotensin II raises BP fast-ish by...

130

Aldosterone raises BP slower by...

131

ADH is a quick water-saving response. Triggered especially by...

132

ANP is basically the opposite direction of RAAS. True or false?

133

Sympathetic effects on the heart are mainly through... (pre-med level)

134

Sympathetic vasoconstriction of arterioles is mainly through...

135

Trap: sympathetic ALWAYS causes vasoconstriction in every tissue. True or false?

136

Scenario: severe bleeding. Why might BP stay low even with max sympathetic drive?



130

Increasing Na^+ retention \rightarrow water retention \rightarrow volume up.

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129

Vasoconstriction (TPR up).

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132

True.

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131

High osmolarity or low volume/pressure.

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134

Alpha-1 receptors.

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133

Beta-1 receptors (HR and contractility up).

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136

Because there's not enough volume to pump (CO can't recover).

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135

False.

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137

Scenario: someone takes a strong vasodilator drug. What happens immediately to TPR and BP?

138

Vasodilator -> BP drops -> baroreflex does what to HR?

139

Scenario: athlete with strong parasympathetic tone at rest. HR is low. Is BP automatically low?

140

If you picked 'baroreceptors detect oxygen levels', what did you mix up?

141

If you picked 'vasodilation raises BP', what's the fix?

142

If you picked 'RAAS is immediate like a reflex', what's the fix?

143

Pulse pressure = $\{\{c1::systolic\}\} - \{\{c2::diastolic\}\}$.

144

Arterioles are the main $\{\{c1::resistance\}\}$ vessels controlling $\{\{c2::TPR\}\}$.



138

Increases HR (reflex tachycardia).

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137

TPR drops and BP drops (unless CO compensates).

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140

Baroreceptors (pressure) vs chemoreceptors (O₂/CO₂/pH).

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139

Not necessarily.

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142

Baroreflex is immediate. RAAS is slower (especially the volume part).

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141

Vasodilation lowers resistance, so BP tends to fall (unless CO rises).

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144

Arterioles are the main resistance vessels controlling TPR.

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143

Pulse pressure = systolic - diastolic.

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145

Vasoconstriction -> resistance \uparrow ;
vasodilation -> resistance \downarrow .

146

Hormone released when atria
are stretched (high volume):



146

ANP

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145

Vasoconstriction -> resistance up;
vasodilation -> resistance down.

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