Q2 Outline the various cardiac reflexes and the mechanisms by which they maintain physiological homeostasis (Sept 2013, Q17 Sept 2010)

The cardiac reflexes are a series of reflex pathways which exist between the cardiovascular and central nervous systems and contribute to the maintenance of homeostasis. Receptors are located in the atria, ventricles, pericardium, cardiac and great vessels. Afferent signals travel mainly via the vagus nerve (other cranial nerves are involved depending on which reflex) to the nucleus of the solitary tract in the cardiovascular centre of the medulla. Efferent signals travel mainly via the vagus.

Important cardiac reflexes include:

1. BARORECEPTOR REFLEX – most important, provides second to second control of blood pressure via circumferential and longitudinal stretch receptors located in the carotid sinus and aortic arch, with afferent signals travelling via C fibres in the glossopharyngeal and vagus nerves respectively. These receptors respond to changes in MAP in the range of 50-200mmHg, with a set point of MAP 100mmHg (this can be changed in chronic conditions such as longstanding hypertension). The response is an alteration of autonomic activity (low BP inhibits parasympathetic and increases tonic sympathetic activity, vice versa for hypertension)

2. BAINBRIDGE REFLEX – aka atrial stretch reflex. Stretch receptors located in the wall of the right atrium and cavoatrial junction fire in response to increased distending pressures, travel via the vagus and result in increased SNS activity to SA node, and consequent tachycardia (also get an increase in renal urinary output, due to release of atrial natriuretic peptide and inhibition of ADH secretion) → the aim being to reduce blood volume back to normal

3. BEZOLD-JARISCH REFLEX – chemo and mechanoreceptors in left ventricle wall sense noxious stimuli, transmit via the vagus and response with the triad of hypotension, bradycardia and coronary artery vasodilatation

4. CHEMORECEPTOR REFLEX – receptors in carotid and aortic bodies sense changes in PaO_2 (<50mmHg) and pH, travel via the glossopharyngeal and vagus nerves respectively, and respond with tachycardia/HTN

5. CUSHING REFLEX – increased ICP leads to ischaemia of vasomotor centre causing sympathetic rise in HR, contractility, and BP. Baroreceptors sense the increase in arterial tension and cause a reflex bradycardia

6. OCULO-CARDIAC REFLEX – pressure applied to the globe or traction on surrounding structures transmits stimuli via CNV and the Gasserian ganglion to the vasomotor centre, stimulating a parasympathetic response (bradycardia and hypotension)