Using sympathomimetic drugs to manage hypotension 2: use in clinical practice

An outline of sympathomimetic drugs, the different types and how they are used in certain groups of patients in clinical practice

INTRODUCTION
When caring for certain groups of critically ill patients, it is sometimes necessary to pharmacologically increase and maintain blood pressure. Such patients might include those suffering from shock and hypotension following surgery or those in cardiac failure.

Prolonged cardiac failure-induced hypotension can result in hypoperfusion, cellular and tissue damage, global acidosis and, potentially, multiple organ failure. These harmful effects can increase both morbidity and mortality (Herndon and Wernerman, 2007; Singer, 2007; Singer and Grant, 1999).

In the absence of disease, the parasympathetic and sympathetic divisions of the autonomic nervous system maintain BP and sustain homeostasis. However, in certain disease states, the sympathetic nervous system is unable to sustain normal BP and it becomes necessary to artificially mimic its effects. Drugs used clinically that mimic the effects of the sympathetic nervous system are known as sympathomimetics.

SYMPATHETIC NERVOUS SYSTEM
To understand how sympathomimetic drugs work, it is necessary to discuss the sympathetic nervous system and its role in maintaining homeostasis and responses to physiological changes.

The sympathetic (and the parasympathetic) nervous system are parts of the autonomic nervous system (ANS). The word ‘autonomic’ denotes that this part of the nervous system cannot be controlled consciously. Together, the sympathetic and parasympathetic nervous systems regulate individual organ function and maintain homeostasis.

Both the sympathetic and parasympathetic systems consist of myelinated preganglionic fibres, which make synaptic connections with unmyelinated postganglionic fibres. These latter fibres innervate target organs. However, the two systems have anatomical and functional differences. The sympathetic nervous system is involved in regulating physiological processes such as heart rate, BP, constriction and dilatation of blood vessels and the ‘fight or flight’ response (Neal, 2005). The fight/flight response is also referred to as the sympathico-adrenal response and causes the secretion of adrenaline and, to a lesser extent, noradrenaline. These hormones increase BP, which is needed in certain situations. The parasympathetic nervous system also regulates physiological processes. However, its actions work to decrease heart rate and BP.

Therefore, drugs used to increase BP mimic the sympathetic division of the nervous system, which originates in the spinal cord.