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Editorial

Syncope and salt

Syncope is an important cause of morbidity, particularly in old people. The common faint contributes significantly to casualty attendance and hospital admission, and therefore to costs.[1] So-called neurogenic or vasovagal syncope comprises vasodepression (causing hypotension) and cardioinhibition (causing bradycardia) in varying combinations.[2] Prevention of syncope has proved difficult. Cardioinhibition may be prevented by pacing, but the results of pacing subjects with presyncope have been disappointing as vasodepression is at least an equally important component of the syndrome.[3–5] Various drug treatments have been tried, including midodrine, ergotamine, disopyramide, β-blockade, scopolamine, fludrocortisone, and theophylline.[6 7] Selection of treatment is somewhat empirical because of incomplete understanding of the underlying mechanisms. Assessment of the effect of treatment has been confounded by the lack of reproducibility of the standard head up tilt test and the sporadic nature of symptoms.[8 9]

On pages 134–140 El-Sayed and Hainsworth report the success of salt supplementation in the prevention of tilt induced syncope,[10] using a double blind controlled trial. This is an important study for two reasons: first, because El-Sayed and Hainsworth used a reproducible method of inducing presyncope that they had previously validated[11] and they can therefore be confident that the improvement observed is not likely to be a result of chance. Second, having identified a cause, and having shown that preventing the cause prevents syncope, their data shed new light on the mechanism of vasodepressor syncope.

Head up tilt is an established method of provoking syncope.[12] The physiology of the response to tilt has been well documented.[13 14] Cardiac output falls gradually, until sympathetic vasomotor tone is abruptly and inappropriately withdrawn and vagal tone increases. At this point the heart is underfilled and contracting vigorously, a combination which is thought to initiate vasodepression via the Bezold-Jarisch or other reflex. Thus there are two factors affecting the occurrence of syncope during tilt testing: effective thoracic blood volume and the behaviour of cardiovascular reflexes.[15]

Volume

The basis of the use of tilt testing is its effect on blood volume. Vasodepression is also observed in other situations where thoracic blood volume is reduced such as during bleeding, in association with vasodilators and diuretics, after a meal, during hot weather, and in subjects with increased calf vein distensibility.[13 16] Hainsworth's group have confirmed that increased plasma volume protects against syncope induced by hypovolaemia. Their investigational protocol is a test of volume homoeostasis under considerable orthostatic stress and does not reproduce the actual precipitants of spontaneous syncope. The fact that it was more difficult to induce syncope at higher plasma volume using this test is not surprising. It does not explain, however, why the subjects had not previously increased their sodium intake despite being vulnerable to hypovolaemia.This suggests that volume control mechanisms act inappropriately in these subjects.

Subjects with congestive cardiac failure are hypervolaemic and conversely should be and are protected against tilt induced syncope.[17] Cardiac transplant recipients are also protected from tilt induced syncope,[18] cardiac denervation having been proposed as a reason. This protection wanes with time. We have observed inappropriate vasodepression during tilt testing in one of six early and seven of 17 long-term cardiac transplant recipients. We have inferred that ventricular sensory nerves are not necessary for vasodepression, and that the early protection against syncope afforded by transplantation may be related to increased plasma volume. Abnormal volume homoeostasis in cardiac transplant recipients results from mild renal damage and impairment of low pressure volume sensation consequent upon cardiac denervation.[19] The return of susceptibility to syncope with time could then be explained by return of volume sensation. These observations are consistent with those of Hainsworth's group and suggest that understanding volume homoeostasis is central to understanding syncope.

Reflexes

Although cardiac filling is reduced this does not explain the degree of hypotension at the time of syncope and there is no explanation for the sudden withdrawal of sympathetic tone. Hypovolaemia is not the only trigger of vasodepression, which may occur in volume replete subjects.[20] The relation between increased baroreflex sensitivity and syncope may be explained by a link between hypovolaemia and baroreflex sensitivity. Alternatively, increased baroreflex sensitivity may be the underlying explanation for the vasodepressor response.

At the time of syncope the system controlling blood pressure suddenly changes its behaviour, so that the normal heart rate response to falling blood pressure is reversed and the consequent bradycardia is inappropriate. Immediately after syncope, both blood pressure and heart rate may remain low even though venous return has been restored. This abnormal behaviour is usually explained as the result of inappropriate information from volume receptors in the briskly contracting empty left ventricle (the Bezold-Jarisch reflex). A number of lines of evidence contradict this explanation, including the persistence of the response and the fact that it may be triggered in the absence of an underfilled left ventricle. Further, events at the time of syncope are not all or nothing, but may contain different components of vasodepression and cardiac inhibition, suggesting that they are more complex than simple reflex responses.

All control systems are vulnerable to instability, and it is

not surprising to demonstrate this in the human cardiovascular system. Brisk reflexes imply sensitive control but predispose to instability. Baroreflex sensitivity increases with head up tilt, and heart rate variability seems to increase just before syncope. There is, however, no synthesis of these observations which would allow a rational approach to the prevention of syncope. It seems likely that both the sinus node and cardiac nerves are intact, and that the abnormality lies at a higher level, in which case pacing is not a physiological solution. If brisk reflexes are a result of hypovolaemia, then volume repletion would treat syncope both directly and by reducing cardiovascular instability.

Although this is a small study with short follow up, El-Sayed and Hainsworth provide the basis for clinical trials of salt in vasodepressor syncope. The subjects were otherwise fit, and not vulnerable to salt induced hypertension. Elderly patients who faint may be hypertensive and may have a non-compliant vascular system. Despite improving symptoms the prescription of salt could increase risk. Long term prescription of salt in young people could lead to hypertension and increased cardiovascular mortality in old age.

Any good study provokes more questions than it answers. What is the link between hypovolaemia and baroreflex sensitivity and does baroreflex sensitivity explain the events at syncope? Does salt supplementation improve symptoms, quality of life, and prognosis? What is the effect on blood pressure in the long term? Are volume sensation and thirst normal? Will volume repletion inhibit the vasovagal response to other stimuli such as carotid sinus massage? What proportion of patients are suitable for salt?

In the meantime, salt is both cheaper and possibly less dangerous than most treatments for vasodepressor syncope.

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