



Electrical stimulation of abdominal muscles for control of blood pressure and assisted cough in a C4 level tetraplegic.

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Purpose

It has been shown by several groups that electrical stimulation can cause autonomic dysreflexia in tetraplegics and high level paraplegics. This effect has been used by a C4 ventilator dependent tetraplegic to raise and maintain blood pressure following postural hypotension, particularly after meals. Additionally the system assists coughing function by stimulation of the abdominal muscles.

Method

A dual channel stimulator was designed that allowed selection and initiation of two predetermined stimulation intensities using a chin controlled joystick. Two sets of 70mm dia electrodes were placed either side of the abdomen. Approximately 80mA, 300ms, 40 Hz was required for assisted cough while about 40mA was required for maintenance of blood pressure. After eating the lower level stimulus is self-administered every 3-5min gradually increasing the time between groups of burst to once every hour over 90 minutes.

Results

Following eating a blood pressure of 60 / 45 mmHg was recorded. After five 1 second bursts of stimulation in quick repetition, this was increased to 133 / 92 mmHg. After 2 minutes blood pressure had fallen to 124 / 86 mmHg and to 93 / 66 after a further 4 minutes. The electrical stimulation was then repeated, returning the blood pressure to the previous higher level. Measurement of peak expiratory flow showed an increase from 275 l/min for an unassisted cough to 425 l/min when using the device.

Conclusion

The device is used every day. The user is now independent in coughing function and no longer requires suction or manual assistance. Maintenance of blood pressure has significantly improved his quality of life.

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