

The Role of Acu-Tens in Hemodynamic Recovery after Open Heart Surgery

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Citation: Jones Alice YM (2023) The Role of Acu-Tens in Hemodynamic Recovery after Open Heart Surgery. *J Uni Sur*, Vol. 11 No. 3: 95.

Abstract

Increased Heart Rate (HR) and decreased Blood Pressure (BP) are common consequences of heart surgery. This study investigates the effects of transdermal electrical nerve stimulation applied to acupuncture points (Acu-TENS) on heart rate, blood pressure, Pressure Product (PPR), and nausea and vomiting indices. After open heart surgery, 40 patients were randomly assigned to the Acu-TENS group, receiving 40-minute TENS with bilateral application to the PC6 acupoint on postoperative days 1 to 5, or to the Placebo-TENS group, treated with TENS. The electrode placement is identical but there is no electrical output from the TENS device, even though the output light is activated. Heart rate, Systolic and Diastolic Blood Pressure (SBP and DBP) were recorded and RPP calculated. Symptoms of nausea and vomiting were quantified using a 4-point Likert scale before and after TENS intervention. Data on heart rate, blood pressure, and daily antiemetic administration were recorded for another 20 consecutive subjects who received no intervention and established a control group. A trend toward decreased heart rate and increased blood pressure in the Acu-TENS group was observed at 5 postoperative days, with all variables returning to preoperative values on day 4 ($P > 0.2$). In the placebo-TENS and control groups, HR was still higher ($P < 0.0001$), BP was lower ($P < 0.05$) and RPP higher ($P = 0.01$) compared with the respective values preoperatively on day 4.

Keywords: Hemodynamic; Open Heart Surgery; Patients; Acupuncture

Received: 1-Mar-2023, Manuscript No. IPJUS-23-13568; **Editor assigned:** 2-Mar-2023, Pre-QC No. IPJUS-23-13568 (PQ); **Reviewed:** 16-Mar-2023, QC No. IPJUS-23-13568; **Revised:** 23-Mar-2023, Manuscript No. IPJUS-23-13568 (R); **Published:** 30-Mar-2023, DOI: 10.36648/2254-6758.23.11.03.95

Introduction

Acupuncture is the placement of needles at specific points (acupuncture points) along the "meridians" (channels) of the body through which Internal Energy (Qi) flows; Acupuncture has been used in traditional Chinese medicine as a treatment to regulate heart rate. Acupuncture advocates believe that stimulating acupuncture points can restore balance Qi and aiding in recovery from bodily injury. In Western medicine, stimulation of certain acupoints would be associated with stimulation of the autonomic nervous system and thus affect HR. The effect of acupuncture on BP maintenance in anesthetized and bleeding dog models has also been reported. However, acupuncture is invasive and treatment-induced damage has been reported. On the other hand, non-invasive transdermal electrical stimulation and when applied to acupuncture points (Acu-TENS) have been shown to be associated with faster recovery of HR and PA at rest after exercise. The effect of Acu-TENS on cardiac function indices

after surgery has not been studied. Acupuncture is also thought to inhibit the vomiting center in the midbrain and has been used as an alternative for the management of Postoperative Nausea and Vomiting (PONV). Exercise, as an important component of cardiac rehabilitation, is often indicated for the purpose of cardiopulmonary rehabilitation after cardiac surgery. Elevated resting heart rate, low blood pressure, and symptoms of PONV are factors that limit the progress of a cardiac rehabilitation program. This study aimed to determine the effect of Acu-TENS on postoperative hemodynamic status and symptoms of PONV following recent open heart surgery [1, 2].

The required dose of Maxalone was the lowest in the Acu-TENS group ($P=0.038$). We conclude that Acu-TENS facilitated early return to preoperative values of BP, HR and PPR in patients after acute cardiac surgery. Increased Heart Rate (HR) is a normal sympathetic response to bodily injury and is a common consequence of major surgical procedures. Any reduction in

cardiac contractility and/or disruption of peripheral vascular control can lead to hypotension in the postoperative period. Altered reflex activity of baroreceptors associated with vagal inhibition and autonomic dysregulation is also common in patients after cardiac surgery. High resting heart rate is associated with increased myocardial work, which may be detrimental to patients with a marginal myocardial oxygen supply. Regulating the heart rate can be accomplished through pharmacological intervention, but it can also be accompanied by adverse effects on the cardiovascular and other body systems [3, 4].

Discussion

Ethical approval was obtained from the appropriate university and hospital human subject ethics committees. Written and informed consent was obtained from all patients prior to data collection. The study adopted a randomized, double-blind, placebo-controlled clinical design. The randomization is performed by a computer-generated sequencing protocol. Subjects were randomly assigned to the Acu-TENS or Placebo-TENS groups. Both groups underwent the 40-minute procedure, at the same time each day postoperatively, from day 1 to day 5. TENS electrodes were placed bilaterally on the PC6 acupoint (Neiguan, 1/6 interval. distance between the wrist and elbow, between the flexor carpi radialis and the palmaris longus tendon). Patients in the Placebo-TENS group received no electrical output from the TENS device even though the output light was activated. Subjects in the Placebo-TENS group were told that humans could not perceive stimulus frequencies [5, 6].

Although these articles show mixed evidence on the impact of BMI, pre-assessment services do not consider BMI as a risk factor in the classification process. The current literature on a pre-assessment approach in the context of BMI and obesity is limited,

and while supporting that a nurse and consultant/specialist in PAS clinic leadership is feasible, translation. This case remains largely undetermined due to the range of surgical specialties. At QEHB, this two-tier screening clinic was recently introduced to allow the assessment of patients by risk groups based on their comorbidities and ASA level. This service assesses the patient's risk of comorbidities such as diabetes and cardiovascular disease before surgery. This is achieved through referral to the relevant medical professional for preoperative review and consultation. This is intended to reduce cancellations on the day of surgery and postoperative complications [7, 8].

Conclusion

One of the limitations of this study is that the data came from a single center. Our results need to be confirmed by several centers that use similar methods to pre-evaluate obese patients. However, this study remains the first in the literature to report the results of pre-assessment services for patients undergoing gastrointestinal surgery. In addition, this study took into account varying degrees of surgical intervention, which made it difficult to assess the need for BMI for classification. Subgroup analysis demonstrated that BMI had no impact on outcome when stratified by surgical grade. This study included only patients who underwent elective procedures and, therefore, the results may not be comparable to previous studies that included both elective and emergency procedures [9, 10].

Acknowledgement

None

Conflict of Interest

None

References

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