Abdominal compression binder – A comparative randomised investigation

Mette Toft, MD, Lene Rørdam, MD, Dr.Med.Sci.
Department of Clinical Physiology, Bispebjerg Hospital, Bispebjerg Bakke 23, DK-2400, University of Copenhagen, Copenhagen NV. Denmark

Introduction: Pulmonary complications and deep venous thrombosis are two major known postoperative complications to abdominal surgery. Furthermore, the patients have a risk of developing hernias in the incision. Abdominal compression binders are in some places used postoperative supporting incisions and counteracting the stress on the wound from physical activity, coughing and sneezing, and thereby help to prevent hernias and allow the cicatrize to heal with less strain applied.

The aim of the present study was to examine whether an abdominal compression binder influences haemodynamic parameters and pulmonary function.

Materials and Methods: 25 healthy volunteers and 3 patients who had undergone abdominal surgery were studied in a randomised order with and without the binder.

The following methods were used: 1. Haemodynamic parameters were investigated in a supine position using a non-invasive measurement of heart rate (HR) and finger blood pressure (FINAP) and from these parameters; the stroke volume (SV) and cardiac output (CO) was estimated. 2. Venous capacitance and maximal venous outflow were recorded using a mercury-in-silicone strain-gauge plethysmograph around the calf muscle in a supine position. 3. Pulmonary function test was performed seated, measuring the oxygen saturation by pulsoximetry for one hour. Moreover, spirometry was performed, measuring vital capacity (VC), forced vital capacity (FVC) and forced expiratory volume during the first second of exhaling (FEV1).

Results: There was a significant decrease in SV from 107.3±22.1 ml (mean±SD) to 104.6±23.4 ml ($p=0.003$) and in CO from 6.2±1.6 l/min to 6.0±1.5 l/min ($p=0.002$) when wearing the binder. There was no correlation between the change in SV or CO and the pressure under the binder. HR and blood pressures were not significantly changed when wearing the binder ($p>0.05$).

The apparent venous capacitance in the lower extremities decreased from 2.24±0.38% to 2.11±0.38% when the binder was applied ($p=0.011$). There was no change in the maximal venous outflow (36.4±0.8%/min versus 36.7±0.8 %/min) when wearing the binder

(p=0.78). It can be estimated that the increased abdominal pressure will increase the leg blood volume to a maximum 25-35% in supine position.

No significant changes were seen in the oxygen saturation during the one-hour observation period. Without binder the VC was 5.1±1.2 l, FVC was 4.9±1.3 l and FEV1 was 4.0±1.1 l and none of these respiratory parameters changed significantly when wearing the binder (p>0.05).

Conclusion: When wearing the binder there was a significant decrease in SV, CO and venous capacitance of the lower extremities indicating a compromised venous return to the heart. This is due to pooling of the blood in the lower extremities caused by an increase in the abdominal pressure when wearing the binder. The significance of this phenomenon remains to be examined further. No changes in respiratory parameters were found when wearing the binder.