

INTRODUCTION

External aortic compression is an effective maneuver used to temporarily reduce bleeding in the management of postpartum hemorrhage (PPH) and reduces blood flow to all vessels below the compressed area. (1) When treating PPH, drugs like tranexamic acid and uterotonics are given intravenously to reach their effect site below the aortic bifurcation.

The aim of this investigation was to evaluate the effect of external aortic compression on distribution of contrast, as a substitute for drug distribution, with different degrees of compressed aorta using a prototype of a device for external aortic compression (ExAC Device, ExAC AS, Norway) in a pig model.

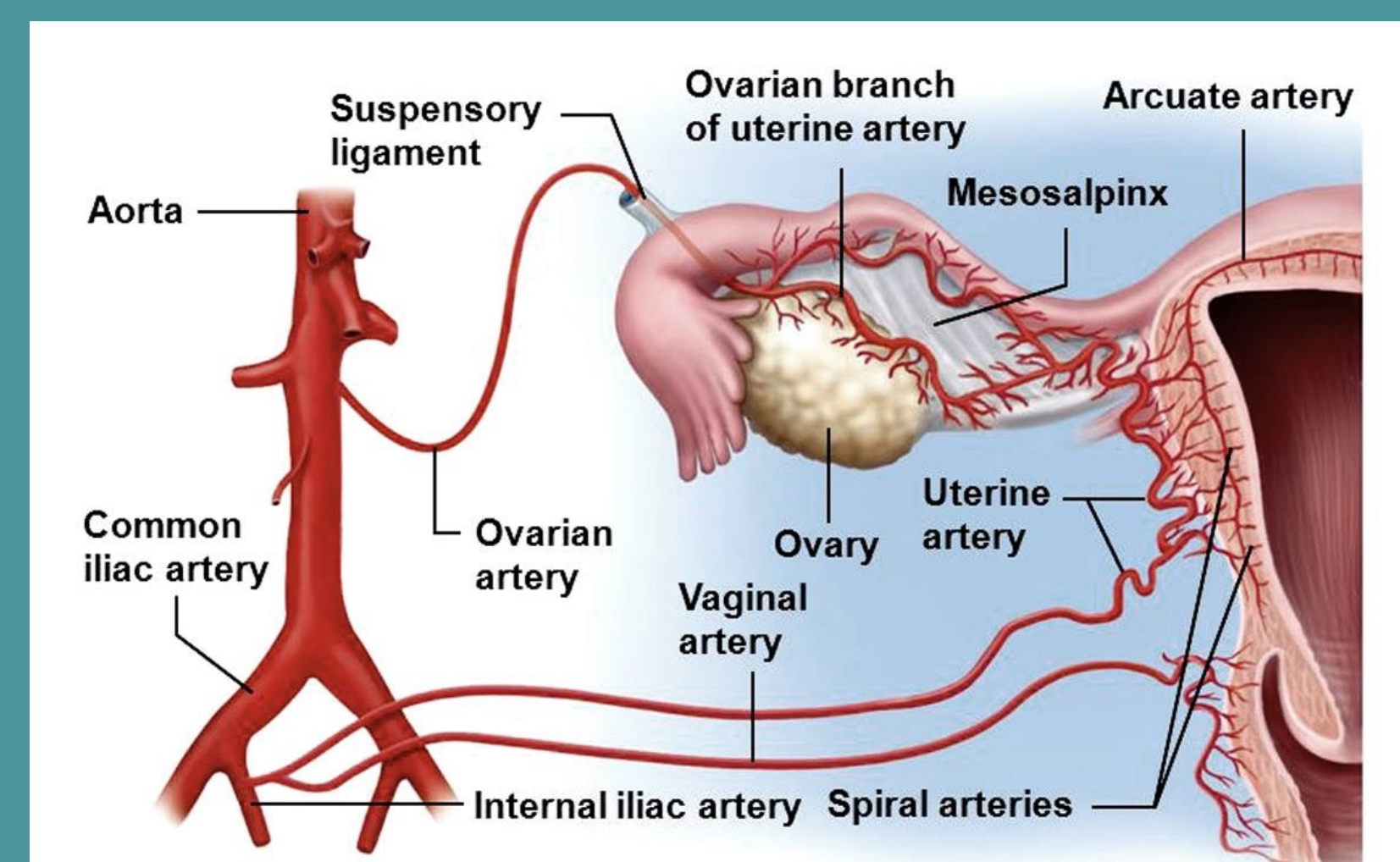


Figure 1 The compression site is above the bifurcation. The vaginal and uterine arteries originate from the internal iliac arteries. The ovarian arteries originate at the level of the renal arteries. (Source: McGraw-Hill Companies, Inc.)

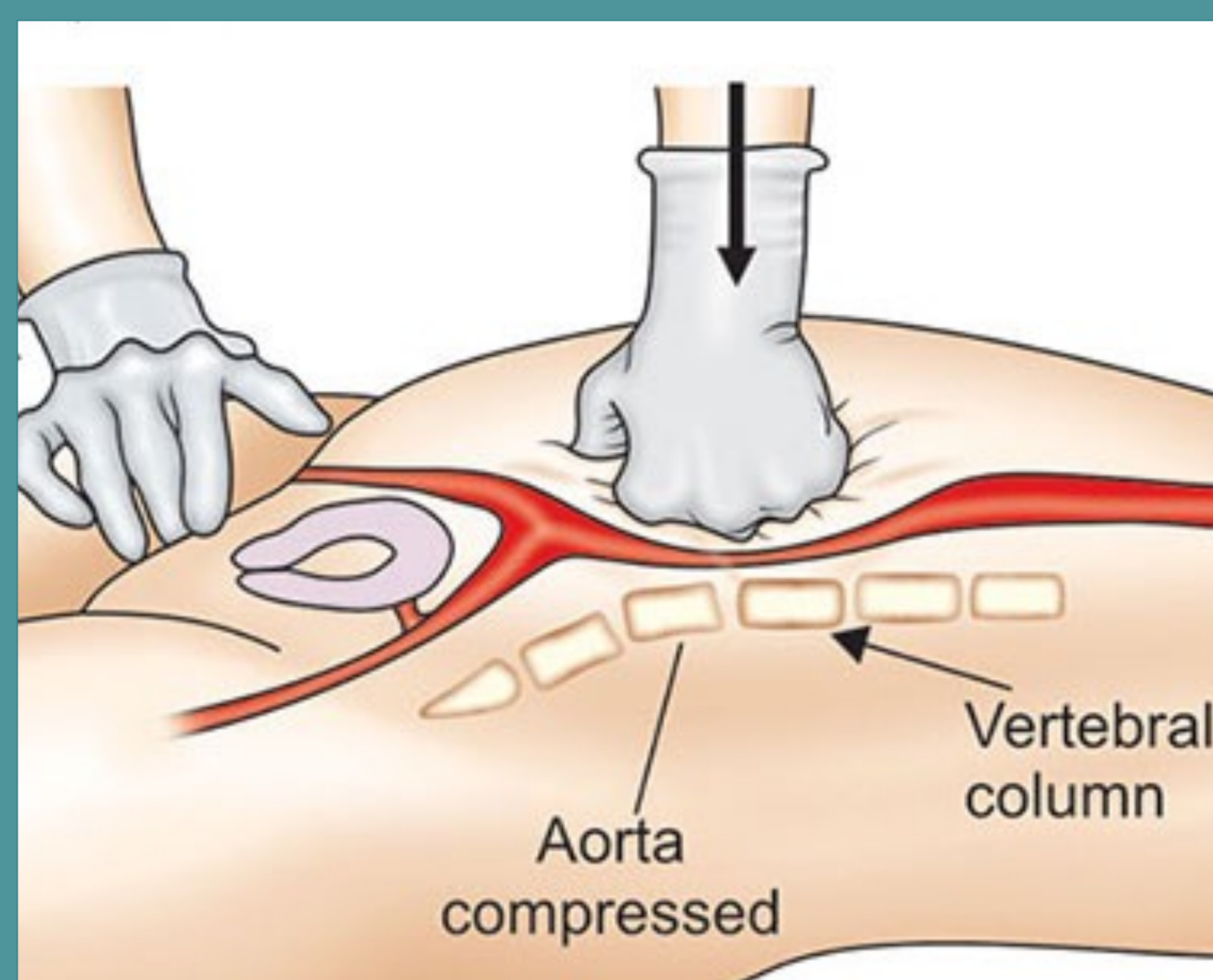


Figure 2 With the fingertips or a closed fist aorta is pressed against the spinal column and herby compressed. The pulsation in the femoral artery will cease when the manuvre is performed correctly.

METHODS

After ethical approval a pig of 70 kg was anesthetized and instrumented with two 18 G intravenous catheters and an arterial catheter in the brachial and femoral artery for blood pressure monitoring.

Dynamic computer tomography (CT) sections, 1 section per second, of the distal aorta were performed after injection of 70 ml of Iohexol 300mg/ml. Time-intensity curves were obtained to quantify the amount of contrast reaching aorta, distal to the compression site. The area under the curve (AUC) was calculated. The contrast injection was first performed without external aortic compression, with complete aortic compression and then two different levels of partial compression based on the relation between systolic blood pressure in the brachial and femoral artery. Complete compression was defined as non-pulsatile pressure in the femoral artery.

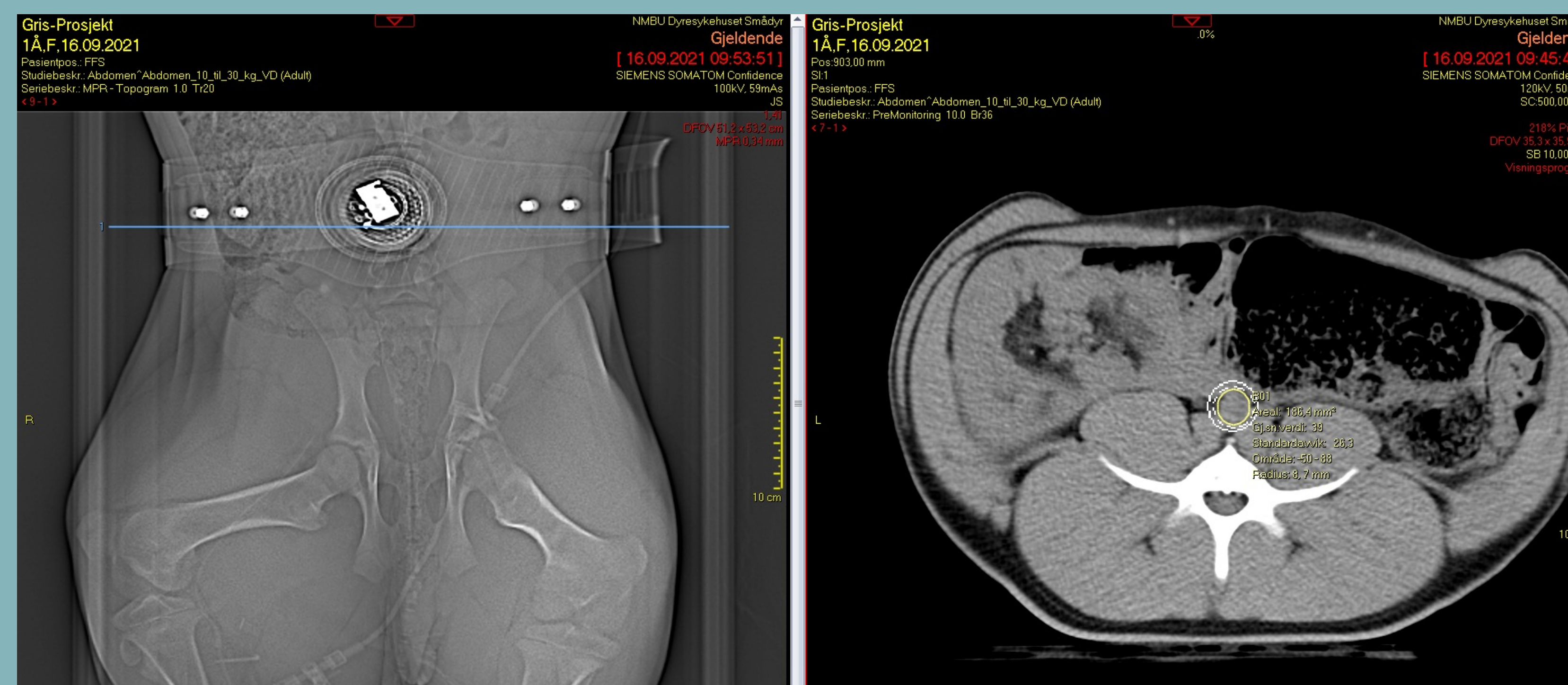


Figure 3 Dynamic computer tomography (CT) sections, 1 section per second, of the distal aorta were performed after injection of contrast in v. auricularis

RESULTS

Without compression of aorta the total AUC in the distal aorta during the first 50 seconds after injection was 3610 RHUs*. This was considered the baseline. The AUC after complete, 23% and 13% compression compared to baseline was 0,33%, 6,9% and 13,3% respectively.

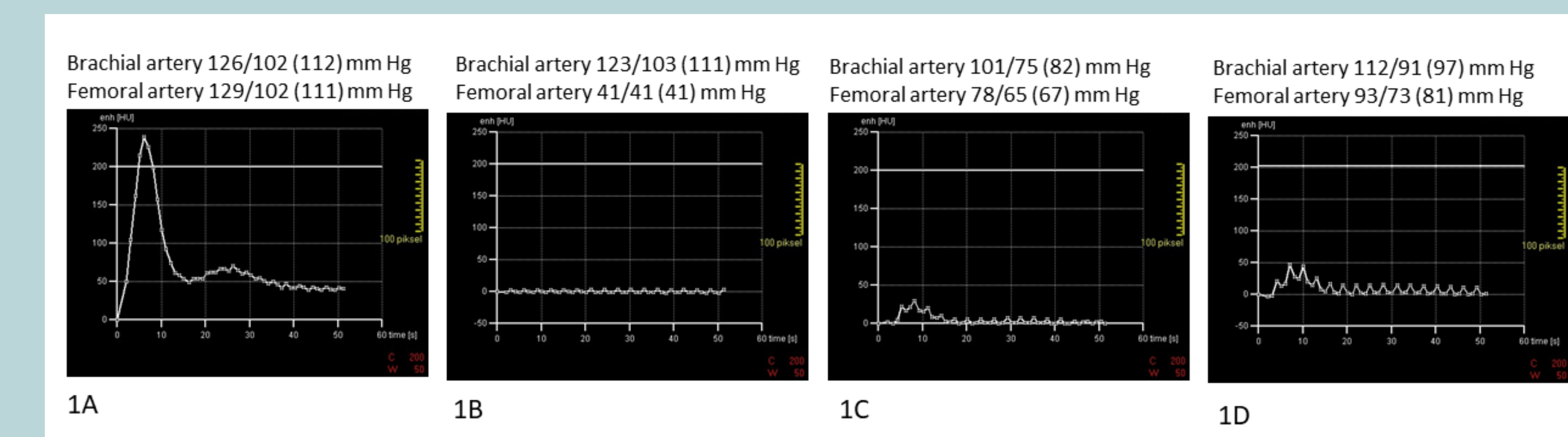


Figure 4 Computer Tomography with contrast in one pig (1) The level of contrast in the distal abdominal aorta after injection of contrast without compression of aorta (A), with complete compression, defined as non-pulsatile pressure in the femoral artery (B), and two levels of non-complete compression (C and D).

DISCUSSION

Complete compression of aorta with the ExAC Device leads to near absence of measurable contrast distal to the compressed area. A partial increased distribution of contrast can be achieved by reduction of degree of compression. Further investigation is needed to evaluate the contribution of the ovarian arteries to the distribution of drugs to the uterus, as these originate from above the compressed area.

REFERANCE

Soltan, M. H., Imam, H. H., Zahran, K. A., & Atallah, S. M. (2010). Assessing changes in flow velocimetry and clinical outcome following use of an external aortic compression device in women with postpartum hemorrhage. *International Journal of Gynecology & Obstetrics*, 110(3), 257-261.

*RHU = Hundsfield Units measured in ROI, divided by the standard deviation times seconds