

World Cardiology Summit 2020: Effects of Carbon Dioxide Angiography on Endothelial Functions in Lower Extremity Arteries via Flow Mediated Vasodilatation

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Introduction:

Carbon dioxide used to be used in scientific screening as early as Twenties as distinction media and in vascular imaging in 1980s. Recently CO₂ is published to be an wonderful and protected angiographic distinction agent in the periphery arterial and venous circulation. However, its use is constrained in sufferers with renal failure and hypersensitivity due to arrhythmic and neurotoxic consequences in cerebral and cardiac circulation.

Carbon dioxide has greater solubility, decrease viscosity and fewer aspect outcomes than real distinction agents, however air contamination, coronary and cerebral embolism, photo degradation, incomplete filling of the giant vessels and now and again want for classical distinction marketers are important drawbacks.

Endothelial vasoactive response is a marker for endothelial dysfunction and can also have an effect on endothelial phone metabolism. It is viable to measure endothelial features by using pharmacologically or robotically inducing vasodilatation. Pharmacologic technique is effortless and non-invasive. Flow mediated vasodilatation (FMD) is used to consider vascular vasomotion in systemic arteries with an ultrasound. Vascular response to nitrate and vascular ischemia through a proportion trade in arterial diameter from the baseline is evaluated.

We hypothesized that CO₂ angiography influences endothelial features both positively or negatively. For that motive we measured drift mediated vasodilatation in decrease extremity arteries following CO₂ angiography.

Materials and Methods:

The find out about was once accredited by way of institutional moral Committee waiving person consent due to its retrospective nature. Patients with renal insufficiency admitted to our clinic for comparison of peripheral arterial sickness between July 2016 and August 2019. Doppler ultrasonography was once carried out with the aid of equal skilled operator at preliminary examination and ones with complete occlusion have been excluded. Sixteen sufferers underwent diagnostic CO₂ angiography by way of identical operator. Antegrade femoral artery strategy guided via doppler ultrasonography by seldinger technique with suitable catheters used to be used. Carbon dioxide was once administrated at 10 to 20 ml/sec for 1.5 seconds and diagnostic snap shots have been obtained. Endothelial features had been decided before, straight away after and 1 hour after CO₂ angiography by means of flow-mediated vasodilatation. All measurements had been made three instances and capability of measurements took in consideration for statistical calculations. Bilateral popliteal artery FMD at baseline used to be measured with the aid of a 9 MHz linear array transducer, positioned over the popliteal artery simply distal to the popliteal fossa. Simultaneous diameter and speed indicators have been bought in duplex mode at a pulsed frequency of 5 MHz and corrected with an attitude of 60°. The blood strain cuff was once utilized on the leg and inflated to 300 mm Hg for 4.5 min for ischemia. It was once deflated quickly after. After 1 minute and at 1 hour, the ultrasound scan of popliteal artery was once obtained,

which indicates the endothelial-dependent dilation due to shear-induced endothelial nitric oxide production.

The percentage diameter exchange for FMD and different parameters of vasomotion have been calculated in relation to its respective scans. Then all measurements had been compared.

Statistical Analysis:

The statistical bundle SPSS (Statistical Package for the Social Sciences, model 17.0, SSPS Inc, Chicago, Ill, USA) was once used for statistical analysis. Continuous variables had been expressed as ability \pm popular deviation. Categorical variables have been expressed as the complete range (percentage). Analysis used to be carried out the usage of Student t-test.

Categorical statistics had been in contrast towards a chisquared distribution. A p price <0.05 used to be set as significant.

Results:

There have been sixteen sufferers with renal insufficiency blanketed in the study; 9 male and 7 female. The suggest age of the sufferers was once 73.56 ± 6.05 . All sufferers had a glomerular filtration price <50 ml/min (19.20 ± 8.72).

Thirteen sufferers (81.2%) had diabetes, all had dyslipidemia, 12 (75%) had coronary artery disorder and 12 (75%) had carotid stenosis $>50\%$.

Baseline suggest arterial diameter (mm), blood glide (ml), expand in blood float (ml) and FMD (%) have been 3.48 ± 0.61 mm, 203.12 ± 15.85 ml, 319.12 ± 22.93 ml and $6.06 \pm 0.72\%$ respectively. The baseline diameter, arterial blood flow, enlarge in blood float and FMD lowered substantially straight away after angiography ($p < 0.001$ for each), however back to baseline degrees one hour after Table 1. Baseline values and 1 hour after values have been comparable ($p: 1.000$).

Discussion:

For diagnostic purposes, intravascular liquid distinction retailers have been first used in 1924. There is sufficient proof that iodinated distinction sellers motive endothelial dysfunction, myocardial telephone injury and coronary spasms. Moreover, iodinated distinction media can purpose acute kidney injury. The endothelial dysfunction is the end result of a direct cytotoxic impact on renal tubular epithelial and endothelial cells. The motives of the endothelial toxicity of distinction dealers are the end result of each direct proapoptotic results and morphological derangements and induction of inflammation, oxidative stress and thrombosis. Also shear stress stimulates endothelium to produce nitric oxide.

To overcome these issues CO₂ used to be used by way of needle injection in 1956, observed by using catheter delivery. It has greater solubility, decrease viscosity and decrease toxicity than genuine distinction agents, however nevertheless has some shortcomings as fuel lure in hallow house and embolism.

The relationship between CO₂ and endothelial dysfunction has no longer been revealed. In this find out about we located non permanent endothelial dysfunction documented through potential of FMD measured noninvasively. Measurements again to baseline 1 hour after angiography. The motive for brief endothelial dysfunction is unclear. When we discover this relation, we located that there are similarities between endothelial dysfunction happening for the duration of decompression illness. This similarity used to be the cause for conducting this study. However, the fuel accountable for dysfunction is different. It used to be said in the past that publicity of endothelial cells with air bubbles induced an inflow of calcium thru a stretch-activated channel, such as a

transient receptor plausible vanilloid household member, triggering the launch of calcium from intracellular shops in decompression illness. This gasoline contact with endothelium can promote launched micro particles that decreased mobile viability, elevated apoptosis, and manufacturing of pro-inflammatory cytokines.

Conclusion:

In conclusion, our find out about confirmed that CO₂ may also reason transient endothelial dysfunction in decrease extremity arteries, however medical importance is no longer known.