

Abstract

Duplex ultrasound (DU) provides a simple, portable, reproducible, and non-invasive assessment of blood flow. Measurement of luminal diameter and blood velocity allows estimation of blood flow, peripheral resistance and the detection of arterial occlusive disease. Owing to its size and anatomic position, the superior mesenteric artery (SMA) is also accessible to DU. DU Applied to the superior mesenteric artery; the method confirms that blood flow in this vessel increases in response to a meal.

The objective of this study was to investigate the contribution of different types of meals in increasing blood flow in the SMA, using Doppler ultrasonography as a means of determination the relative potencies of the major nutrient stimuli in healthy human subjects. One hundred healthy volunteers, with age variation (20 -50) years, were examined before and after different two meals type (fatty and carbohydrate), at different intervals (0-90mins), that meals included varying kilocalories (Kcals) and contents (250 gram, 545 Kcal and 270 gram, 477 Kcal) in order to assess (SMA), diameter DM, blood flow volume BFV, resistive index (RI) and peak systolic velocity (PSV). The study showed that the peak values of DM and BFV of SMA for the fatty, and carbohydrate meal appear at 60 min, and 30 min respectively, after meal taken up to 90 min. There was significant value for the correlation between the varying time with the mean values of DM, and BFV of SMA for fatty and carbohydrate meal. Also the study revealed that there was significant correlation changes in BFV and DM of SMA after intake of the two meals, this changes were significant using paired t-test at $p=0.05$ with $p<0.0001$. The researcher concluded that the fatty compared to carbohydrate meal take long time for SMA response sonographically. Researcher revealed that the normal values of SMA for DM, BFV, PSV, and RI were estimated from each correlation factor, and this can be easily applicable and taken as the reference values for each normal health subjects. Researchers recommended that more studies in this field for other abnormal patients.

Keywords: Doppler ultrasonography; Superior mesenteric artery flow; diameter DM; Meals.

المستخلص

الموجات فوق الصوتية المزدوجة تعطي تقييم بسيط لتدفق الدم، وهي متنقلة، قابلة للتكرار، ولا تحتاج جراحة. قياس قطر تجويف الشرايين، وسرعة تدفق الدم يسمح بتقدير كمية الدم المتدفق، والمقاومة الطرفية لتدفق الدم والكشف عن وجود مرض انسداد الشرايين. وذلك نظرا لحجمها وموقعها التشريحي، أيضا يمكن تقييم الشريان المساريقي العلوي بالموجات فوق الصوتية المزدوجة. إن الموجات فوق الصوتية المزدوجة عند تطبيقها على الشريان المساريقي العلوي؛ تؤكد إن تدفق الدم في هذه الأوعية يزداد كاستجابة لتناول الطعام. كان الهدف من هذه الدراسة هو التعرف على مساهمة الأنواع المختلفة من وجبات الطعام في زيادة تدفق الدم في الشريان المساريقي العلوي، وذلك باستخدام الموجات فوق الصوتية دوبلر كوسيلة لتحديد الفعاليات النسبية للمواد الغذائية الرئيسية المختلفة التي تؤثر في الشريان المساريقي العلوي عند الأشخاص الأصحاء. تم فحص مائة المتطوعين الأصحاء، من الفئة العمرية بين 20-50 سنة، قبل وبعد نوعين من الوجبات المختلفة (وجبة دهنية- وجبة كربوهيدرات)، على فترات زمنية مختلفة ما بين 0-90 دقيقة، أن الوجبات إشملت على محتويات، وسعرات حرارية مختلفة (250 غرام، 545 سعرة حرارية و 270 غرام و 477 كيلو كالوري) من أجل تقييم قطر، كمية الدم المتدفق، مؤشر المقاومة، وسرعة الانقباض القسوي، في الشريان المساريقي العلوي. وأظهرت الدراسة أن القيم القسوى لقطر، وكمية الدم المتدفق في الشريان المساريقي العلوي للوجبة الدهنية ووجبة الكربوهيدرات تظهر في 60 دقيقة، و 30 دقيقة على التوالي، بعد تناول الوجبات حتى 90 دقيقة. وكان هناك قيمة ذات أهمية إحصائية تربط بين الوقت مع القيم المتوسطة لقطر، وكمية الدم المتدفق في الشريان المساريقي العلوي للوجبة الدهنية ووجبة الكربوهيدرات. كما كشفت الدراسة أن هناك تغيرات في قطر، وكمية الدم المتدفق في الشريان المساريقي العلوي ذات علاقة إحصائية هامة بعد تناول الوجبتين، وتم اختبار هذه التغيرات المهمة باستخدام اختبار (t) عند (p= 0.05). وخلص الباحث إلى أن الوجبة الدهنية مقارنة مع وجبة الكربوهيدرات تستغرق وقتا طويلا لاستجابة الشريان المساريقي العلوي لها وذلك باستخدام الموجات فوق الصوتية المزدوجة. وكشف الباحث أن القيم الطبيعية لكل من قطر، كمية الدم المتدفق، مؤشر المقاومة، وسرعة الانقباض القسوي في الشريان المساريقي العلوي يمكن تقديرها من معامل الارتباط الخاص بكل منها، وبذلك يمكن أن تكون قابلة للتطبيق بسهولة وتؤخذ على أنها قيم مرجعية لكل الأشخاص الأصحاء. وأوصى الباحثون لعمل المزيد من الدراسات في هذا المجال للمرضى.

Dedication

- *To the my dear parent and beloved mother*
- *To my sisters, brothers, wife, my son and daughters.*
- *My students past present and future researchers.*

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List of abbreviations

(Alphabetical order)

AA	Abdominal Aorta
AO	Aorta
BF	Blood Flow
BFV	Blood Flow Volume
BMI	Body Mass Index
CA	Celiac Artery
CD	Color Doppler
CT	Computerized Tomography
DU	Duplex ultrasound
EDV	End Diastolic Velocity
GIT	Gastro Intestinal Tract
IMA	Inferior Mesenteric Artery
IMV	Inferior Mesenteric Vein
Kcal	kilocalories
MBFV	Mean Blood Flow Volume
MBV	Mean Flow Velocity
MRA	Magnetic Resonance Arteriography
MRI	Magnetic Resonance Imaging
PD	Pulsed Wave Doppler
PI	Pulsatility Index
PSV	Peak Systolic Velocity
RI	Resistance Index
SMA	Superior Mesenteric Artery
SMABF	Superior Mesenteric Artery blood flow
SMADM	Superior Mesenteric Artery Diameter
SMV	Superior Mesenteric Vein
SSc	Systemic Sclerosis
TAV	Time Average Velocity
US	Ultrasonography