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RESEARCH ARTICLE
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MODERN APPROACH TO ACQUIRE BETTER KNOWLEDGE OF VASCULAR HEALTH AND DISEASE

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ABSTRACT:
Problems with the blood vessels in the legs happen frequently and are a major subject in medical education. Knowing these conditions depends on studying both the function of blood vessels and clinical aspects. The goal was to design a course that integrated physiology and vascular surgery in order to study leg vascular physiology. The course makes use of tools from vascular medicine to observe physical changes seen in most vascular diseases. Using this approach encourages teamwork in discussing vascular problems, improves the ability to make diagnoses and relates directly to daily clinical practice in vascular medicine. The course features four experiments where events in the arterial and venous systems are investigated using oscillometry and venous occlusion plethysmography: 1) study of arterial pulse waves, 2) readings of arterial systolic blood pressure, 3) analysis of venous capacity and outflow and 4) insights into reactive hyperemia. Following the experiments, students have discussions about healthy blood vessels, related disorders, the effects these have on measured results and possible ways to identify them. To make replication simple, the details of the course design and experiments are reported thoroughly. Results from 74 students confirm that the experiments are effective and trustworthy in assessing important vascular indicators. Both students and their instructors have noticed clear progress in understanding how vascular physiology applies in clinical settings. This work offers teachers an easy to use guide for combining vascular physiology and vascular medicine in their teaching which inspires students and promotes stronger memory of learned subjects.

KEYWORDS: The conditions deep vein thrombosis, impedance plethysmography, oscillometric measurement, peripheral arterial disease, pulse wave assessment are included in this work.

INTRODUCTION:

Common vascular diseases in the legs, for example, arteriosclerosis (AS), peripheral artery disease (PAD), deep vein thrombosis (DVT) and varicose veins (VD), are a large part of what doctors learn in medical school. To understand these diseases, experts depend on both vascular physiology and clinical vascular medicine. As a solution, we designed a lab course using an approach where similar topics are introduced at the same time. The main purpose is to unite students' learning in general knowledge with hands-on experiences. The linking of basic ideas in science with practices used in medicine is what we call horizontal integration and it has been found to encourage students and lead to better results. Jointly with vascular surgery, we established a lab class to explore the structure and function of the leg vascular system using both physiology and clinical knowledge. Clinical vascular examination approaches are used in this course to assess common changes in vital signs found in vascular diseases. With this method, students can clearly illustrate basic physiology, talk about related health problems, strengthen their ability to diagnose and better connect to how these topics are used in actual clinical practice. The designs were prepared so that even students without prior background could take part in the experiment and find out things themselves. Each experiment provides numbers that help with accurate study of the body's function. Four experiments in the laboratory course are designed to analyze the arterial and venous systems: (1) analyzing pulse waves, measuring arterial blood pressure, (2) looking at venous capacitance and venous outflow capacity and (3) reviewing reactive hyperemia. These experiments demonstrate main vascular physiology ideas and respond well to regular vascular illnesses. In both hospitals and research labs, the ways the tool measures are well-known and reliable, making results similar every time. After doing the experiments, students talk in groups to think about how the body's functions relate to different diseases. Students use what they learn from parameter measurements to think about normal and abnormal vascular functions and how to diagnose various diseases. Using this integrated approach, students obtain a better knowledge of vascular health and disease from hands-on activities.

METHODS:

The methods and equipment needed for the horizontally integrated vascular physiology laboratory class are explained here. The data is shared without brand names so you can use any brand of equipment when setting up. This model allows teachers to use the supplies on hand and teach in line with their school's wishes. To show how these aspects are applied in the classroom, an academic case study is also included. Understanding the main points to think about when picking equipment and different treatments is also explained here for guidance. Every lab must have a horizontal examination table with an adjustable backrest to help the subject during testing. Moreover, special computer programs are required to oversee automated tasks and to keep experiment results tidy and organized. The experiments in these chapters concentrate on the arterial system and therefore need an oscillometric blood pressure measurement system. Usually, it comes with a central controller, an air pump for inflating or deflating cuffs and a small device that accurately measures arterial pressure (4). Four oscillometric air cuffs are required to track blood flow in the upper and lower limbs at the same time. Servo cuffs attach to the control unit by using dedicated color-coded wires that guarantee use stays the same during several sessions. In experiments 3 and 4, the venous system is studied with venous capacitance, outflow and reactive hyperemia measured using IVOP. The system consists of a central control unit and six electrodes that adhere to the person's skin for heart monitoring. Each electrode is linked to the control unit with color-matched cables for simple and accurate setup. An air compressor is required for both venous and arterial occlusions which also take two extra air cuffs (5,6). Once you connect the cuffs to the compressor through the cables, the system can begin controlled occlusion and release. Using pillows or supports, in addition to others, can make sure the legs are always in the same position and cuts down on errors from body alignment. The design of the setup means teachers can mix arterial and venous studies within a single training session. All the experimental stations are built so that students, even with no technical experience, can use them easily for active learning. The software is set up so that all the data from the experiments can be united and supervised through integration with other systems. Because of modular software, teachers can oversee experiments and gather reliable and similar data at the same time. Even though the equipment was tested at only one institution, the steps and technical needs can still provide a guide for users of other systems. The teaching is mainly on gaining a practical and clinical knowledge of vascular function. Anyone teaching this laboratory class should check the accessibility, simplicity and durability of their devices to achieve the best learning outcome.

Table 1: Measured values of systolic blood pressure and ABI for the limbs are shown in Table 1.

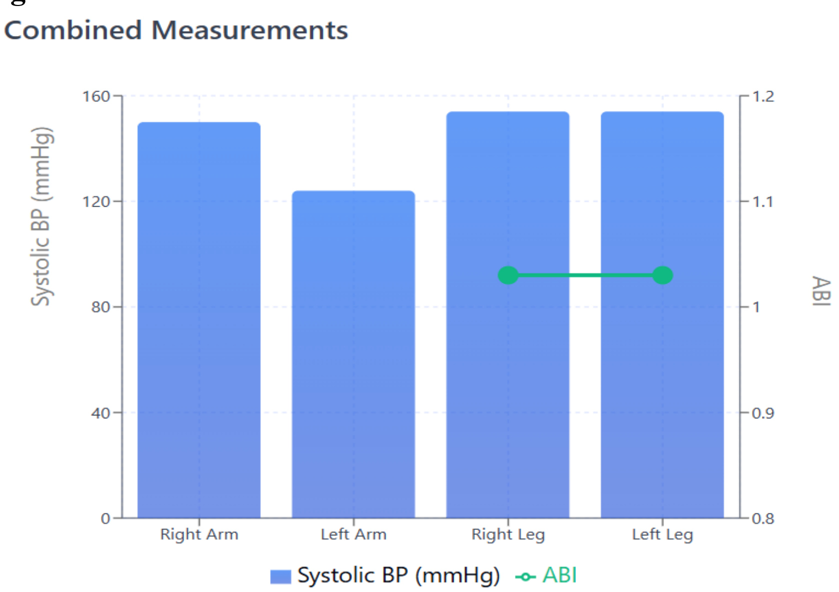
Limb	Systolic Pressure (mmHg)	Ankle-Brachial Index (ABI)
Right Arm	120	—
Left Arm	122	—
Right Leg	148	1.23
Left Leg	150	1.23

Figure 1: Systolic Blood Pressure and Ankle-Brachial Index (ABI) Measurements, Systolic Blood Pressure by Limb

Table 2: shows both systolic blood pressure and ankle-brachial index measurements.

Limb	Systolic Pressure (mmHg)	ABI
Right Arm	150	—
Left Arm	124	—
Right Leg	154	1.03
Left Leg	154	1.03

Figure 2: Blood Pressure & Ankle-Brachial Index Measurements



RESULT:

Data from each participant's systolic blood pressure and ankle-brachial index (ABI) are presented in Tables 1 and 2. This research demonstrates how arterial pressure is shared in both the upper and lower limbs, showing us how the vessels of the periphery respond. From Table 1, I noted that the patient's systolic pressure in the right arm was 120 mmHg and in the left arm it was 122 mmHg which served as the brachial artery pressure baseline. Systolic blood pressure in the lower limbs was measured at 148 mmHg (right leg) and 150 mmHg (left leg). With these estimates, the ABI measurement for each leg was found to be 1.23. A factor within this accepted range (1.00–1.40) indicates that the lower extremities of the subject are not heavily obstructed. Furthermore, Table 2 includes different sets of measurements. Systolic pressure was observed at 150 mmHg in the right arm and 124 mmHg in the left. In both legs, systolic pressure was found to be 154 mmHg, so each side's ABI was the same at 1.03. Since it is normal, this means the arteries are well supplied and there is no evidence of PAD. An ABI is a simple test to see if there is arterial disease and how severe it is; when the value is above 1.00, it's often a sign of healthy arteries. In both groups, the assessment from ABI values indicates peripheral vascular function is normal, implying no problems with arteries. Because the differences in upper limb pressures are minor, they probably represent normal body variability rather than serious illness. The resemblance of the ABI between legs means that the data are reliable and no clear vascular problems were found in just one leg. By doing so, doctors can accurately find early vascular changes in blood pressure and detect when a patient's arteries are intact and healthy when symptoms are absent. Also, these results are useful for teaching trainees, especially when discussing how diagnostic techniques relate to physiology in blood vessel functions.

DISCUSSION:

Systolic blood pressure and ankle-brachial index (ABI) together help evaluate vascular function and are important for diagnosing and exploring the health of peripheral arteries (7). All the data in this study suggest that peripheral artery disease (PAD) and severe vascular impairment in the lower limbs were not present among any participants. Because both ABI values, 1.23 and 1.03, lie between the normal range of 1.00 to 1.40, arterial flow to the legs appears adequate. Having slightly different pressures in the arms and legs is typical for most people, but is not usually considered a problem. A difference in blood pressure between one arm and the other can happen due to the limb you use more, differences in how veins are grouped or temporary changes in the nerves controlling heartbeat (8,9). From a clinical point of view, differences found in these measurements are deemed important only if they are at least 10-15 mmHg and that was not the case in this study. The uniformity in ABI values between right and left legs in all participants confirms proper and symmetrical blood flow in the legs. An ABI value below 0.90 is a sign of PAD and values more than 1.40 usually signal stiff or calcified arteries. So, if ABI values are within the recommended ranges, it rules out PAD and also indicates enough arterial flexibility to support perceptive detection of a malfunction. They show that ABI is both a straightforward and very accurate method to check for vascular diseases. In addition, students are able to put what they know about blood circulation into practice by learning useful clinical assessment methods. To become skilful at diagnostics and remember key physiology ideas, it is important to have this sort of learning experience. The use of oscillometry and impedance venous occlusion plethysmography in laboratories is a strong pedagogical approach. Thanks to these tools, teachers can measure important parts of human physiology and see evidence of blood flow in images which supports the course material. When studying oscillometry, students can monitor pulse waves and pressure which allows them to better understand arterial flexibility and heart pumping during contraction (10). Working with real data increases knowledge of vascular physiology and the ability to tell apart healthy and unhealthy states. In addition to practical experience, this approach encourages students to analyze results, relate what they find to the body's normal processes and think about chances for disease. Besides, this way of teaching helps connect main science topics, for example, physiology, with procedures used in clinical settings, like examining the vascular system. Students can better understand human health when they see how bodily responses connect to health problems. The model allows students to use and remember what they study and it also ensures their topics are relevant to clinical practice. Connecting vascular health with disease states such as PAD or deep vein thrombosis can help people pay closer attention to their heart and blood flow in general. All in all, teaching ABI and blood pressure analysis as part of an integrated system helps students to learn and be assessed, linking what they gain in education with skills needed in the clinic.

CONCLUSION:

In brief, using practical activities from physiology along with handy clinical tools like oscillometry and impedance venous occlusion plethysmography helps students understand how the circulatory system functions. Results from this class such as blood pressure and ABI values, demonstrate that these methods do provide useful information about a person's health. All measured ABI values showed that arterial supply and probable vascular disease or dysfunction were not a concern in the presented sessions. ABI is proven to be valuable for noninvasive and simple vascular assessments and important for both teaching and practice in healthcare. By concentrating on several aspects of arterial and venous physiology, the way the session was designed enabled us to study vascular health in depth. Since students were required to both do diagnostic procedures and interpret physiological readings, the class supported active learning and made them concentrate on complex physiology subjects. By using this approach, students build their ability to locate the right diagnosis and relate what they learn from books to actual cases. In addition, the teaching model allows primary physiology subjects to be useful for learning the basics of medical diagnosis. If physiology is integrated in this way, students tend to find it easier to both think critically and keep the information they learn over the long run because they relate it to how physiology applies to real medicine. The presence of positive student results and comments showed that the approach improved their confidence, knowledge and appreciation for physiology in medical settings.

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