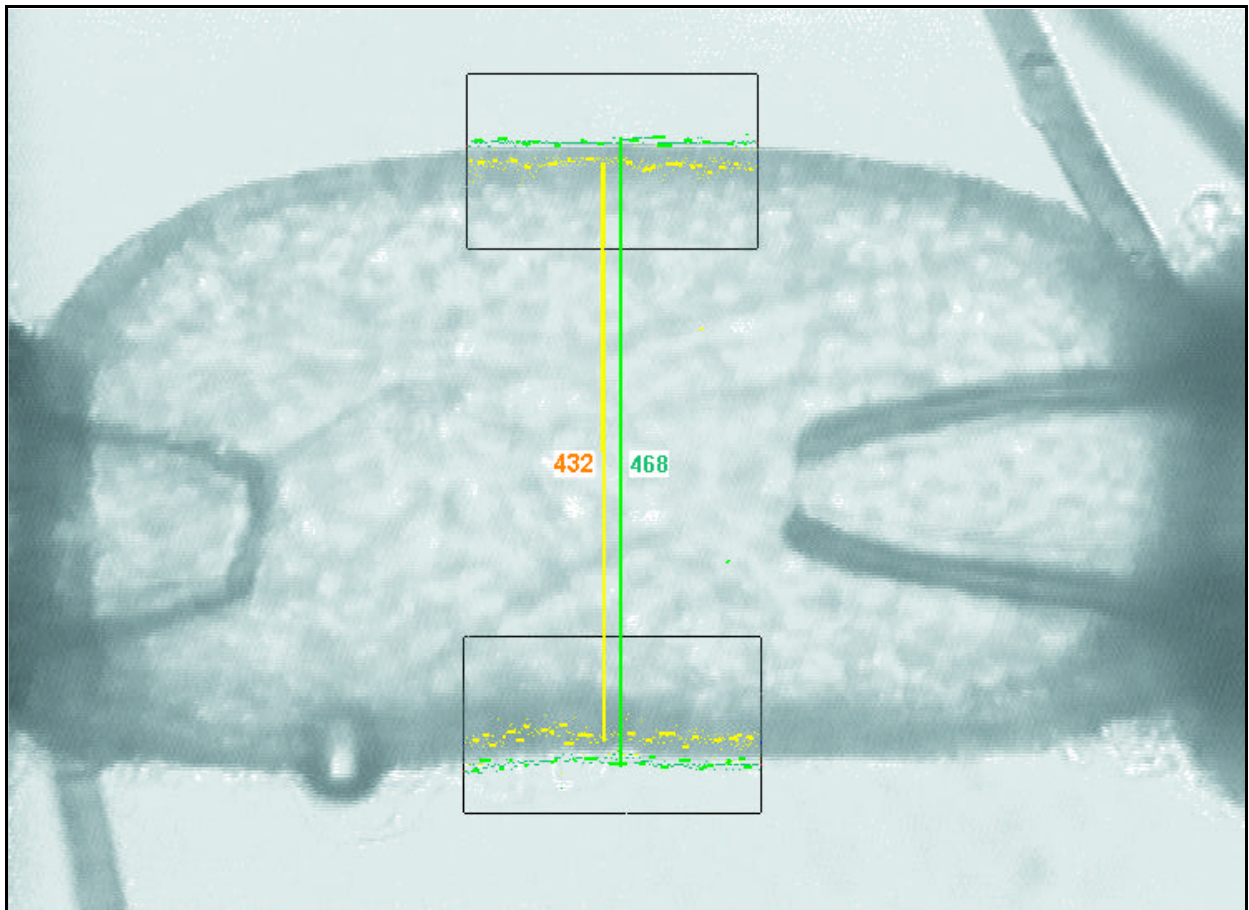


TSE VasoTrack



Determination of the diameter and thickness of blood vessels by videomicroscopy

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1. Introduction

In industrially developed nations up to one quarter of the population suffer from high blood pressure. Eighty-five percent of all the possible varieties of high blood pressure are genetically induced conditions in which environmental factors such as stress and excessive salt consumption also play a part. In the long term increased blood pressure causes damage to various organs. This damage could include cardiac infarction, renal malfunctioning, apoplexy and visual impairment. In many cases the exact causes of increased blood pressure are still not known.

One of the factors into which research is currently being carried out is the blood circulatory system. It is primarily the small blood vessels with a diameter of approx. 200 μm (resistance vessels) which determine the blood pressure level.

It is a known fact that the construction and function of these resistance vessels is altered at high blood pressures (diameter changes).

2. The system

In order to be able to study blood vessel reactions under as realistic physiological conditions as possible together with a high degree of automation we have developed a **vessel analysis system** in which optical measurements are carried out using videomicroscopy and digital image processing.

One of the advantages of this measuring systems is that it functions with conventional PC hardware under an MS-Windows operating system. This means that the system is reliable and easy to use.

The system itself consists of

- a PC with the TSE **framegrabber card** and
- the **VasoTrack** measuring software.

3. Measuring place arrangement

Apart from the measuring system itself (**Fig. 1**), the measuring place also has several other components which are necessary for supplying and controlling the vessel preparations.

After the very careful and gentle preparation of a resistance vessel (injury to its extremely sensitive inner lining would affect the whole measurement) it is attached to a glass capillary. The vessel is surrounded by a physiological saline solution. This allows the internal pressure of the vessel to be varied over a wide range.

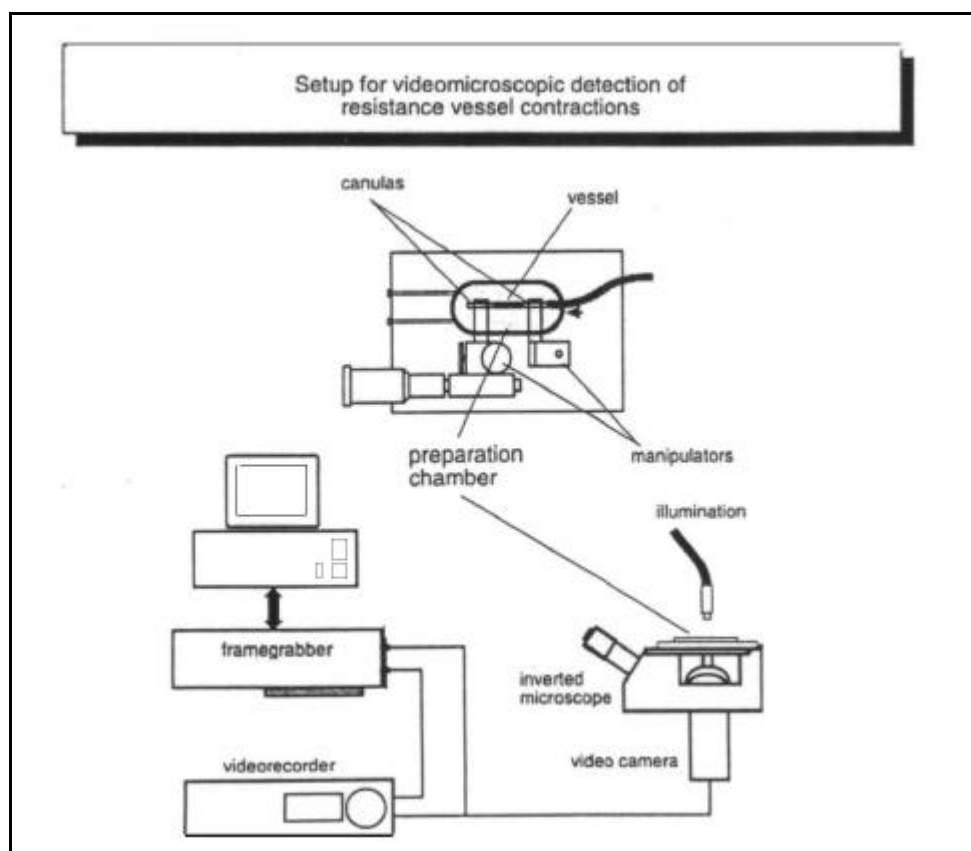


Fig. 1

The arrangement of the measuring place makes it possible to add substances to the physiological saline solution and record the corresponding reaction of the vessel to them (e.g. for testing vasoactive substances).

4. The measurement

Fig. 2 shows a section of a measurement.

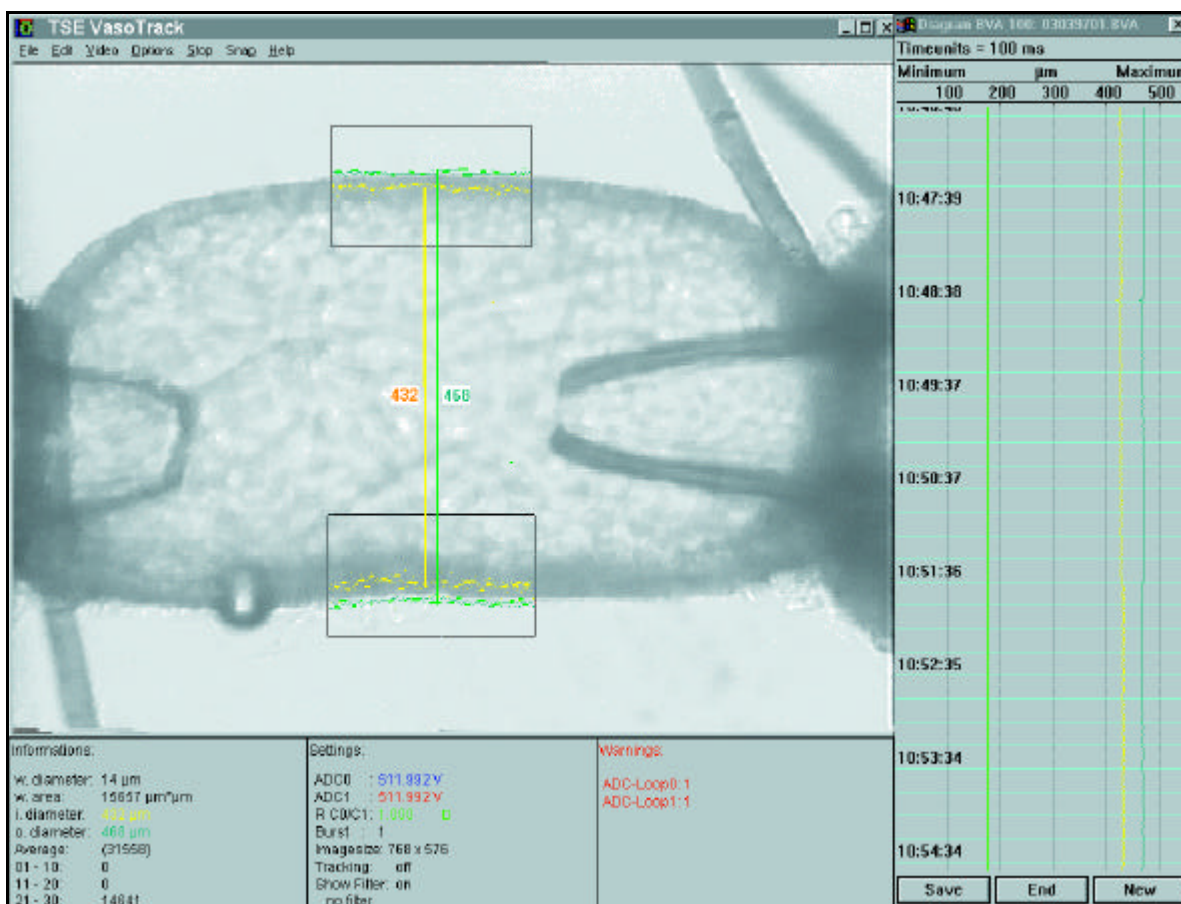


Fig. 2

Apart from the on-line diameter-time presentation in the diagram window, the display of the determined vessel edges in the vessel image together with the display of the determined mean values of the previous measurement in a separate window are beneficial for checking the measuring process.

The largely automatic, but still controllable, recording of the vessel diameter alterations means that the operator is free to concentrate completely on carrying out the experiment.

The storage of video images during the measurement is carried out simply by pressing a key. The time of storage and the image name are noted in the measuring file.

The possibility of altering the settings of various parameters (threshold values, low-pass filter) means that it is easy to adapt the measuring system to different types of vessels. There is also a simple way of calibrating the system with a length scale.

5. Result of a measurement

At the end of a measurement an ASCII file with all relevant numbers and comments is available. The following are listed in tabular form:

- time,
- inner vessel diameter,
- outer vessel diameter,
- cross-sectional area of vessel wall, and
- comments which the operator can enter by pressing keys.

This file can be further processed in other programs (e.g. spread-sheet programs, etc.). A typical evaluation of such a measurement can be seen in **Fig. 3**.

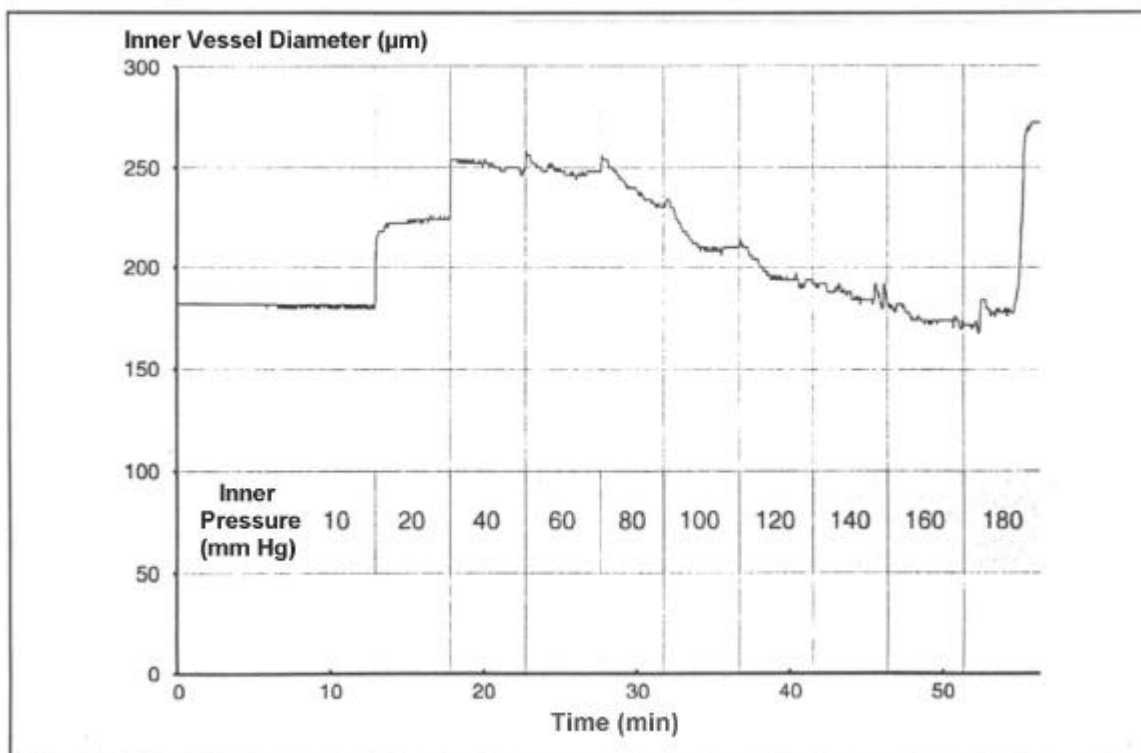


Fig. 3

6. Brief system characterization

Fields of application

- Measuring the length of structures or objects (e.g. myocytes) which can be detected optically.
- Specially designed for the contact-free recording of alterations in the diameter of resistance vessels; the inner and/or outer diameter is recorded.

Performance

- The possibility of altering the settings of various parameters (threshold values, low-pass filter) means that it can be adapted to a wide range of objects.
- Diameter determinations are always reliable, even under unfavorable contrast conditions and moving vessels walls (measuring field tracking).
- Several measurements per second are possible depending on the size of the selected measuring field.
- If the system is calibrated then measurements can be made directly according to a selected scale.

Option

- Our newest development, the fluorescence emission analyzer **FluoCal**, performs calcium measurements in parallel to your diameter or movement analysis. Highest sensitivity and time resolution are provided via single photon counting and a revolutionary processing of incoming data.

7. Ordering Information

Cat.No.	Description
690210-VTS	VasoTrack Videomicroscope measuring system (VTS) for invitro analysis of bloodvessel-diameter and wallthickness. For use with optional microscope, consisting of: <ul style="list-style-type: none">• VasoTrack Software System (Windows)• VasoTrack Display Processor & Imaging Board• VasoTrack High Speed CCD Camera, 60 Hz, up to 360 frames/sec• VasoTrack Video-kit (recorder, cables)• Micromanipulator & adapter to microscope• Preparation chamber with carbogenization connector• PC System & Monitor• Connectors
690210-STI	VasoTrack Cell Stimulator

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