

From the Gynecologic Clinic (Head: Professor PER WETTERDAL) of the Caroline Institute, Sabbatsberg Hospital, Stockholm, Sweden; and the Photogrammetric Department (Head: Professor BERTIL HALLERT) of the Royal Institute of Technology, Stockholm, Sweden.

Stereoscopic capillaroscopy.

**A method for photogrammetric investigation
and registration of the peripheral blood-vessel system,
with special regard to the gingiva and oral mucosa.**

By

GÖSTA FORSLUND.

Review.

The capillary examination of various organs, the mucous membranes and the skin have long been performed according to the microscopic method worked out by LOMBARD (1912) and WEISS (1916). Since this time the procedure has undergone no changes in principle. It has generally been the practice for research workers to register their findings by means of drawings and photomicrographs. KOLB (1931) and PARMA (1939) are among those who have pointed out the disadvantage of the ordinary two-dimensional photomicrograph. The use of the third dimension is clearly of great importance in mensuration as one cannot assume the capillaries and veins to lie parallel to the film plane.

Capillary measurements have been carried out histologically (SPALTEHOLZ, 1893; CRAIGIE, 1921) and by capillaroscopic procedures using the ocular micrometer (BROWN & GIFFIN, 1923).

The new method.

Pilot investigations of the blood-vessel system of the gingiva and oral mucosa have been performed to sound the possibilities of measuring those vessels that are visible under the capillary microscope. The Zeiss-Opton stereoscopic preparation micro-

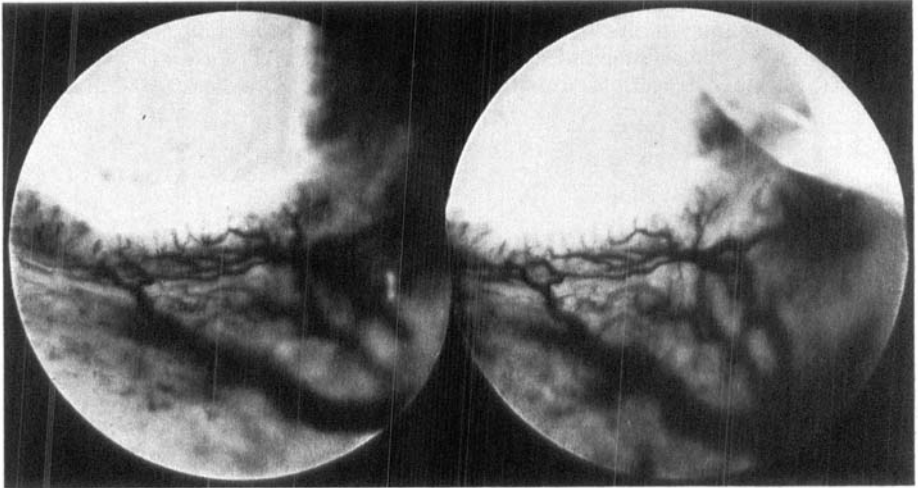


Fig. 1.

A stereo-pair of veins in the marginal gingiva of the lower jaw. Capillary loops are visible at the limit of the depth of focus. (Objective—eyepiece 16 \times , extension lens 2 \times , giving a real image in the film plane of about 14 \times .)

scope was employed. No description of the instrument or its clinical application will be provided but there is mention of some details of photographic registration.

It is intended that the microscope shall be used as a *stereo-camera*, and for this purpose each ocular is supplied with a suitable camera housing (R. Winkel, G. m. b. H., Göttingen). Exposures were made by electronic flash light. The Blaupunkt Ultrablitz-Reporter 51 with amplifier as the power unit. This provides a light of about 6,000°K and closely resembles the solar spectrum. The light consumes 400 joules with one lamp or 200 joules for each of two lamps used simultaneously. The exposure was about 1/5,000 second. 6 $\frac{1}{2}$ \times 9 cm orthochromatic plates were used and a green filter (Gevaert G. 537) placed at the light source.

Discussion.

With the method outlined the author has obtained three-dimensional photographs of blood-vessels and other objects. The negatives can be used for mensuration without photographic

enlargement, since the measuring instrument employed, the stereo-comparator, gives an optical enlargement of $\times 8$.

Since the geometric properties of the apparatus can be calculated with precision, absolute figures of greater accuracy than hitherto should be obtainable.

Summary.

No measurements of the gingival blood-vessels have hitherto been reported. With such measurements in view a pilot investigation has been carried out.

Using the Zeiss-Opton stereo-microscope adapted as a stereo-camera it should be possible to obtain absolute measurements, of capillaries for instance, in accordance with photogrammetric theory. Some photographic details are given.

Résumé.

La capillaroscopie stéréoscopique.

Une méthode pour l'examen photogrammétrique et la registration du système périphérique des vaisseaux sanguins, en particulier de la gencive et de la muqueuse buccale.

On n'a pas donné dans la littérature, de chiffres exacts sur les dimensions des vaisseaux sanguins de la gencive. L'auteur a fait des recherches préliminaires dans l'intention de mettre à point une méthode pour obtenir ces dimensions.

Il doit être possible d'arriver à des chiffres absolus sur les dimensions, des capillaires par exemple, en employant le stéréoscope Zeiss-Opton adapté comme une stéréocamera, selon la théorie de la photogrammétrie. On donne des détails photographiques.

Zusammenfassung.

Die stereoskopische Kapillaroskopie.

Eine Methode für die photogrammetrische Untersuchung und Registrierung des peripherischen Gefäßsystems insbesondere des Zahnfleisches und der Schleimhaut.

Keine Messungen von Zahnfleischgefäßen sind bis jetzt in der Literatur beschrieben. Mit solchen Messungen vor Augen hat der Verfasser eine vorläufige Untersuchung unternommen.

Mittels des Zeiss-Opton Stereomikroskops, wie einen Stereokamera angepasst, ist es möglich absolute Messungen, zum Beispiel von Kapillären gemäss die photogrammetrischen Theorien zu erhalten.

Einige photographischen Einzelheiten sind vorgelegt.

References.

- BROWN, G. E. & GIFFIN, H. Z.: Studies of capillaries and blood volume in polycythemia vera. *Am. J. Sc.* 166, 489—502, 1923.
- CRAIGIE, E. H.: The vascularity of the cerebral cortex of the albino rat. *J. Comp. Neurol.* 33, 193—211, 1921.
- FORSLUND, G.: Stereoskopisk kapillärmikroskopi. En metod för fotogrammetrisk undersökning och registrering av det perifera blodkärlssystemet, speciellt vener och kapillärer i tandkött och munslimhinna. *Sv. Tandl. Tidskr.* 45, 369—373, 1952.
- KOLB, H.: Kapillarphotographie bei Parodontose. *Parodontium* 3, 150—159, 1931.
- LOMBARD, W. P.: The blood pressure in the arterioles, capillaries and small veins of the human skin. *Am. J. Physiol.* 29, 335—362, 1912.
- PARMA, KATRI: Kapillarmikroskopische Untersuchungen bei Schwangeren, mit besonderer Berücksichtigung der Zahnfleischkapillaren. *Finska Tandläkaresällskapets Förhandl. Diss.* 56, 1939.
- SPALTEHOLZ, W.: Die Verteilung der Blutgefässe in der Haut. *Arch. f. Anat.* 17, 1—54, 1893.
- WEISS, E.: Beobachtung und mikrophotographische Darstellung der Hautkapillaren am lebenden Menschen. *Deutsches Arch. klin. Med.* 119, 1—38, 1916.

Address:

Sabbatsbergs Sjukhus,
Stockholm C, Sweden.