Letters to the Editor

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Liquid Crystal Thermography; Comments on Technique

The article by Hofferberth, Gottschaldt, and Dykan (Stroke 11:27-30, 1980) has drawn attention to the use of liquid crystal (LC) thermography as a non-invasive technique for assessing cerebral vascular disease. I have employed LC thermography in my examinations in the office and at the bedside since 1971 when I was first introduced to the technique by Dr. Henry B. Stokes of Guatemala City. Some of the information that I have gained with LC thermography may prove of value to those who wish to adopt the method.

Plastic sheets coated with encapsulated LC are available from various American suppliers (I have obtained mine from Edmond Scientific Company, Barrington, NJ 08007 and from Carolina Biological Supply Company, Burlington, NC 27215). Each sheet has a characteristic range of thermal sensitivity spanning from 1° to 5° Celsius. Within its predetermined range of temperature, a sheet of LC exhibits thermophotochromism, whereby the sheet undergoes distinctive changes in color from brick-red through yellow, green, and blue. Each color correlates with a specific temperature. To preserve their color reactivity, sheets of LC must be protected from excessive mechanical force such as bending or pressure. I have found LC over the range of 30° to 35° Celsius most useful for forehead measurements in normothermic patients. Often, the sheet turns blue (at or above its maximal temperature) with surrounding bands of color representing isotherms of lower temperature caused by less intimate contact of the sheet with the skin. Since the LC often enter the blue range, one cannot always surmise absolute temperature by directly comparing colors between the two sides. Accordingly, I observe the rate of warming between right and left sides after applying the sheet to the forehead and the rate of cooling upon removing the sheet after 10–15 sec of skin contact. Of course, rate of color evolution and devolution is dependent upon thermal conductivity and the temperature gradient between skin and ambient air.

Two characteristic thermographic patterns often encountered are unilateral hyperthermia (cutaneous vasodilatation and/or anhidrosis) and unilateral hypothermia (cutaneous underperfusion in the internal or external carotid territories). When a thermal asymmetry appears, the abnormal side must be determined on the basis of clinical data such as other signs of Horner's syndrome, lateralized sensorimotor deficits, and the precise anatomical location of the cutaneous temperature difference.

I have found LC thermography to be a highly reproducible procedure which is used routinely on our service for all patients suspected of having cerebrovascular disease. I feel its sensitivity and accuracy approximate that of other non-invasive techniques for high-grade occlusive disease, but it offers the unique advantage of detecting incomplete Horner's syndrome.

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