

22. Goadsby PJ, Edvinsson L. Human in vivo evidence for trigeminovascular activation in cluster headache. *Brain* 1994;117:427-434.
23. May A, Bahra A, Buchel C, Frackowiak RSJ, Goadsby PJ. Hypothalamic activation in cluster headache attacks. *Lancet* 1998;351:275-278.
24. May A, Ashburner J, Buchel C, et al. Correlation between structural and functional changes in brain in an idiopathic headache syndrome. *Nat Med* 1999;5:836-838.
25. Kudrow L. Response of cluster headache attacks to oxygen inhalation. *Headache* 1981;21:1-4.
26. Friedman AP, Mikropoulos HE. Cluster headache. *Neurology* 1958;8:653-663.
27. Ibraheem JJ, Paalzow L, Tfelt-Hansen P. Low bioavailability of ergotamine tartrate after oral and rectal administration in migraine sufferers. *Br J Clin Pharmacol* 1983;16:695-699.
28. Tfelt-Hansen P, Johnson ES. Ergotamine. In: Olesen J, Tfelt-Hansen P, Welch KMA, eds. *The headaches*. New York: Raven Press, 1993:313-322.
29. Kitrelle JP, Grouse DS, Seybold ME. Cluster headache: local anesthetic abortive agents. *Arch Neurol* 1985;42:496-498.
30. Barre F. Cocaine as an abortive agent in cluster headache. *Headache* 1982;22:69-73.
31. Visser WH, Klein KB, Cox RC, Jones D, Ferrari M. 311C90, a new central and peripherally acting 5HT-1D receptor agonist in the acute oral treatment of migraine: a double-blind, placebo-controlled dose-range finding study. *Neurology* 1996;46:522-526.
32. Rapoport AM, Ramadan NM, Adelman JU, et al. Optimizing the dose of zolmitriptan (Zomig, 311C90) for the acute treatment of migraine. *Neurology* 1997;49:1210-1218.
33. MaassenVanDenBrink A, Reekers M, Bax WA, Ferrari MD, Saxena PR. Coronary side-effect potential of current and prospective antimigraine drugs. *Circulation* 1998;98:25-30.

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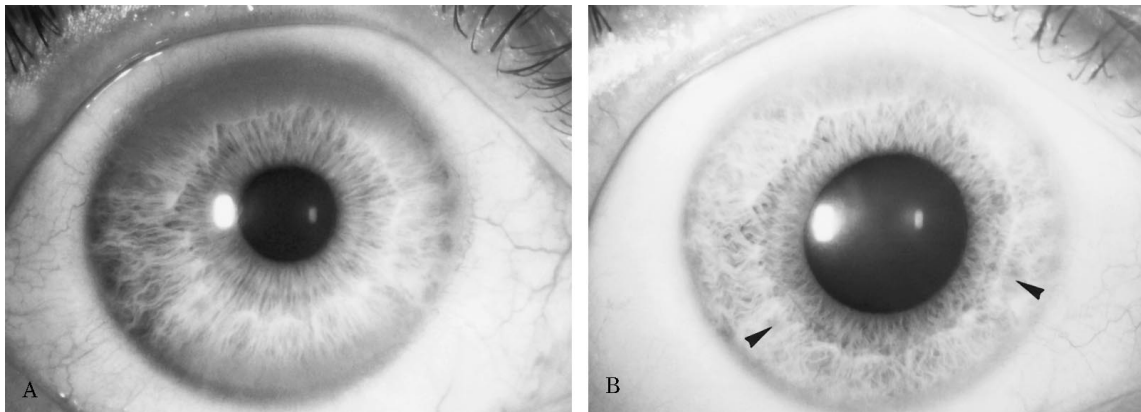


Figure. (A) Marked Kayser-Fleischer corneal ring superiorly and inferiorly. (B) Same eye 12 years after successful treatment with D-penicillamine. Note marked regression of Kayser-Fleischer corneal ring, which has virtually disappeared inferiorly. Note two unrelated small iris nevi of similar color at 4 and 7:30 on the iris (arrowheads).

Kayser-Fleischer corneal ring

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A 26-year-old man was diagnosed with Wilson's disease in 1981. D-penicillamine treatment was started but discontinued because of increased tremor. We first treated the patient in our ICU in 1987 for acute neurologic deterioration after mild brain injury caused by a fall. On admission, he was stuporous and unable to communicate verbally. We observed vertical gaze palsy, an increase in muscle tone, and a prominent circular Kayser-Fleischer corneal ring (A). The laboratory findings revealed low serum copper (400 $\mu\text{g/L}$), low ceruloplasmin (7 mg/dL), and elevated 24-hour urine copper (1403 $\mu\text{g}/1800 \text{ mL urine/day}$). Treat-

ment with D-penicillamine was reinstated, along with physiotherapy and ergotherapy. The patient, now 44, is ambulatory and was recently readmitted for follow-up. Mild dysarthria, mild bilateral dysdiadochokinesia, and mildly elevated muscle tone of all four limbs were found, and the Kayser-Fleischer corneal ring had markedly regressed (B). Serum copper (203 $\mu\text{g/L}$) and ceruloplasmin (3.9 mg/dL) were diminished. D-penicillamine will be continued.

The presence of a Kayser-Fleischer corneal ring^{1,2} may correlate with treatment and markedly regress after successful decoppering.

1. Fleischer B. Zwei weitere Fälle von grünlicher Verfärbung der Hornhaut. *Klin Monatsbl Augenheilkd* 1903;41:335-352.
2. Finelli PF. Kayser-Fleischer ring: hepatolenticular degeneration (Wilson's disease). *Neurology* 1995;45:1261-1262.

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Kayser-Fleischer corneal ring

Neurology 2000;54;1839

DOI 10.1212/WNL.54.9.1839

This information is current as of May 9, 2000

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