

Occipital Lobe Meningioma in a Patient With Multiple Chemical Sensitivities

Joel F. Moorhead, MD, MPH and Anthony J. Suruda, MD, MPH*

Background *The concurrent diagnosis of meningioma with increased intracranial pressure has not been reported previously in a patient who meets diagnostic criteria for multiple chemical sensitivities (MCS).*

Methods *A patient who had been evaluated in an occupational medicine practice, and by several other physicians for sensitivity to chemical odors was found to have papilledema and a visual field deficit. The patient met the clinical criteria set forth by Cullen in 1987 for MCS. A magnetic resonance imaging (MRI) scan was performed.*

Results *The MRI revealed a large occipital lobe meningioma, which was surgically resected. Removal of the meningioma had little effect on the patient's symptoms. She has been unable to return to her job as a custodian.*

Discussion *The etiology of MCS has been disputed and is currently unresolved. Those who evaluate patients with MCS are reminded that meningiomas and other intracranial mass lesions can affect olfaction, and that patients with MCS can have treatable intracranial abnormalities.* Am. J. Ind. Med. 37:443–446, 2000. © 2000 Wiley-Liss, Inc.

KEY WORDS: *multiple chemical sensitivity (MCS); meningioma; neoplasms; environmental illness; occupational medicine; illness behavior; smell*

INTRODUCTION

Patient complaints of sensitivity to odors and to chemical exposure are common in occupational medicine practice. The rarity of relevant documented organic disease in these patients can tend to reduce the practitioner's usually energetic search for an anatomic or physiologic etiology for the patient's symptoms. The following case report discusses a patient who was discovered to have a large right occipital lobe meningioma during her diagnostic evaluation for multisystem complaints associated with unpleasant olfactory experiences.

CASE REPORT

The patient, a 59 year-old woman was examined at the Occupational Medicine Clinic at the University of Utah on September 5, 1994, with the medical complaint that she had become allergic to the chemicals she was using in her work as a custodian.

The patient had worked as a custodian for 15 years. She initially complained of occipital headaches which were partially relieved by tilting her head back, ringing in her ears, decreased hearing, memory problems, confusion, nasal irritation, skin burning and itching, abdominal, flank, and shoulder pain, weakness, fatigue, and visual disturbances including flashing lights, worm-like visions, and patchy visual loss.

Her symptoms had begun 12 years earlier, when she noticed a headache after using window cleaners. Several years later, she observed getting a headache and cough after using other cleaners as well. Three years prior to being seen at the University of Utah, she experienced the gradual onset of the additional symptoms (already listed). She also

Contract grant sponsors: National Institute for Occupational Safety and Health (NIOSH); Contract grant number: T42/CCT810426-05

*Correspondence to: Dr. Suruda, University of Utah, Rocky Mountain Center for Occupational and Environmental Health, Department of Family and Preventive Medicine, 75 South 2000 East, Salt Lake City, UT 84112-5120. E-mail: asuruda@dfpm.utah.edu

Accepted 2 December 1999

observed that these symptoms occurred only in the presence of chemical odors, and reported inhalation exposure to cleaning products, without ingestion and with only limited skin contact. Her symptoms became so severe that she had to stop working from August 22, 1994.

Review of systems disclosed no shortness of breath or skin rashes. Her past medical history was significant only for recurrent sinus infections. A sinus CT on June 20, 1994 was consistent with mild sphenoid sinusitis. She did not smoke, drink alcohol, or take illicit drugs. Her past surgical history disclosed a cholecystectomy, hysterectomy, left breast biopsy, and right knee arthroscopy. She took estrogen supplements regularly, and also took Seldane[®] (terfenadine) and antibiotics when needed for sinus infections. She had already consulted an allergist in early 1994, who advised her that she was allergic to some trees, shrubs, plants, wheat, and household dust and mentioned the possibility of multiple chemical sensitivity. She denied medication allergies.

A history of inhalation and limited skin contact with ethanolamine, phosphoric acid, and 2-butoxyethanol was documented. These substances are respiratory and mucous membrane irritants at high concentrations. Under the conditions of usage that the patient described, high-concentration exposure appeared to be unlikely.

Physical examination disclosed an elevated blood pressure at 150/100. No wheal was elicited on the scratch test. No motor or sensory abnormalities were noted. Laboratory test evaluation was normal except for an elevated cholesterol at 245. Pulmonary function tests were normal.

The patient was advised to avoid contact with the cleaning products that precipitated her symptoms pending the outcome of further diagnostic testing.

Subsequent evaluation by another physician disclosed papilledema and a left upper quadrant visual field deficit consistent with a right occipital lesion. On September 20, 1994, an MRI scan disclosed a 6 cm right occipital tumor that had the appearance of a meningioma (Figs. 1 and 2). She underwent a craniotomy on October 10, 1994, and a large right occipital lobe meningioma was removed. The dural origin of the tumor could not however, be removed. Her recovery was uneventful, and visual field deficit persisted postoperatively.

The patient was again seen at the University of Utah Occupational Medicine clinic on October 8, 1998 for a reevaluation of her ability to work. At that time she reported that the removal of her meningioma had had no effect on her symptoms. She continued to experience fatigue, and skin burning and itching upon exposure to a variety of odors that were common in her community. She had not yet returned to work.

At the time of the 1998 follow-up visit, the patient reported that even odors which others found innocent or pleasant, like that of a perfume, were capable of causing her

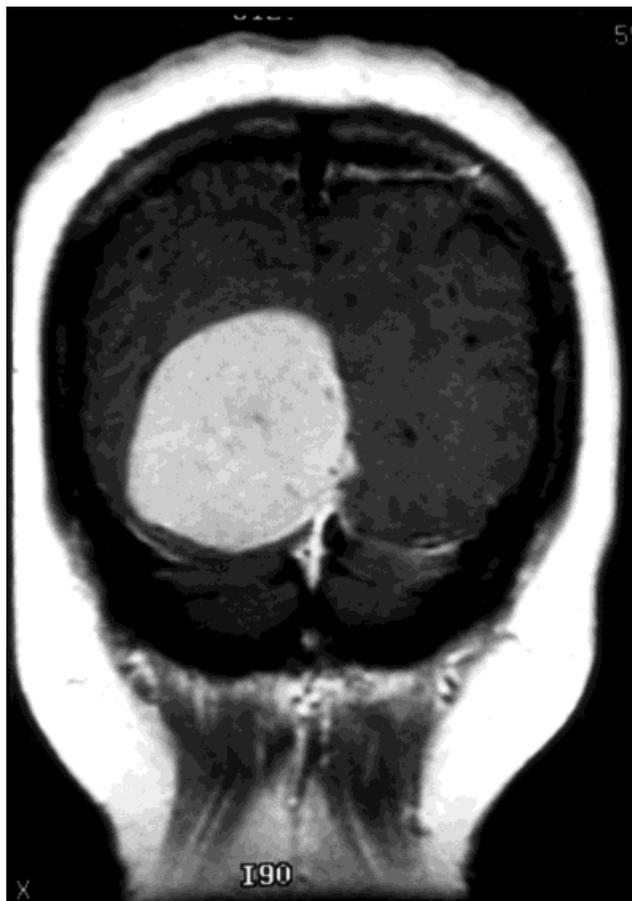


FIGURE 1. MRI scan of brain, A-P view.

to feel ill. She reported frequently being aware of odors while others remained unaware of them. She also felt that the number of odors which were troubling her were increasing with time. She opined that, since she had been sensitized by exposure to cleaning products, it was easier for other odors to make her feel ill. She reported that that Echinacea Golden Seal, Zyrtec[®] (cetirizine HCl), and Alleve[®] (naproxen sodium) shortened the duration of her symptoms.

DISCUSSION

A working definition of multiple chemical sensitivity (MCS) had been proposed by Cullen in 1987. According to this definition, the onset of MCS is associated with an identifiable environmental exposure. Patients experience multisystem symptoms in response to low level exposures to predictable stimuli. Diagnostic evaluation does not identify a plausible explanation for patients' symptoms [Cullen, 1987]. Neurologic and psychiatric symptoms predominate, with respiratory and gastrointestinal symptoms reported frequently as well [Fiedler and Kipen, 1997]. MCS patients

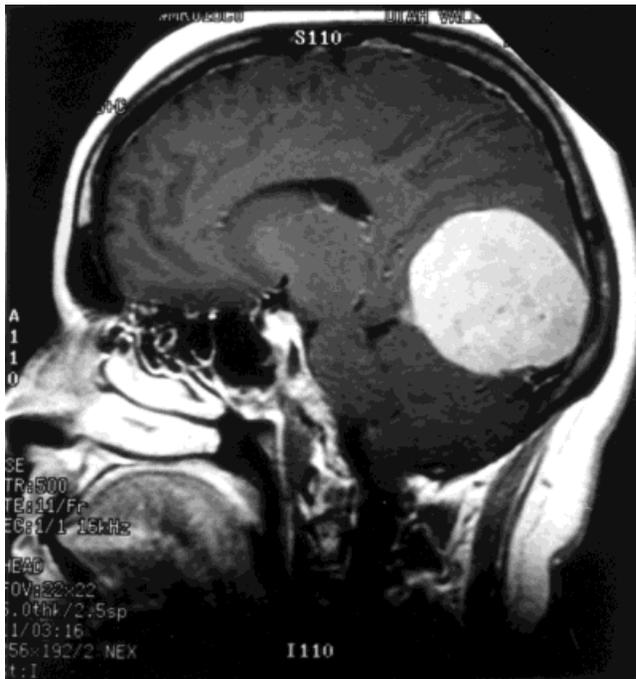


FIGURE 2. MRI scan of brain, lateral view.

are often educated, middle-aged women with a shy temperament [Newlin, 1997]. Females are most often affected, by a ratio of 4:1 to men; a ratio which is of perhaps greater interest in this case considering the 2.4:1 female predominance in meningioma patients. Many patients date the onset of symptoms to a specific event, but 38% report a gradual onset without specific initiating exposure [Fiedler and Kipen, 1997].

The patient-in-discussion appears to meet the criteria set forth in Cullen's working definition of MCS. She is a middle-aged female who spends much of her time at home. She has multisystem complaints, with neurologic and cognitive symptoms predominating. She reports a gradual onset of symptoms, and now becomes symptomatic after low-level exposures that would generally be considered harmless. The diagnostic evaluation of the patient did disclose organic disease, a large occipital lobe meningioma, but it is unlikely that all of her past and present symptoms can be ascribed to her meningioma.

Meningiomas can present with headaches, seizures, cranial neuropathies, and focal neurologic deficits [Black, 1995]. The location of this patient's tumor is consistent with her visual symptoms and her headaches, but an occipital lobe tumor would not fully explain the patient's entire spectrum of symptoms. Increased intracranial pressure (ICP) as suggested by this patient's history of papilledema could be responsible for more global neurological and cognitive disturbances, although persistent mental symptoms would be expected to result only from prolonged unrelieved increased ICP.

Mechanisms of mental symptoms in patients with increased intracranial pressure include dysfunction of the brainstem reticular formation and its projections to the cortex, direct compression of brain tissue, and impaired vascular and cerebrospinal fluid circulation [Lishman, 1987]. While frontal lobe tumors are more often associated with mental symptoms than other intracranial tumors [Lishman 1987; Lampl et al., 1995], 52-82% of patients with occipital tumors can have mental symptoms [Lishman, 1987]. Pressure from more focal peritumoral edema has been associated with psychiatric disturbances in meningioma patients as well.

In a series of 50 patients with intracranial meningiomas studied by Lampl et al., 72% had convexity meningiomas and 28% had base-of-skull meningiomas such as the occipital lobe meningioma in Figures 1 and 2. Psychiatric disorders were diagnosed in 44% of the patients with convexity meningiomas, but in none of the patients with base-of-skull meningiomas [Lampl et al., 1995]. Anxiety attacks have been reported in a patient with a right temporal lobe meningioma [Ghadirian et al., 1986], and mania in patients with frontal and temporal meningiomas [Starkstein et al., 1988]. The mass effect of the patient's meningioma may partially explain her clinical presentation, but is not a completely plausible explanation for the multiple persistent effects that chemical aromas have on her health. The concepts of kindling and time-dependent sensitization (TDS) may be applicable to the development of this patient's chemical sensitivity.

Low-level electrical stimuli applied to the brains of experimental animals will eventually produce seizures, if they are presented repeatedly over time, a phenomenon called kindling. Sorg and Prasad note that behavioral sensitization by stress and kindling can make an organism more responsive to stimuli over time [Sorg and Prasad, 1997]. A variety of substances can elicit this TDS, including stimulants, glucocorticoids, tranquilizers, antidepressants, ethanol, toluene, and formaldehyde [Bell et al., 1997]. Tumors that are remote from anterior fossa olfactory structures can cause disturbances of the sense of smell, due to increased intracranial pressure [Schurr, 1975]. Sinusitis and allergic rhinitis have been reported to cause olfactory dysfunction [Li et al., 1994]. Substances that are not ordinarily strong trigeminal stimulants have been reported to cause trigeminal stimulation in patients with MCS [Fiedler et al., 1996], possibly resulting in an ammonia-like experience from usually innocuous aromas. Middle-aged women without a diagnosed nasal or other disease have been reported to experience 'parosmia,' a 'subjective distortion of olfactory perception' [Pryse-Phillips, 1975]. It seems possible that, by one of the above mechanisms, this patient experienced the aroma of the cleaning compounds at work with increasing intensity or distortion during her years of custodial work. McPhail

[1997] notes that a stimulus-response model has been used to explain the development of MCS.

A heightened perception of the aroma of cleaning compounds in the setting of even normal job stress could create conditions favoring a conditioned response. Flavors and odors can be potent triggers for the formation of a conditioned response. Conditioned responses can take many forms, including alterations of cardiovascular, respiratory, gastrointestinal, and immunological function [MacPhail, 1997]. Although speculative, it is possible that multisystem symptomatology such as that observed in this patient could result from a psychological mechanism. A primary psychiatric disorder which presents with somatic complaints is also possible.

The patient presented here remains constantly preoccupied by somatic concerns which have substantially limited her activities, even though it has been years since she has had any chemical exposure beyond what would be expected from normal household and community substances. Patients with MCS score higher on psychological scales that relate to somatic concerns. Many display heightened sensitivity to the physical manifestations of anxiety [Sorg and Prasad, 1997]. As many as 50% of MCS patients have met the criteria for Axis I disorders within their lifetimes [Sorg and Prasad, 1997], and as many as 75% may have a history of an Axis II mental disorder within their lifetimes [Black et al., 1993]. An interaction between exposure and psychological stress may lead to chemical sensitivity in some people [Bell et al., 1997].

CONCLUSION

In her 1962 book *Silent Spring*, Rachel Carson wrote, "As crude a weapon as the cave man's club, the chemical barrage has been hurled against the fabric of life." For many MCS patients, the "chemical barrage" is a fearsome enemy. The multiple vague symptoms which MCS patients report are frustrating both to patient and physician alike.

Physicians who evaluate patients with symptoms of MCS are reminded that intracranial masses, such as the meningioma found in this patient, can affect olfactory perception. Because of the patient's multiple non-specific symptoms, her meningioma may have gone undiscovered were it not for her visual signs and symptoms. This patient's tumor may have contributed to her heightened perception of the aromas around her, which in turn may have triggered a conditioned response producing non-visual symptoms.

This patient's non-visual symptoms persisted even after removal of tumor, making the contribution of the tumor to her persistent widespread symptoms questionable. A conditioned response or another primarily psychological etiology may be responsible for the multiple non-specific symptoms of which she continues to complain.

REFERENCES

- Bell IR, Schwartz GE, Baldwin CM, Hardin EE, Klimas NG, Kline JP, Patarca R, Song Z-Y. 1997. Individual differences in neural sensitization and the role of context in illness from low-level environmental chemical exposures. *Environ Health Perspect* 105(Suppl 2):457-466.
- Black DW, Rathe A, Goldstein RB. 1993. Original Research Reports. Measures of distress in 26 "environmentally ill" subjects. *Psychosomatics* 34(2):131-138.
- Black, PMcL. 1995. Benign brain tumors. *Neurol Clin* 13(4): 927-952.
- Cullen MR. 1987. The worker with chemical sensitivity: an overview. *Occup Med State Art Rev* 2:669-681.
- Fiedler N, Kipen H. 1997. Chemical sensitivity: the scientific literature. *Environ Health Perspect* 105 (Suppl 2):409-415.
- Fiedler N, Kipen HM, DeLuca J, Kelly-McNeil K, Natelson B. 1996. A controlled comparison of multiple chemical sensitivity and chronic fatigue syndrome. *Psychosom Med* 58:38-49.
- Ghadirian AM, Gaughier S, Bertand S. 1986. Anxiety attacks in a patient with a right temporal lobe meningioma. *J Clin Psychiatry* 47:270-271.
- Lampl Y, Barak Y, Achiron A, Sarova-Pinchas I. 1995. Intracranial meningiomas: correlation of peritumoral edema and psychiatric symptoms. *Psychiatry Res* 58:177-180.
- Li C, Yousem DM, Doty RL, Kennedy DW. 1994. Neuroimaging in patients with olfactory dysfunction. *AJR* 162:411-418.
- Lishman WA. 1987. *Organic Psychiatry*. 2nd ed. Boston: Blackwell Scientific Publications.
- MacPhail RC. 1997. Evolving concepts of chemical sensitivity. *Environ Health Perspect* 105(Suppl 2):455-456.
- Newlin DB. 1997. A behavior-genetic approach to multiple chemical sensitivity. *Environ Health Perspect* 105(Suppl 2):505-508.
- Pryse-Phillips W. 1975. Disturbance in the sense of smell in psychiatric patients. *Proc R Soc Med* 68:472-474.
- Schurr PH. 1975. Aberrations of the sense of smell in head injury and cerebral tumors. *Proc R Soc Med* 68:470-472.
- Sorg BA, Prasad BM. 1997. Potential role of stress and sensitization in the development and expression of multiple chemical sensitivity. *Environ Health Perspect* 105(Suppl 2):467-471.
- Starkstein SE, Boston JD, Robinson RG. 1988. Mechanisms of mania in brain injury. *J Nerv Ment Dis* 176(2):87-100.