CHAPTER 4

Laboratory Procedures Related to the Metals

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INTRODUCTION

Most physicians can recall from their medical student days a learned professor standing at the lectern and saying, “if you just listen, your patient will tell you what is wrong.” Some patients, however, cannot tell their story well. There simply are certain things in a patient's history which no patient no matter how intelligent or well versed would put into his/her “own story.” For precisely this reason the review of systems is universally included as part of the medical history to pick up things that are wrong, which the patient has left out of his story. It is then up to the physician to find out how these symptoms are related to the presenting illness. It is our responsibility as physicians to elicit this data and to make sense of it. This is even more starkly the case when one considers the vast array of symptoms produced by disorders of metal metabolism or by metal poisoning. Consequently, any information which is obtained about these elements, in almost all cases, is the responsibility of the physician to elicit from specially designed historical questions and from the laboratory.

Laboratory analysis as an aid to diagnosis in psychiatry is not one of our richer traditions. In most instances, our use of such tests is on a pro forma basis. Consequently, when we admit a patient to the hospital, many psychiatrists do certain laboratory tests because they are required for admission to hospital. Or we order a white blood cell count to make sure that our patient who has now devel-
oped a sore throat is not developing agranulocytosis from the medication we are giving. On the clinical level, our consultation/liaison and biologically oriented colleagues remind us that certain body chemicals when elevated or deficient can cause approximations of some of the syndromes which we are fond of diagnosing. These reminders usually provoke the more observant of us to say somewhat uncomfortably to ourselves something such as “I’ll look out for that more closely.” Very few of us, however, actually change our diagnostic habits. Such a nonchalant attitude toward laboratory analysis can no longer hold sway in our specialty. This is especially true in the area of metal deficiencies and intoxications where the laboratory is absolutely indispensable. Disorders of metal metabolism (essential and nonessential) often produce syndromes which are either totally or partially psychiatric in their presentation [1].

This chapter deals with the laboratory procedures related to metal disorders. The essential metals are described first, followed by the nonessential metals.

**ESSENTIAL METALS**

**Calcium (Ca)**

Calcium has long been known to be an important element for man’s internal homeostasis. It is essential in bone metabolism and for conduction of nerve impulses. In 1968 Peterson [2] demonstrated that elevated serum Ca is related to a variety of psychiatric disorders ranging from subtle personality changes to psychoses. Gatewood, et al [3] in 1978 noted a similar range of disorders in five cases. Carman and his associates have published a series of articles [4-7] relating both serum Ca and cerebrospinal fluid (CSF) Ca to cyclical affective disorders. These authors have demonstrated transient increases in serum Ca at the onset of agitated psychotic and manic states. Further, they have noted more enduring decreases in cerebrospinal fluid Ca of (1) depressed patients as they improve and (2) manic and other agitated psychotic patients. Jimerson et al [8] demonstrated similar CSF findings in depressed patients as they improved and significant increases in CSF Ca in schizophrenics recovering from acute psychotic episodes. Weizman et al [9] reported on a series of twelve patients with hypercalcemia secondary to malignancy, seven of whom demonstrated psychiatric symptomatology ranging from mild anxiety and depression to severe depression and organic psychosis. Groat and Mackenzie [10] in 1980 reported a case of mania following intravenous Ca replacement. Decreases in serum Ca have been noted, in 1976, by Paterson [11] to be associated with a variety of psychiatric symptoms ranging from mild anxiety and irritability to severe depression and toxic psychosis. Prolonged decreases of serum Ca have been associated with irreversible dementia [11].

At the present the most useful and practical Ca measurement for the psychiatrist is the screen Ca. This is obtained in most medical centers as part of the routine SMA-12/60. It should be obtained fasting as an additional screening test to