
Fluorosis of the Cervical Spine

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"All substances are poisons, there is none which is not a poison. The right dose differentiates a poison and remedy".-Paracelsus

Fluorine, the thirteenth most abundant element in the earth's crust, does not occur in its free state in nature. It is therapeutically used as a cariostatic substance and for the treatments of osteoporosis, but prolonged exposure to high amounts of fluorine results in the disabling condition of skeletal fluorosis. The development of skeletal fluorosis is governed by the prevalence of high levels of fluoride intake, continued exposure to fluoride, strenuous manual labour, poor nutrition, magnesium deficiency and impaired renal function [1].

Endemic fluorosis has been reported from many parts of the world [2], [3], [4], [5], [6], [7], where drinking water contains excessive quantities of natural fluoride, as well as from several parts of India [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19]. However, neurological complications of endemic skeletal fluorosis have been exclusively reported from India [20], [21], [22], [23].

Mechanical compression of the spinal cord and nerve roots due to osteophytosis and sclerosis of the vertebral column are the main causes in the production of radiculomyelopathy in this disease [23], which may be complicated by ischaemia of the radicular arteries. There is no known medical treatment of neurological complications of skeletal fluorosis. Earlier experiences of surgery for this condition report a very high morbidity and mortality [21], [24].

However, good results of surgery in this condition were reported by Reddy [25], [26], and in consultation with him we decided to embark upon the difficult task of salvaging these crippled patients. The present report documents our experiences with 10 cervical laminectomies performed for this condition.

Material

A total of 13 patients of fluorotic myelopathy were operated at the Post Graduate Institute of Medical Education & Research (PGIMER), Chandigarh between 1980-85. Ten of these had evidence of cervical spinal cord compression and form the basis of this communication. There were 9 males and one female, ranging between 28-58 years of age. They presented with clinical features of spastic quadriparesis with or without sensory loss. The diagnosis of skeletal fluorosis was obvious from the plain skiagrams.

Preoperative investigations included a full assessment of pulmonary function, which revealed moderate to severe restrictive airway disease in 8 patients (Figure 1). All the patients were prepared with oral magnesium hydroxide and calcium preparations. Steroids were started 48 hours prior to surgery. During surgery intravenous calcium chloride and steroids were administered. The patient's ventilation was controlled, but hyperventilation was avoided. Postoperative ventilatory support was given

whenever required, and steroids, calcium and magnesium hydroxide were continued [29].

Pulmonary function test results

The surgical procedure performed has been a careful, extensive cervical laminectomy. The exterior of laminectomy has been from C2-7 in 7 cases, and C1-6, C3-7 and C2-D2 in one each.

Results

There has been no operative mortality in this series, compared to 100% mortality in four cases operated earlier [7]. One patient with an extremely poor pulmonary function died later, and another succumbed to infective complications. Six patients improved following surgery, while two remained unchanged. All patients were given calcium and magnesium hydroxide for long periods to encourage slow mobilisation and excretion of the fluorine from the body over a period of years.

Discussion

There are very few series of a large number of laminectomies for fluorotic spondylotic myelopathy. While favourable results in selected cases have been reported by Aggrawal and Singh [27] and Jolly [28] et al. Reddy and his colleagues [25], [26] have been the only group so far advocating surgery for these patients with favourable results in the cervical region. Our experiences have been similar [29]. Routine evaluation of pulmonary functions have helped us to plan these patient's operative and postoperative management better. Our anaesthetic colleagues have worked out a regime for the anaesthetic management of such patients, which has made the surgery much safer [30]. It involves perioperative administration of magnesium hydroxide, calcium and steroids. Anaesthesia is induced with thiopentone and suxamethonium, and maintained with oxygen, nitrous oxide, pancuronium and controlled ventilation. The use of pancuronium, blood with CPD and haemaccel is preferred, while hyperventilation and the use of blood with ACD and tetracyclines is avoided as they all produce a fall in serum calcium levels. Long term use of magnesium hydroxide for mobilisation and excretion of fluorine has also been advocated by Reddy et al [31], [32].

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