# Neurosarcoidosis

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**KEYWORDS**

• Sarcoidosis • Neurosarcoidosis • Clinical manifestation • Imaging study
• Treatment • Outcome

**KEY POINTS**

- Neurosarcoidosis occurs in 3% to 10% of patients with sarcoidosis.
- Any part of the nervous system can be affected with cranial neuropathy and meningeal involvement being the most common manifestations.
- Glucocorticoids are the main therapy, although immunosuppressive agents are also often required because of the high rate of relapse.

## INTRODUCTION

Sarcoidosis is a chronic granulomatous disease of unknown cause characterized by the presence of noncaseating granuloma.[1,2] Incidence of sarcoidosis differs considerably among ethnic groups and sexes, ranging from less than 1 new case per 100,000 per year among Japanese men to more than 70 new cases per 100,000 among African American women.[3–5] Sarcoidosis can virtually affect any organ including the nervous system with the reported prevalence of neurologic involvement between 3% and 10% of patients.[3,5–8] However, the true prevalence of neurosarcoidosis could be much higher as post-mortem studies report that only half of patients with neurosarcoidosis were recognized antemortem.[9,10]

## CLINICAL FEATURES

Any part of the nervous system can be affected by sarcoidosis, and multiple lesions are often noted.[11–13] The frequency of each neurologic manifestation is summarized in **Table 1**. Neurologic abnormalities are one of the first clinical manifestations that

Disclosure Statement: The authors have no financial or nonfinancial potential conflicts of interest to declare.
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Rheum Dis Clin N Am 43 (2017) 593–606
http://dx.doi.org/10.1016/j.rdc.2017.06.008 **rheumatic.theclinics.com**

**Table 1**
**Frequency of each neurologic manifestation among patients with neurosarcoidosis**

| Neurologic Manifestation | Frequency, % |
|---|---|
| Facial nerve neuropathy | 11–25 |
| Optic neuritis | 7–35 |
| Vestibulocochlear nerve involvement | 3–17 |
| Meningitis | 10–20 |
| Intraparenchymal brain lesions on imaging studies | Up to 50 |
| Seizure | 15 |
| Depression | 60 |
| Neuroendocrinologic dysfunction | 2–8 |
| Spinal cord involvement | 5–20 |
| Peripheral neuropathy | 2–86 |

lead to the diagnosis of sarcoidosis in 70% to 80% of patients with neurosarcoidosis.[13–15] Isolated neurosarcoidosis is uncommon, because more than 90% of patients also have sarcoidosis in other organs, especially the lungs and mediastinal lymph nodes.[5,11–13] One study found that more than 80% of patients with an initial diagnosis of isolated neurosarcoidosis eventually developed extraneurologic sarcoidosis over the course of more than 6.6 years of follow-up.[14]

### *Cranial Neuropathy*

Cranial neuropathy is the most common manifestation of neurosarcoidosis. Involvement of all cranial nerves has been reported, with cranial nerve II, VII, and VIII being the most frequently affected.[16] An older cohort suggested that facial nerve palsy accounted for two-thirds of neurosarcoidosis.[15] More recent studies report that facial nerve palsy occurs in 11% to 25% of cases.[12–14,16,17] About one-third of facial nerve palsies are bilateral and could be either concurrent or sequential.[12,15,16]

It was formerly thought that facial nerve palsy is a consequence of sarcoidosis-associated inflammation of the parotid gland as classically described as Heerfordt syndrome.[18] However, more recent studies have failed to demonstrate a relationship between the 2 conditions. One study reported that only 20% of patients with facial nerve palsy had associated parotitis,[15] whereas another study reported no facial nerve palsy in 7 patients with parotitis due to sarcoidosis.[19] Epineural inflammation, perineural inflammation, and external compression by granulomatous mass/inflammation in leptomeninges are now more commonly accepted as the cause of cranial neuropathies, including facial nerve palsy.[16] The prognosis of cranial nerve involvement is generally good with complete recovery in more than 85% of cases.[13,15,20]

Optic neuritis accounts for 7% to 35% neurosarcoidosis cases.[13–17] Bilateral involvement is slightly more common than unilateral disease.[14,16,17] Typical presentations include subacute visual loss, retrobulbar pain, and papilledema on examination.[11] Outcome of optic neuritis is quite unfavorable. In one series with average duration of follow-up of 5 years, 30% of patients had visual acuity of 20/200 or worse at last follow-up.[17] Another series revealed a significant improvement of visual acuity in only 5 out of 18 patients during 18 months of follow-up.[21]

Involvement of vestibulocochlear nerve resulting in intermittent or persistent sensorineural hearing loss and vestibular dysfunction is seen in 3% to 17% of patients with neurosarcoidosis.[14,16,20,21] It is thought to be a consequence of granulomatous meningitis.[22]