Tumefactive Demyelination Mimicking Intracranial Neoplasms: A Case Series

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Abstract

Background: Tumefactive demyelination is a rare inflammatory demyelinating disorder of the central nervous system characterized by large, space-occupying lesions that often mimic intracranial neoplasms, leading to diagnostic and therapeutic challenges.

Conclusion: Tumefactive demyelination is a rare inflammatory demyelinating disorder of the central nervous system characterized by large, space-occupying lesions that closely mimic intracranial neoplasms both clinically and radiologically. These lesions, typically exceeding 2 cm in diameter, may occur as the initial presentation of multiple sclerosis or as an isolated monophasic event, accounting for approximately 1–3% of demyelinating disorders. Patients commonly present with subacute focal neurological deficits, seizures, or features of raised intracranial pressure. Neuroimaging often reveals mass effect, perilesional edema, and characteristic contrast-enhancement patterns such as the open-ring sign. Early and accurate recognition is essential, as most cases respond well to immunosuppressive therapy and misdiagnosis may result in unnecessary neurosurgical intervention.

Results: Tumefactive demyelination is a rare but important demyelinating disorder that can closely mimic intracranial neoplasms and other space-occupying lesions. This case series highlights the wide clinical and radiological spectrum of the disease, including behavioural disturbances, optic neuritis, multifocal CNS involvement, and relapsing presentations. Recognition of characteristic imaging features, correlation with clinical findings, and awareness of steroid responsiveness are critical to establishing an accurate diagnosis. Early identification can prevent unnecessary neurosurgical interventions and facilitate prompt immunomodulatory therapy, leading to favourable outcomes.

Keywords: Tumefactive demyelination; Demyelinating disorders; Open-ring enhancement; Glioma mimic; Multiple sclerosis

Introduction

Tumefactive demyelination is a rare inflammatory demyelinating disorder of the central nervous system characterized by large, space-occupying lesions that often mimic intracranial neoplasms, leading to diagnostic and therapeutic challenges.

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Methods

This was a descriptive case series conducted at a tertiary care neurology center. Four patients diagnosed with tumefactive demyelination based on clinical features, neuroimaging, cerebrospinal fluid analysis, and histopathology where indicated were included. Demographic, clinical, radiological, treatment, and outcome data were retrospectively analyzed.

Results

Four patients with tumefactive demyelination were included in this case series. The mean age at presentation was 47 years (range 13–65 years), with a male predominance (75%, 3/4). One patient (25%) was pediatric. Behavioural disturbance was observed in two patients (50%), while focal neurological deficits were present in three patients (75%), including hemiparesis and optic neuritis. A relapsing course was noted in two patients (50%), both following premature discontinuation of corticosteroids.

Case Series

CASE 1:

Case 2: A 58-year-old man with no known comorbidities presented with a history of fever one week in duration, followed by headache for one week. On day 10 following the onset of fever, he developed acute onset weakness of the left upper and lower limbs, accompanied by behavioural disturbance characterized by anger outbursts, social disinhibition, way-finding difficulty, and difficulty in dressing. There was no history of fever at presentation, vomiting, seizures, hallucinations, or delusions.

Case 3: A 13-year-old boy presented with acute onset giddiness followed by a fall, associated with sudden visual disturbance in the form of blurring of vision in the right eye. This was accompanied by difficulty in color appreciation and pain on ocular movements. There was no history of headache, nausea, vomiting, seizures, limb weakness, sensory disturbance, or gait instability.

Case 4 : A 65-year-old man, a known case of systemic hypertension, presented with a history of giddiness followed by transient loss of consciousness, after which he regained consciousness spontaneously. There was no history of headache, fever, seizures, focal neurological deficits, or behavioural disturbance.

Discussion

Tumefactive demyelination represents an uncommon but clinically significant variant of inflammatory demyelinating disease of the central nervous system, characterized by large, space-occupying lesions that frequently mimic neoplasms both clinically and radiologically. These lesions are typically larger than 2 cm and are often associated with mass effect, edema, and contrast enhancement, leading to substantial diagnostic uncertainty. Epidemiological data suggest that tumefactive demyelinating lesions account for approximately 1–3% of all demyelinating presentations, with a wide age distribution spanning pediatric to elderly populations [1,2].

The present case series highlights the heterogeneous clinical spectrum of tumefactive demyelination, encompassing behavioural disturbance with frontal lobe involvement (Cases 1 and 2), acute focal neurological deficits (Cases 2 and 3), optic neuritis (Case 3), and nonspecific presentations such as giddiness and transient loss of consciousness (Case 4). Behavioural disturbance, apathy, social disinhibition, and executive dysfunction, as observed in our series, are well-recognized manifestations of frontal lobe involvement and may further confound differentiation from primary psychiatric or neurodegenerative disorders [3].

Neuroimaging plays a pivotal role in diagnosis. Characteristic MRI features include T2/FLAIR hyperintense lesions with incomplete or open-ring enhancement, relative sparing of the cortex, and limited mass effect compared to lesion size. The open-ring sign, seen in multiple cases in our series, has been reported to have a high specificity (up to 84–94%) for demyelinating lesions when compared to neoplasms or abscesses [4]. Corpus callosal involvement, including "butterfly-like" lesions, as seen in Case 1, is particularly challenging, as it closely resembles high-grade glioma; however, tumefactive demyelination typically demonstrates incomplete marginal enhancement and steroid responsiveness, aiding differentiation [5].

Advanced imaging modalities such as MR spectroscopy can provide supportive evidence. Elevated choline with reduced N-acetylaspartate and the presence of lactate peaks, as observed across our cases, reflect active demyelination and inflammation but are not pathognomonic, as similar patterns may be seen in high-grade tumors. Hence, imaging findings must be interpreted in conjunction with clinical features and treatment response [6].

Cerebrospinal fluid findings in tumefactive demyelination are variable. Oligoclonal bands may be absent in up to 50–70% of cases at initial presentation, particularly in monophasic or early disease, as observed in our series [7]. Histopathological confirmation, although not routinely required, becomes essential in cases with atypical imaging or poor treatment response. In two patients from our series, brain biopsy revealed reactive gliosis without evidence of malignancy, reinforcing the inflammatory nature of the lesions and preventing unnecessary oncological treatment.

Corticosteroids remain the cornerstone of management. High-dose intravenous methylprednisolone typically results in rapid clinical and radiological improvement in the majority of patients, with reported response rates exceeding 80% [8]. All patients in our series demonstrated significant steroid responsiveness. However, relapse following premature discontinuation of steroids, as seen in Cases 1 and 3, underscores the importance of adequate tapering and close follow-up. Long-term outcomes vary, with studies reporting conversion to multiple sclerosis in 30–70% of patients over time, particularly in those with multifocal lesions or recurrent episodes [9]. Continued surveillance is therefore essential.

Overall, this case series emphasizes that tumefactive demyelination should be strongly considered in the differential diagnosis of large intracranial lesions across all age groups, particularly when imaging features and steroid responsiveness favour an inflammatory etiology.

Results

Four patients with tumefactive demyelination were included in this case series. The mean age at presentation was 47 years (range 13–65 years), with a male predominance (75%, 3/4). One patient (25%) was pediatric. Behavioural disturbance was observed in two patients (50%), while focal neurological deficits were present in three patients (75%), including hemiparesis and optic neuritis. A relapsing course was noted in two patients (50%), both following premature discontinuation of corticosteroids.

MRI brain in all patients demonstrated large (>2 cm) T2/FLAIR hyperintense lesions. Incomplete or open-ring enhancement was observed in three patients (75%), and corpus callosal involvement was

present in three patients (75%). Multifocal supratentorial and infratentorial involvement was seen in two patients (50%), and optic nerve involvement in one patient (25%).
Cerebrospinal fluid analysis was performed in three patients (75%); oligoclonal bands were negative in all tested patients (100%), while an elevated IgG index was noted in one (25%). Brain biopsy was performed in two patients (50%) and revealed reactive gliosis without evidence of malignancy.
All patients (100%) were treated with high-dose intravenous methylprednisolone followed by oral corticosteroids and showed significant clinical improvement. Relapses occurred in two patients (50%) and responded well to repeat steroid therapy.

Conclusion

Tumefactive demyelination is a rare but important demyelinating disorder that can closely mimic intracranial neoplasms and other space-occupying lesions. This case series highlights the wide clinical and radiological spectrum of the disease, including behavioural disturbances, optic neuritis, multifocal CNS involvement, and relapsing presentations. Recognition of characteristic imaging features, correlation with clinical findings, and awareness of steroid responsiveness are critical to establishing an accurate diagnosis. Early identification can prevent unnecessary neurosurgical interventions and facilitate prompt immunomodulatory therapy, leading to favourable outcomes.

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