Case Report: Rheumatoid Pachymeningitis in a Seronegative Patient Presenting with Dural Thickening - A Rare Case Report and Review of the Literature

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Abstract

Rheumatoid pachymeningitis (RP) is an extremely rare central nervous system (CNS) manifestation of rheumatoid arthritis (RA). We report a rare case of a first diagnosed seronegative rheumatoid arthritis patient presenting with acute paraparesis and urinary retention. Whole spine MRI revealed dural thickening between C6 and T7 levels with leptomeningeal enhancement along the conus medullaris and cauda equina roots. Cerebrospinal fluid (CSF) analysis showed marked lymphocytic pleocytosis and elevated protein level. Infection and malignancy were excluded. A spinal meningeal biopsy demonstrated palisading granulomatous inflammation consistent with rheumatoid nodule. The patient responded well to high-dose corticosteroid therapy, with near-complete clinical and radiological recovery.

This case illustrates an unusual neurological presentation of seronegative RA and emphasizes the importance of including RP in the differential diagnosis when evaluating dural lesions of unclear etiology.

เยื่อหุ้มสมองอักเสบจากโรคข้ออักเสบรูมาตอยด์ (rheumatoid pachymeningitis; RP) เป็นภาวะแทรกซ้อนที่พบได้ยากมากของระบบประสาทส่วนกลาง (CNS) ในผู้ป่วยโรคข้ออักเสบรูมาตอยด์ (RA) รายงานฉบับนี้นำเสนอผู้ป่วยที่ได้รับการวินิจฉัยเป็นโรคข้ออักเสบรูมาตอยด์ชนิด seronegative เป็นครั้งแรก โดยมีอาการอ่อนแรงของขาทั้งสองข้างเฉียบพลัน (acute paraparesis) ร่วมกับการกลั้นปัสสาวะไม่ได้

ผลการตรวจ MRI ทั้งกระดูกสันหลังพบการหนาตัวของเยื่อดูรา (dural thickening) ตั้งแต่ระดับ C6 ถึง T7 และมีการเสริมความเข้มสัญญาณของ leptomeninges

รับต้นฉบับ 30 สิงหาคม 2568, ปรับปรุงต้นฉบับ 1 ตุลาคม 2568, ตอบรับต้นฉบับตีพิมพ์ 1 พฤศจิกายน 2568

บริเวณ conus medullaris และรากเส้นประสาทของ cauda equina การตรวจน้ำไขสันหลัง (CSF) พบเม็ดเลือดขาวชนิดลิมโฟไซต์เพิ่มขึ้นอย่างมากและระดับโปรตีนสูงขึ้น โดยตัดสาเหตุจากการติดเชื้อและมะเร็งออกไปแล้ว การตัดชิ้นเนื้อจากเยื่อหุ้มไขสันหลังพบการอักเสบแบบ granulomatous ที่มี palisading ซึ่งสอดคล้องกับ rheumatoid nodule

ผู้ป่วยตอบสนองต่อการรักษาด้วยยาคอร์ติโคสเตียรอยด์ขนาดสูงเป็นอย่างดี โดยอาการทางคลินิกและภาพรังสีเกือบกลับเป็นปกติทั้งหมด กรณีนี้แสดงให้เห็นถึงการแสดงออกทางระบบประสาทที่ผิดปกติของโรคข้ออักเสบรูมาตอยด์ชนิด seronegative และเน้นย้ำถึงความสำคัญของการพิจารณา RP เป็นหนึ่งในกลุ่มการวินิจฉัยแยกโรคเมื่อประเมินรอยโรคของเยื่อหุ้มสมองที่มีสาเหตุไม่ชัดเจน

Keywords: Rheumatoid arthritis, Rheumatoid pachymeningitis, Dural thickening, Seronegative, Spinal cord, Granulomatous meningitis

Introduction

Rheumatoid arthritis (RA) is a chronic, systemic autoimmune disease primarily affecting synovial joints, typically presenting with symmetric polyarthritis of small peripheral joints such as the metacarpophalangeal and proximal interphalangeal joints. It affects approximately 1% of the adult population and is more prevalent among women.[1] Beyond articular manifestations, RA can involve multiple extra-articular organs, including the skin (rheumatoid nodules), lungs (interstitial lung disease), eyes (scleritis, episcleritis), blood vessels (vasculitis), and kidneys.[2] Neurological involvement in RA is relatively uncommon and usually manifests as peripheral neuropathy, mononeuritis multiplex, or cervical myelopathy secondary to atlantoaxial subluxation. Central nervous system (CNS) involvement, particularly rheumatoid meningitis (RP), is extremely rare and often underrecognized. RA may involve the pachymeninges (dura mater), leptomeninges (arachnoid and pia mater), or both, and presents with a wide range of symptoms, including headache, seizures, focal neurological deficits, cognitive disturbances, and stroke-like presentations.[3] The diagnosis is challenging due to its rarity and nonspecific imaging and cerebrospinal fluid findings. Histopathological confirmation is often required to differentiate it from infections, neoplastic, or other inflammatory processes. Here, we describe a rare case of rheumatoid pachymeningitis in a seronegative RA patient, presenting with atypical spinal-level neurological symptoms, histologically confirmed rheumatoid nodule in the meningeal biopsy and showing a favorable response to high-dose corticosteroid therapy.

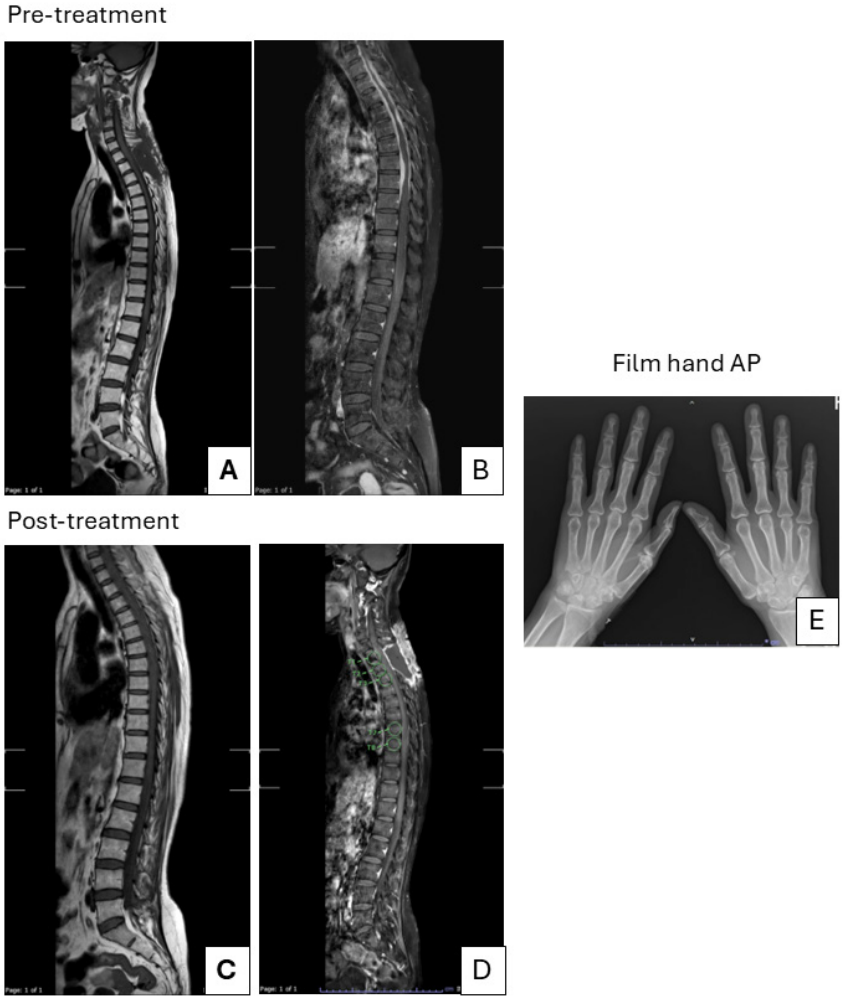
Case Report

A 56-year-old Asian woman with a 4-year history of symmetrical polyarthritis involving the left wrist, both knees, and both ankles. One month prior, she experienced intermittent mid-back pain that responded well to prednisolone. Approximately 12 hours after waking up, she developed bilateral leg weakness and was unable to stand due to instability of both legs. In addition, she had urinary retention. A Foley catheter drained 900 mL of urine, confirming significant retention.

Neurological examination revealed normal mental status and cranial nerve function. Motor examination showed normotonia with mild weakness of both iliopsoas muscles (Grade IV+). Sensory examination demonstrated decreased vibratory sense at both anterior superior iliac spines (ASIS) and the right knee, but complete loss of vibration at the left knee and both ankles which were consistent with sensory ataxia. Reflexes were hyperactive

in the upper extremities (biceps, triceps, brachioradialis) but showed hyporeflexia in the knees and ankles. Tenderness over the lower thoracic spinous processes was noted. Joint examination revealed mild swelling and tenderness in the left wrist, both knees, and both ankles without evidence of sclerodactyly, digital ulcers, periungual erythema, puffy hands, or rheumatoid nodules.

Whole spine MRI of the thoracolumbar spine revealed dural thickening extending between C6 and T7, with mass effect on the cervicothoracic spinal cord but without definite compressive myelopathy. Leptomeningeal enhancement was also observed along the conus medullaris and cauda equina roots (Fig1).



(Front cover)

Fig 1. The pre-treatment whole spinal MRI showed dural thickening between C6 and T7 in T1W (A) with gadolinium enhancement (B) The post-treatment MRI revealed complete absence of previous dural thickening in T1W (C) with gadolinium enhancement at surgical site of biopsy. The plain x-ray of both hands showed juxta-articular osteopenia, joint space narrowing, and marginal erosions (E).

Cerebrospinal fluid (CSF) analysis showed a white blood cell count of 148/µL (lymphocyte predominant), 23 red blood cells, elevated protein (2270 mg/dL), and a glucose level of 32 mg/dL with a serum glucose of 78 mg/dL (CSF/serum glucose ratio = 0.41). CSF culture and cytology were negative for fungal organisms or malignancy.

Routine blood tests revealed a normal complete blood count. However, inflammatory markers were significantly elevated: C-reactive protein (CRP) was 144.7 mg/L (normal 0–5 mg/L) and erythrocyte sedimentation rate (ESR) was 83 mm/h (normal 0–25 mm/h). Extensive infectious workups, including tests for tuberculosis, HIV, and syphilis, were negative. Autoimmune serology was also negative, including rheumatoid factor, anti-cyclic citrullinated peptide (anti-CCP), and antinuclear antibody (ANA).

Histopathology of spinal dural biopsy revealed central necrobiotic collagen surrounded by spindle-shaped, elongated histiocytes, multinucleated-giant cells, and mononuclear inflammatory cells especially plasma cell (palisading granuloma). These findings could be compatible with rheumatoid nodule, chronic infection, vasculitis, autoimmune or malignancy (Fig 2). Chronic infection was not probable due to negative straining for fungal and acid-fast bacilli. The evidence of malignancy or vasculitis were not found. Inflammation caused from IgG4 related disease was not compatible because IgG4/IgG ratio was only 10% although number of plasma cells up to 200 cell/HPF (Fig 3), Finally the diagnosis of , a granulomatous meningitis secondary to rheumatoid arthritis was made.

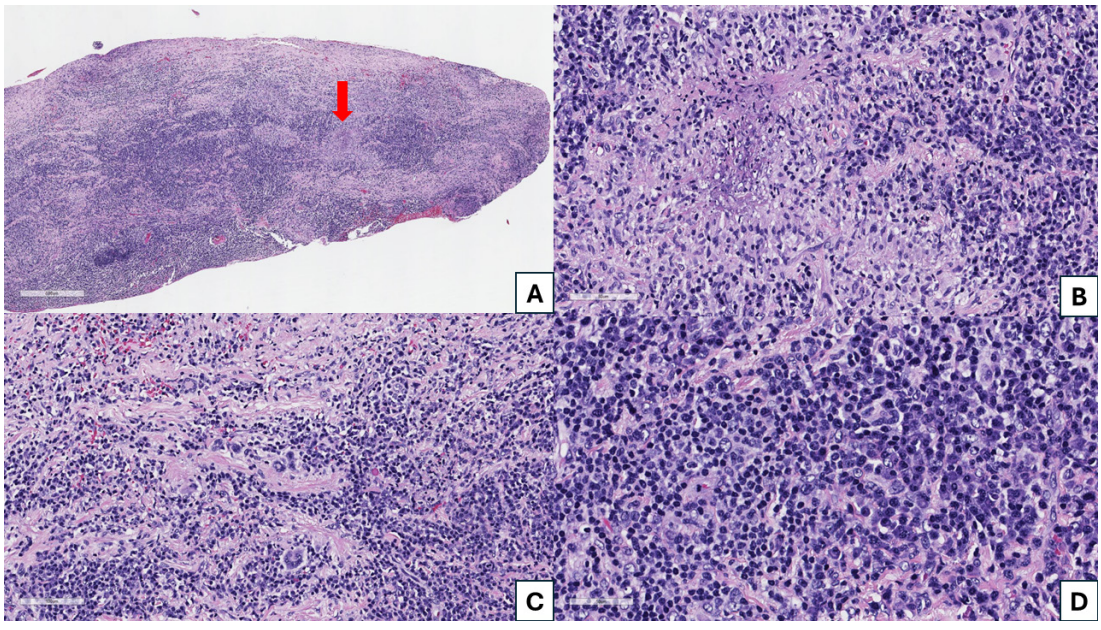


Fig 2. Histopathology of dural biopsy. (A) Low-power view 40x showing dense chronic inflammatory cell infiltration with a palisading granuloma (arrow). (B) Higher magnification 400X of the palisading granuloma, demonstrating central necrotic collagen surrounded by spindle-shaped and elongated histiocytes, multinucleated giant cells, and numerous plasma cells. (C, D) Dense lymphoplasmacytic infiltration with scattered histiocytes and multinucleated giant cells. (Back cover)

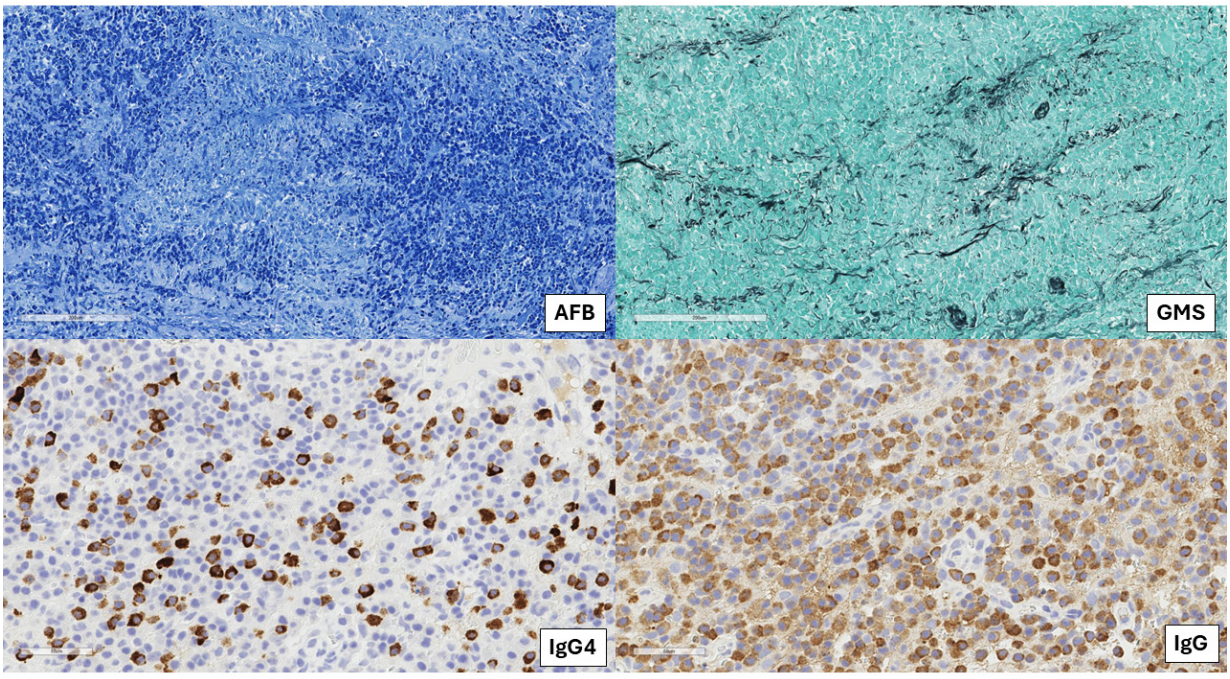


Fig 3. Special stains and immunohistochemical stains as AFB, GMS, IgG4 and IgG, respectively. The patient was treated with intravenous methylprednisolone 1000 mg daily for 5 days, followed by prednisone 30 mg daily then tapered over several months. (Back cover)

Outcome and Follow-Up

The patient had near-complete resolution in her symptoms after completed high-dose corticosteroids, with minimal residual weakness without urinary retention. Repeat blood tests showed that CRP and ESR decreased to normal level (CRP <1, ESR 10 mm/h). After follow-up 1 month MRI showed a completely absence of meningeal parenchymal at cervicothoracic spine with some residual mild myelopathy (from previous compression) at T1-T2 and T7-T8 levels. This improvement of clinical, serum blood tests and MRI result, further supports our diagnosis of rheumatoid meningitis.

Discussion

Rheumatoid pachymeningitis (RP) is a rare CNS complication of rheumatoid arthritis (RA). This occurs in patients with longstanding seropositive RA with extra-articular involvement. Notably, not all patients had long-standing RA before the onset of RP. In this case review, 45% had reported data about RA duration had less than 5 years after diagnosis (median duration of RA before RP onset was 8.5 years).[3]

Diagnosis of RP depends on a combination of clinical presentation, lumbar puncture, brain MRI and biopsy along with exclusion of other etiologies. A majority of the patients have elevated systemic inflammatory markers erythrocyte sedimentation rate and C reactive protein. The CSF analysis on lumbar puncture may have mild pleocytosis with

predominant lymphocytes, increased protein and increased or normal glucose. To exclude any infections, CSF cultures should be negative. Leptomeningeal enhancement is commonly seen as abnormality on MRI (69%), followed by pachymeningeal and pachymeningeal with leptomeningeal enhancement.[4-7] The most common finding on pathology was chronic inflammation. This is consistent with the autopsy findings in Kato's case review that studied reports before the year 2000. Another key feature described was the presence of rheumatoid nodules;[4] central necrosis surrounded by elongated histiocytes and mononuclear inflammatory cells, mostly plasma cells. After infectious etiologies are ruled out, the differential diagnosis for necrotizing granulomas would favor rheumatoid nodules.

In our patient, she initially presented with a history of chronic polyarthritis involving multiple joints over four years, consistent with seronegative rheumatoid arthritis despite negative RF and anti-CCP results. Uniquely, she developed acute bilateral leg weakness and urinary retention — an uncommon presentation compared with most previous cases that typically involve cranial meninges. MRI findings demonstrated dural thickening from C6 down to T7 with leptomeningeal enhancement along the conus medullaris and cauda equina roots, indicating spinal meningeal involvement, which is rarely reported in the literature.

Meningeal biopsy revealed central necrobiotic collagen surrounded by spindle-shaped, elongated histiocytes, multinucleated giant cells, and abundant plasma cells (palisading granuloma), characteristic of rheumatoid nodules. Chronic infections, IgG4-related disease, vasculitis, and malignancy were also excluded.

According to our literature review summarized in Table 1, most reported cases were cranial-based, and spinal involvement is exceedingly rare. Furthermore, to the best of our knowledge, this is the first reported case of rheumatoid pachymeningitis involving the spinal dura in Thailand in over 20 years. The combination of seronegative status, atypical spinal presentation with acute paraparesis and urinary retention, and confirmatory histopathology makes this case exceptionally rare and highlights its value for clinical recognition and further study.

Table 1. Literature Review of Rheumatoid Pachymeningitis and meningitis.

Study / PMID	Case	Year	Country	Age	Sex	Symptoms	Serostatus	Location	Biopsy	Treatment	Outcome
Sasao et al., PMID:40491753[8]	1	2025	Japan	~50s	F	Headache, aphasia, paralysis, seizure	RF-neg, CCP-pos	Falx cerebri	Yes	Steroid pulse + immunosuppressive	Improved
Muramatsu et al., PMID:40213738[9]	2	2025	Japan	75	M	Acute paraparesis, no arthritis	CCP-pos	Bilateral frontoparietal lobes	No	Steroid	Improved
Bo et al., PMID:40022907[10]	3	2025	Japan	64	F	Otitis media, headache, hematoma	RF-pos,	Right falx, fornix, cranial fossa, and tentorium.	No	Steroid + immuno	Improved
Bombaci et al., PMID:39853451[11]	4	2025	Italy	42	M	Generalized seizure	RF-pos	Bilaterally, more pronounced on the right hemisphere,	No	Steroid	Improved
Kita et al., PMID:39694521[12]	5	2025	Japan	67	F	Pantalgia, fever and consciousness disturbance	RF-neg, CCP-pos	Bilateral sulcus	Yes	Steroid pulse	Improved
Murakami et al., PMID:38552529[13]	6	2024	Japan	32	F	Seizures, headache and photophobia	RF-pos, CCP-pos	Bilateral frontal sulci	Yes	Steroid	Improved
Ide et al., PMID:37155424[14]	7	2023	Japan	66	F	Psychiatric, overlap NMDAR	RF-neg CCP-pos	Bilateral cerebral hemispheres	No	Steroid + IVIG	Improved
Zhang et al., PMID:36275742[15]	8	2022	China	66	M	Paroxysmal weakness overlap NMDAR	RF-pos CCP-pos	Bilateral frontal-parietal menines	Yes	Steroid + IVIG	Improved
Huang et al., PMID:36125522[16]	9	2023	China	43	M	Repeated headaches, no RA history	RF-pos CCP-pos	Bilateral frontal and parietal lobes	Yes	Steroid	Improved
Manolios et al., PMID:33044165[17]	10	2021	Australia	71	F	Exacerbation of polyarthritis	RF-pos CCP-pos	Bilaterally superiorly near the falx	No	Steroid	Improved
Yamaoka et al., PMID:32779602[18]	11	2020	Japan	62	F	Mental disorder, seizure	CCP-pos	Left frontal and parietal sulci	No	Steroid	Improved
Okusa et al., PMID:32435045[19]	12	2020	Japan	59	F	Migraine and abnormal behavior	CCP-pos	Cerebral/cerebellar pia mater and subarachnoid space	No	Steroid + fluconazole	Improved
Qin et al., PMID:32190423[4]	13	2020	USA	63	F	Speech disturbance, confusion, and right-sided weakness	RF-pos CCP-pos	Frontal and parietal lobes sulci	Yes	Steroid	Improved
Akamatsu et al., PMID:30189853[20]	14	2018	Japan	55	F	Stroke-like, speech difficulty and left arm numbness	RF-pos CCP-pos	Right frontotemporal sulci	No	Steroid + rtPA	Improved

Study / PMID	Case	Year	Country	Age	Sex	Symptoms	Serostatus	Location	Biopsy	Treatment	Outcome
Oono et al., PMID:29776427[21]	15	2018	Japan	36	F	Neurological, MG overlap	RF-pos	Subarachnoid space over the left parietal lobe and cortex	Yes	Steroid	Improved
Parsons et al., PMID:29722740[22]	16	2018	USA	76	M	Generalized seizure and weakness	RF-pos CCP-pos	Midline frontal region	Yes	Steroid	Improved
Matsuda et al., PMID:27659704[23]	17	2019	Japan	66	M	Unintentional fall, no others no neurological manifestation, MRI	RF-pos	Both hemispheres and the interhemispheric scissure	No	Steroid	Improved
Kawabata et al., PMID:26511025[24]	18	2015	Japan	69	F	Aphasia, ideomotor apraxia, right hemiparesis and convulsion	RF-neg CCP-pos	Subarachnoid space along the left frontal and both parietal lobes	No	Steroid	Improved
Morimoto et al., PMID:26084231[25]	19	2015	Japan	62	F	Headache, cognitive decline, and fever	RF-neg CCP-neg	Cerebral sulci	Yes	Steroid	Improved
Hasiloglu et al., PMID:21901351[26]	20	2012	Turkey	62	F	Headache	RF-pos	Right frontoparietal subarachnoid space	No	Steroid	Improved
Aguilar-Amat et al., PMID:21532380[27]	21	2011	Spain	71	F	Mimicking progressive supranuclear palsy	RF-pos	Both frontal and temporal lobes	Yes	Steroid	Improved
Cianfoni et al., PMID:19309435[28]	22	2010	Italy	74	F	Progressive left-side weakness and hypoesthesia	RF-pos	Right frontal and parietal lobes	Yes	Steroid	Improved
Zheng et al., PMID:16778982[29]	23	2006	China	71	M	Recurrent weakness of extremities, dysarthria and tremor	RF-pos	Both frontal and parietal lobes	Yes	Steroid	Improved
Visual loss from intracranial pachymeningitis/-[30]	24	1999	Thailand	17	F	Chronic intermittent headache with blurred vision	Not mentioned	Left side frontal cortex downwardly to cavernous sinus.	Yes	Steroid	Improved
Our case	25	2025	Thailand	56	F	intermittent mid-back pain, bilateral leg weakness and urinary retention	RF-neg CCP-neg	Dural thickening from C6 to T7 and leptomeningeal enhancement along conus medullaris and cauda equina	Yes	Steroid	Improved

Conclusions

We present a case of rheumatoid pachymeningitis, an extremely rare neurological complication of rheumatoid arthritis. The diagnosis was based on a combination of clinical, radiological and pathological features. Clinical and radiological improvement was noted after high dose intravenous corticosteroid treatment. Clinical and pathological features of this rare condition are reviewed.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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