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Research Article

MRI Findings and Serum Creatine Kinase Correlation in Inflammatory Myopathies

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Abstract

Background: Inflammatory myopathies are a heterogeneous group of muscle disorders characterized by muscle inflammation, weakness, and elevated muscle enzymes. Magnetic resonance imaging (MRI) is increasingly used as a non-invasive tool to detect muscle edema, fatty infiltration, and chronic changes. Serum creatine kinase (CK) is a commonly used biochemical marker for muscle injury, but its correlation with MRI findings remains variable in literature.

Objective: To evaluate the correlation between MRI muscle findings and serum creatine kinase levels in patients with inflammatory myopathies.

Methods: A cross-sectional study was conducted including patients clinically diagnosed with inflammatory myopathies. Serum CK levels were measured at presentation. MRI of major muscle groups (thigh, pelvic girdle, or upper limb) was performed using STIR and T1-weighted sequences. Muscle edema, fatty infiltration, and atrophy were graded using standardized scoring. Correlations between MRI severity and serum CK were analyzed using Spearman's correlation coefficient.

Results: A total of 72 patients were included. Mean serum CK was 5,420 ± 1,890 U/L. MRI muscle edema was present in 89% of cases, fatty infiltration in 47%, and muscle atrophy in 32%. A significant positive correlation was found between MRI edema scores and serum CK ($r = 0.61$, $p < 0.001$). No significant

correlation was noted between CK and fatty infiltration ($r = 0.21$, $p = 0.09$) or atrophy ($r = 0.14$, $p = 0.18$).

Conclusion: MRI muscle edema strongly correlates with elevated CK levels and reflects active inflammation. Fatty infiltration and atrophy, representing chronic changes, do not correlate with serum CK. MRI serves as a robust adjunct to biochemical testing in diagnosing and staging inflammatory myopathies.

Introduction: Inflammatory myopathies constitute a group of immune-mediated muscle disorders including dermatomyositis, polymyositis, necrotizing autoimmune myopathy, and inclusion-body myositis. These conditions are characterized by muscle weakness, variable systemic involvement, and biochemical evidence of muscle injury.[1-3]

Serum creatine kinase (CK) remains one of the most widely used laboratory markers for detecting muscle damage. However, CK levels may not reliably reflect the degree of inflammation, especially in chronic disease, steroid-treated patients, or those with advanced muscle fibrosis.

Magnetic resonance imaging (MRI) has emerged as a sensitive modality for evaluating muscle edema, inflammation, and chronic structural changes. STIR sequences detect active inflammatory edema, while T1-weighted sequences depict fatty replacement and atrophy.[5-7]

Understanding the correlation between MRI findings and serum CK is essential for precise diagnosis, monitoring disease activity, and guiding muscle biopsy.

This study investigates the relationship between MRI severity and serum CK in patients with inflammatory myopathies.[8-10]

Methodology

Study Design

A cross-sectional observational study at Mukhtiar A. Sheikh Hospital, Multan.

Study Population

Patients diagnosed with inflammatory myopathy based on clinical features, elevated muscle enzymes, and/or autoantibody testing.

Inclusion Criteria

- Age ≥ 18 years
- Clinical and laboratory features suggestive of inflammatory myopathy
- MRI of relevant muscle groups available
- Serum CK levels measured within ≤ 7 days of MRI

Exclusion Criteria

- Muscular dystrophies
- Thyroid-related myopathies
- Chronic kidney disease
- Recent trauma, seizures, or injections influencing CK
- Prior muscle biopsy within 4 weeks

MRI Protocol

MRI performed using 1.5T or 3T scanner.

Sequences included:

- **STIR** for edema
- **T1-weighted** for fatty infiltration and atrophy

MRI Scoring System

Edema, fatty infiltration, and atrophy graded 0–3:
0 = normal
1 = mild
2 = moderate
3 = severe

Laboratory Analysis

Serum CK measured using enzymatic colorimetric assay.

Statistical Analysis

- Spearman correlation coefficient (r)
- $p < 0.05$ considered statistically significant

Results

Demographics

Total		patients:			**72**
Mean	age:	44.6	±	13.2	years
Female:Male ratio = 1.7:1					

Serum CK Levels

Mean	CK:	**5,420**	±	**1,890**	**U/L**
Range: 1,200 – 11,500 U/L					

MRI Findings

MRI Feature	**Prevalence**
Muscle edema	**89%**
Fatty infiltration	**47%**
Atrophy	**32%**

Correlation Analysis

MRI Parameter	**Correlation with CK**	**p-value**
Edema	**r = 0.61**	<0.001
Fatty infiltration	r = 0.21	0.09
Atrophy	r = 0.14	0.18

Interpretation:

CK correlates significantly with MRI edema, indicating active inflammation. Chronic changes do not correlate with CK.

Discussion: The present study demonstrates a strong correlation between MRI muscle edema and elevated serum CK levels in inflammatory myopathies. This finding is consistent with several recent studies indicating that MRI edema most accurately reflects disease activity.[11-13]

Fatty infiltration and atrophy, representing chronic muscle damage, did not correlate with CK, which aligns with literature

suggesting CK normalizes as muscle destruction stabilizes despite ongoing weakness or structural change.[14-15]

MRI offers additional value in identifying muscle groups with active inflammation, guiding biopsy site selection, and monitoring treatment response in conjunction with clinical and biochemical markers.[16-18]

Given the heterogeneity of inflammatory myopathies, combining MRI with serum markers improves diagnostic accuracy and reduces the need for repeated invasive biopsies.[19-20]

Conclusion: MRI muscle edema shows a strong positive correlation with serum CK levels in patients with inflammatory myopathies and serves as an effective marker of active muscle inflammation. MRI evidence of fatty infiltration and atrophy does not correlate with CK and represents chronic disease. MRI is a valuable adjunct diagnostic tool in assessing disease activity, guiding treatment, and monitoring progression.

Recommendations

1. MRI should be integrated as a routine diagnostic tool in evaluating inflammatory myopathies.
2. STIR sequences should be used to identify active disease.
3. CK alone should not be used to assess chronic or treatment-modified myopathies.
4. MRI findings should guide selection of optimal biopsy sites.
5. Prospective studies with larger sample sizes and longitudinal follow-up are required.

Limitations

- Single-center design
- Cross-sectional (no follow-up)
- Potential variations in MRI scanners
- Small sample size
- CK levels may fluctuate with daily activity or medications

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