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Effectiveness of Dwips MRI Imaging and Use of Interleukin-6 Inhibitors in Takayasu Arteritis

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Abstract This article discusses the diagnostic value of the DWIPS MRI method in Takayasu arteritis and the therapeutic efficacy of interleykin-6 (IL-6) inhibitors in treatment [2,3]. MRI with DWIPS allows early detection of vascular wall inflammation [1,3,5]. At the same time, IL-6 inhibitors, particularly drugs like tocilizumab, are considered effective in controlling the chronic inflammatory process of the disease [4].

Keywords Takayasu arteritis, Interleykin-6 (IL-6), MRI DWIPS, CRP, MSCTA, Carotid artery, ESR, Tocilizumab

1. Introduction

Takayasu arteritis is a chronic granulomatous vasculitis of unknown etiology that predominantly affects large arteries, especially the aorta and its major branches. Early and precise visualization methods, particularly MRI DWIPS technology, play an important role in diagnosis. In treatment, beyond conventional immunosuppressive therapy, the use of biological agents — IL-6 inhibitors — is increasingly emphasized.

Takayasu Arteritis: Pathogenesis and Clinical Features [7,9,14]

- Autoimmune in nature.
- Manifests with stenosis, occlusion, or aneurysms in the aorta and brachiocephalic branches [8].
- Symptoms: fatigue, signs of ischemia, pulse deficit, headache, visual disturbances, and hypertension.

Significance of DWIPS MRI

What is DWIPS?

DWIPS — "Diffusion-Weighted Imaging with Background Suppression" — is an MRI technology with high sensitivity to detect inflammatory processes in parenchymal tissues [10,16].

Capabilities of DWIPS in Takayasu Arteritis:

- Detects inflammatory activity in the arterial wall [2,8,15].
- Identifies active vasculitis without contrast agents.
- Assesses treatment efficacy.

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Interleukin-6 Inhibitors: A Modern Therapeutic Approach

Role of IL-6

- IL-6 is a key cytokine involved in inflammation, and its level is elevated in Takayasu arteritis.
- Contributes to edema, fever, and increased ESR and CRP levels [10,12].

Tocilizumab and Other Inhibitors

- Tocilizumab is a monoclonal antibody that blocks IL-6 receptors.
- Clinical studies show that tocilizumab reduces vasculitis activity and increases the likelihood of remission [11,13,16].

2. Material and Methods

A retrospective analysis of the surgical treatment of 42 patients with NAA who were hospitalized at the Republican Center for Surgical Angioneurology and at the Department of Vascular Surgery of the Multidisciplinary Clinic of the Tashkent Medical Academy in the period 2019-2024 was carried out.

Clinical Cases

Patient X, 32 years old, presented to the Republican Specialized Center of Surgical Angioneurology in 2016 with complaints of neck pain, dizziness during physical exertion, and low-grade fever. Nonspecific aortoarteritis (NSAA) had been diagnosed in 2013 according to ACR criteria (1990). Examination revealed a moderate general condition, preserved orientation in time and space, and absence of pulse in both radial arteries. A systolic bruit was heard over the right carotid artery.

Apart from microcytic anemia (Hb 95 g/L), lab tests showed elevated inflammatory markers (ESR 9 mm/hr; serum CRP 0.2 mg/dL). Liver and kidney functions, immunoglobulins, and complement levels were normal. ANA and ANCA were negative. Serologic testing for syphilis was also negative.

At admission, the patient was on glucocorticoid therapy with prednisolone 10 mg/day. Carotid ultrasound revealed concentric, hypoechoic thickening of the brachiocephalic vessel walls, causing stenosis on the right and complete occlusion of the left common carotid artery. Proximal subclavian artery occlusion was seen bilaterally; vertebral arteries appeared normal.

Two months earlier, MSCT had confirmed bilateral involvement of the carotid and subclavian arteries, as well as the circle of Willis.

To assess inflammatory activity, diffusion-weighted MRI was performed. Increased signal intensity was observed in the carotid and subclavian arteries, consistent with inflammation seen on MSCTA.

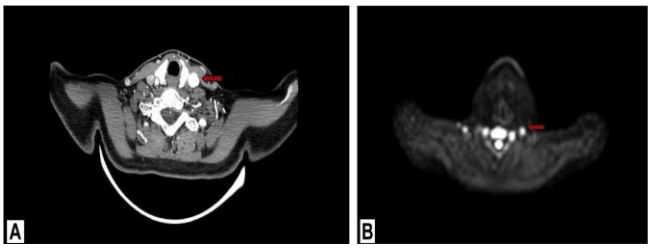

Figure 1. MSCTA (A) and DW MRI (B) images showing inflammation of the same arterial wall (red arrows)

Additionally, increased signal foci were seen from both iliac arteries (Figure 2).

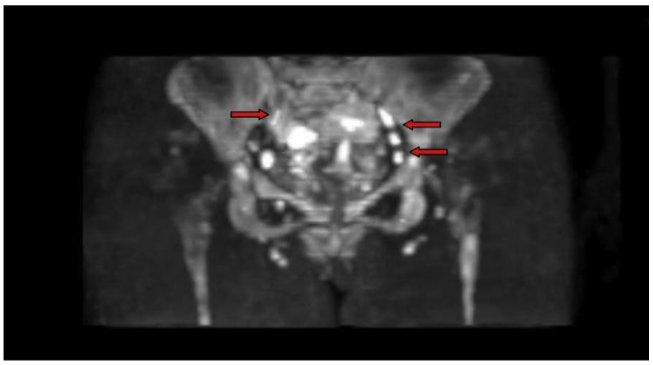

Figure 2. DW MRI of pelvic area showing high signal from both iliac arteries and enhanced signal from perivascular lymph nodes

Based on this data, the patient was diagnosed with active phase NSAA type V involving the aortic arch and abdominal aorta. A treatment plan was initiated, including pulse methylprednisolone combined with escalating doses of prednisolone and dual antiplatelet therapy.

- DWIPS-visible inflammation decreased on MRI after tocilizumab treatment.
- Improvements in CRP, ESR, and clinical symptoms were noted.

Patient Z, symptomatic since age 13 with recurrent erythema nodosum and arthralgias. From 2013, developed fevers up to 39℃, BP spikes to 200/100 mmHg, headaches, up to 7 syncopal episodes per day, and left arm numbness. In September 2015, carotid Doppler showed up to 70% stenosis of the left common carotid artery during her first pregnancy. The pregnancy was medically terminated.

By December 2015, CRP was 34 mg/L, with signs of hypercoagulability. Angiography showed up to 70% stenosis in the left common carotid artery and up to 80% at the external carotid artery bifurcation. NSAA diagnosis was confirmed. Surgical replacement of the left common carotid artery was performed in India, with significant post-op improvement, though left arm numbness persisted. Curantil and aspirin were prescribed.

In January 2018 (at 6 weeks into a second pregnancy), occlusion of the carotid prosthesis was diagnosed with preserved blood flow through internal and external carotid arteries. The pregnancy was complicated by syncope, dizziness, left hand numbness, and BP spikes up to 210/100 mmHg. Treated with clexane 40 mg/day throughout pregnancy. Under follow-up since March 2018.

In September 2018, at 36 weeks, a successful cesarean delivery was performed. Postpartum Doppler showed added 50% stenosis of the left internal carotid artery. Abdominal aorta and its branches showed no pathology. Treated with 20 mg/day methylprednisolone, but poorly tolerated due to hypertension episodes. Methotrexate was discontinued after a single 10 mg dose due to elevated liver enzymes, nausea, and diarrhea. Switched to azathioprine 100 mg/day, which also caused dyspeptic symptoms. Clexane was increased to 60 mg/day. Despite treatment, persistent 80% stenosis of the internal carotid artery and wall thickening at the external carotid artery bifurcation were observed.

In March 2019, tocilizumab was initiated at 8 mg/kg with 2-week intervals initially, then monthly. Last infusion in October 2019. After 1 month of TCZ, CRP was 1.8 mg/L, ESR 11 mm/hr, platelets 349×10^9/L.

In November 2019, successful subclavian–common carotid artery bypass was performed in India, restoring main blood flow. Post-op: CRP 18 mg/L, platelets 444×10^9/L, procalcitonin negative.

In February 2020, planned exam showed CRP 0.9 mg/L, ESR 14 mm/hr, platelets 470×10^9/L. Doppler confirmed graft patency.

This long-term case of Takayasu arteritis (15 years without immunosuppressive therapy) demonstrates that no new arterial lesions occurred and that clinical improvement with normalization of CRP under tocilizumab suggests effective inflammation control.

Integration of DWIPS and IL-6 Inhibitors

- DWIPS allows dynamic monitoring and objective assessment of treatment efficacy.
- When combined with biomarkers, DWIPS becomes a key tool in therapeutic decision-making.

3. Conclusions

DWIPS MRI visualization and IL-6 inhibitors (particularly tocilizumab) are among the most significant innovations in the diagnosis and treatment of Takayasu arteritis. These methods enable early disease detection, monitoring of treatment efficacy, and control of inflammation. Further clinical studies are needed to better understand and validate these approaches.

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