**2018 Update of the EULAR Recommendations for the Management of Behçet’s Syndrome**

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This paper is dedicated to the memory of Ignazio Olivieri.

**ABSTRACT**

Several new treatment modalities with different mechanisms of action have been studied in patients with Behçet’s syndrome (BS) since the EULAR Recommendations for the Management of Behçet’s Disease were published in 2008. The aim of the current effort was to update the recommendations in the light of these new data under the auspices of the EULAR Standing Committee for Clinical Affairs. A task force was formed that included BS experts from different specialties including internal medicine, rheumatology, ophthalmology, dermatology, neurology, gastroenterology, oral health medicine and vascular surgery along with a methodologist, a health professional, 2 patients and 2 fellows in charge of the systematic literature search. Research questions were determined using a Delphi approach. GRADE methodology was used as the framework. Results of the systematic literature review were presented to the task force during a meeting. The former recommendations were modified or new recommendations were formed after thorough discussions followed by voting. The recommendations on the medical management of mucocutaneous, joint, eye, vascular, neurologic and gastrointestinal involvement of BS were modified, five overarching principles and a new recommendation about the surgical management of vascular involvement were added. These updated, evidence based recommendations are intended to help physicians caring for patients with BS. They also attempt to highlight the shortcomings of the available clinical research with the aim of proposing an agenda for further research priorities.

**Keywords:** Behçet’s syndrome recommendations, treatment, management

**INTRODUCTION**

Behçet’s syndrome (BS) is a systemic variable vessel vasculitis that involves the skin, mucosa, joints, eyes, arteries, veins, nervous system and the gastrointestinal system. Physicians from several different disciplines are involved in the care of patients with BS. The disease shows geographic differences in its clinical features. Thus a multi-center collaboration of experts from different specialties and from different parts of the world is necessary for the optimization of the recommendations for managing BS.

The first EULAR Recommendations for the management of Behçet’s disease were published in 2008 has gained a lot of interest and helped physicians from different disciplines in the management of BS patients.1 At that time a total of nine recommendations were formed after a literature review, a Delphi exercise and two expert consensus meetings by a task force that included rheumatologists, ophthalmologists, dermatologists, a neurologist and a patient. In 5 of the 9 recommendations, the strength of the recommendation was “D” indicating that it was based only on expert opinion for the whole or at least a part of the recommendation.

The task force felt that there was a need for updating these recommendations as there had been several related new publications and data with new agents were available. Especially the experience with the use of biologic agents in BS has substantially increased during the recent years. There is also more evidence to guide us in the management of gastrointestinal involvement and about other issues such as the use of anticoagulants in BS patients with vascular involvement. One of the shortcomings of the previous recommendations was that it lacked guidance regarding the surgical and interventional treatment options for vascular involvement.

The objective of the current project was to update and improve the EULAR Recommendations for the management of BS in the light of the new studies, in addition to identifying the hitherto uncovered areas for future research. The target population for these recommendations includes all physicians and surgeons who are involved in the treatment of BS.

**METHODS**

The standard operating procedures for developing EULAR endorsed recommendations was followed and when applicable the AGREE instrument was utilized.2 A task force was formed including 20 BS experts from 7 European countries and Korea, 1 health care professional (a nurse), 2 patients with BS, 2 fellows responsible for the systematic literature review who are EMEUNET members and 1 senior methodologist. The experts were from various specialties that are involved in the management of BS patients including internal medicine, rheumatology, ophthalmology, dermatology, neurology, gastroenterology, oral health medicine and vascular surgery.

An initial Delphi was conducted among the task force members to identify the questions and problem areas which were not covered by the previous recommendations and areas that need updating. A total of 52 clinical questions were decided on with input from both physician and patient members of the task force. The questions were amalgamated and formulated into PICO questions for the systematic review.3 A protocol was prepared for the systematic review according to the recommendations given in PRISMA-P and registered in International Prospective Register of Systematic Reviews (PROSPERO) before starting the systematic literature search (registration number CRD42015027033). The systematic literature search was conducted by 2 fellows independently and disagreements were resolved by the convenor. Systematic reviews for mucocutaneous and joint involvement and for major organ involvement including eye, vascular, nervous system and gastrointestinal system involvement are prepared in detail for publication separately (Ozguler *et al*. Management of Major Organ Involvement of Behçet’s Disease: Systematic Literature Review for the Update of the EULAR Recommendations for the Management of Behçet’s Disease, submitted for publication; Pietro *et al*. Management of Skin, Mucosa and Joint Involvement of Behçet’s Syndrome: A Systematic Literature Review for Update of the EULAR Recommendations for the Management of Behçet’s Disease, submitted for publication). These systematic reviews and the recommendations manuscript form an integral and inseparable sum and should be read as such.

GRADE methodology was used for the entire process from creating the systematic literature review to deciding on the strength of recommendations.4 MEDLINE (from 1950); EMBASE (from 1980); The Cochrane Library, including the Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Database of Systematic Reviews (CDSR), Database of Abstracts of Reviews of Effects (DARE), and Health Technology Assessments (HTA), International Pharmaceutical Abstracts Database (IPAD), and the [www.ClinicalTrials.gov](http://www.ClinicalTrials.gov) website were searched using the predefined keywords and keyword combinations. Any randomised controlled trial (RCT), controlled clinical trial whether open label or not comparing an active intervention (alone or in combination) in patients with BS with any other comparator (drug or placebo) were included. If controlled trials were not available for answering a specific research question, uncontrolled evidence from preferably prospective cohort studies or case series was considered. Studies including patients meeting any of the criteria sets for BS or with a given diagnosis of BS as described by the authors were considered eligible. Authors and/or sponsors were contacted when additional data was required.

Results of the systematic reviews for mucocutaneous and joint involvement and for major organ involvement including eye, vascular, nervous system and gastrointestinal system involvement were presented to the task force during a one-and-a-half-day meeting. Following these presentations, thorough discussions led to the formation of draft recommendations. At the end of the meeting these draft recommendations were discussed again and modified accordingly. Each recommendation was designated as a “strong” or “conditional” recommendation according to the GRADE methodology. implies for patients that most people in their situation would want the recommended course of action and only a small proportion would not. 4 Similarly for clinicians that most patients should receive the recommended course of action and for policy makers the recommendation can be adapted as a policy in most situations. On the other hand a conditional recommendation would indicate for a patient that the majority of people in their situation would want the recommended course of action, but many would not. Similarly for clinicians they would mean that they should be prepared to help patients to make a decision that is consistent with the patients’ own values and finally for the policy makers that there is a need for substantial debate and involvement of stakeholders. The Oxford system was also used for designating the level of evidence and strength of recommendation as advised by the standard operating procedures for developing EULAR endorsed recommendations.2 Consensus was reached explicitly via voting with the prespecified decision to include only the statements that obtain agreement by at least 70% of the experts. Additionally the level of agreement from 0 to 10 for each recommendation was determined by a closed vote.

**RESULTS**

The systematic search of the literature databases yielded 3,927 articles. After reviewing the title and abstracts, 395 were selected for full text evaluation and 11 additional articles were identified through hand search. Finally 192 studies on the management of mucocutaneous, joint, eye, vascular, nervous system and gastrointestinal system involvement of BS were included (Figure). The detailed methods and results of the systematic reviews for mucocutaneous and joint involvement and for major organ involvement are submitted separately. Based on the results of these systematic reviews and experts’ opinions 5 overarching principles and 10 recommendations (Table 1) were formed.

**Overarching Principles**

* **Behçet’s syndrome is a condition that typically runs a relapsing and remitting course and the goal of treatment is to promptly suppress inflammatory exacerbations and recurrences to prevent irreversible organ damage.**
* **A multidisciplinary approach is necessary for optimal care.**
* **Treatment should be individualized according to age, gender, type and severity of organ involvement and patient’s preferences.**
* **Ocular, vascular, neurologic and gastrointestinal involvement may be associated with a poor prognosis.**
* **Disease manifestations may ameliorate over time in many patients.**

The relapsing and remitting nature of BS and the differences in natural course of different types of organ and system involvement as well as differences in the disease course between men and women mandate that the treatment should be individualised accordingly. In BS patients skin, mucosa and joint involvement can cause impairment of quality of life, but do not cause permanent damage whereas untreated eye, vascular, nervous system and gastrointestinal system involvement can cause serious damage and even death. When there is only skin, mucosa and joint involvement, treatment can be tailored according to the patient’s need and how much the symptoms impact on their quality of life compared to the risks associated with adverse effects of any medication used. When chronic oral and genital ulceration caused scarring vigorous treatment is required to prevent oropharyngeal narrowing, and obliterative and deforming genital scarring. On the other hand when the patient has organ involvement, it is important to rapidly suppress the inflammation and prevent relapses in order to prevent loss of function. Immunosuppressives are usually necessary to accomplish this. The more severe disease course among men with an early age of disease onset prompts more aggressive treatment and increased caution during follow-up in such patients.5 As the disease manifestations usually abate over time treatment may be tapered and even stopped during the course of the disease.6

**Recommendation 1 - Mucocutaneous Involvement**

**Topical measures such as local steroids should be used for the treatment of oral and genital ulcers (Low QoE; Strong recommendation). Colchicine should be tried first for the prevention of recurrent mucocutaneous lesions especially when the dominant lesion is erythema nodosum or genital ulcer (Moderate QoE; Strong recommendation). Papulopustular or acne-like lesions are treated with topical or systemic measures as used in acne vulgaris (Very low QoE; Strong recommendation). Leg ulcers in BS might be caused by venous stasis or obliterative vasculitis (Very low QoE; Conditional recommendation). Treatment should be planned with the help of a dermatologist and vascular surgeon (Very low QoE; Strong recommendation). Drugs such as azathioprine, thalidomide, interferon-alpha, tumor necrosis factor alpha inhibitors or apremilast should be considered in selected cases (Moderate QoE; Conditional recommendation).**

Several RCTs explored the efficacy of different immunomodulatory and immunosuppressive agents for mucocutaneous lesions. Colchicine was shown to be effective for genital ulcers and nodular lesions especially in women, but there was some controversy regarding its efficacy in oral ulcers.7-9 The efficacy of colchicine and immunosuppressives for papulopustular or acne-like lesions seems to be limited. Mild forms of papulopustular or acne-like lesions are treated first by topical measures as used in acne vulgaris. However chronic recurrent lesions or severe forms mimicking acne conglobata or acne cystica require systemic measures such as retinoids, sometimes together with surgical and physical therapy. Considering the safety and good tolerability of colchicine, the group agreed that it should be tried first in patients who have only mucocutaneous involvement. In patients who present with an acute exacerbation of mucocutaneous lesions, topical corticosteroids may help the rapid healing of these lesions. For patients whose lesions continue to recur despite colchicine, immunomodulatory or immunosuppressive drugs such as azathioprine, thalidomide, interferon-alpha, tumor necrosis factor alpha inhibitors (TNFis) or apremilast can be used.10-14 Uncontrolled observational evidence suggests that lactobacilli lozenges may be a safe alternative.15 Dapsone and azithromycin have also been tried with beneficial results.16,17 Among the newer biologic agents IL-1 blockade with anakinra and canakinumab seems to provide a partial benefit in BS patients with mucocutaneous involvement whereas IL-17 blockade with secukinumab was ineffective and IL-6 blockade with tocilizumab worsened mucocutaneous lesions.18-23 A very recent manuscript published after the preparation of these recommendations suggests that ustekinumab may also be beneficial.24

Management should be planned according to patient’s preferences, depending on the burden of their mucocutaneous lesions weighed against the risk of adverse drug reactions with these agents.

The management of leg ulcers may be problematic since it is associated with venous stasis caused by deep vein thrombosis (DVT) and/or obliterative vasculitis causing acute and chronic arterial ischemia. Leg ulcers may occasionally be associated with pyoderma gangrenosum and require immunosuppressives. The systematic review showed no studies guiding the management of leg ulcers, thus this part of the recommendation was based solely on expert opinion. For each patient treatment should be planned with a dermatologist and vascular surgeon experienced with such lesions as these may require the use of immunosuppressives, antibiotics if infection is present, debridement, or occlusive measures such as the use of compression bandaging.

**Recommendation 2 - Eye Involvement**

**Management of uveitis of BS requires close collaboration with ophthalmologists with the ultimate aim of inducing and maintaining remission (Very low QoE; Strong recommendation). Any patient with BS and inflammatory eye disease affecting the posterior segment should be on a treatment regime such as azathioprine, cyclosporine-A, interferon-alpha or monoclonal anti-TNF antibodies (Moderate QoE; Strong recommendation). Systemic glucocorticoids should be used only in combination with azathioprine or other systemic immunosuppressants (Very low QoE; Strong recommendation). Patients presenting with an initial or recurrent episode of acute sight threatening uveitis should be treated with high dose glucocorticoids, infliximab or interferon-alpha (Low QoE; Strong recommendation). Intravitreal glucocorticoid injection is an option in patients with unilateral exacerbation as an adjunct to systemic treatment (Low QoE; Conditional recommendation)**

Management of uveitis requires great caution with early recognition and evaluation of the severity of the involvement and frequent monitoring of drug response in order to prevent damage causing permanent decrease in visual acuity and eventual blindness. Close collaboration with an expert ophthalmologist is essential.

Systemic, high dose glucocorticoids are used for rapid suppression of inflammation during acute attacks. However, glucocorticoids should never be used alone in patients with posterior uveitis. Systemic immunosuppressives such as azathioprine, cyclosporine-A, interferon-alpha, infliximab or adalimumab should be used in such patients. RCTs have shown the efficacy of azathioprine and cyclosporine-A in preserving visual acuity and preventing relapses in patients with uveitis.10,25-27 However, there are no RCTs to guide the management of patients who are refractory to these agents. Some experts have preferred interferon-alpha and others monoclonal anti-TNF antibodies for such patients. A review of the literature for open label, observational studies or retrospective case series with these agents hinted at certain differences such as a rapid response and improvement in visual acuity with infliximab, a sustained response with interferon-alpha as well as high remission rates with both of these agents.28-64 The choice of treatment would depend on patient factors such as risk of infections including tuberculosis with monoclonal anti-TNF antibodies and tolerability of interferon-alpha, physician’s experience with these agents and reimbursement policies of each country.

Among the monoclonal anti-TNF antibodies, although there is more accumulated experience with infliximab, adalimumab also seems to be an effective alternative.64-68 Switching between these agents seems to be possible in patients with primary or secondary unresponsiveness or adverse events. After the preparation of these recommendations, adalimumab has been approved for the treatment of non-infectious intermediate, posterior and panuveitis by EMEA and FDA based on 2 RCTs. However results for patients with BS which comprised a small portion of the study population in these trials were not provided.65,69

Whether immunosuppressives such as azathioprine or cyclosporine-A should be used together with monoclonal anti-TNF antibodies was discussed. Although there is no controlled data, some experts felt that concomitant use of azathioprine and/or cyclosporine-A with monoclonal anti-TNF antibodies may improve the outcome. A retrospective case series of BS patients who were prescribed monoclonal anti-TNF antibodies for different types of involvement suggested that concomitant use of these agents did not provide extra benefit.64 Care should be taken since plasma concentrations of cyclosporine-A may be reduced by coadministration with azathioprine.70

Other biologic agents such as IL-1 and IL-17 blockers have also been tried. The IL-1 blocker gevokizumab71 and IL-17 blocker secukinumab21 failed to meet their primary endpoints in RCTs.

Intravitreal glucocorticoid injections can be used in patients with an acute exacerbation in one eye.72-76 However this should be used only as an adjunct to systemic immunosuppressive therapy.

Vitrectomy should only be used in patients with complications such as vitreous condensation, coagulated vitreous hemorrhage, tractional retinal detachment, vitreoretinal or epiretinal membranes. There is no anti-inflammatory effect of this procedure in patients with uveitis.

**Recommendation 3 – Isolated anterior uveitis**

**Systemic immunosuppressives could be considered for those with poor prognostic factors such as young age, male sex and early disease onset (Very low QoE; Conditional recommendation).**

Isolated anterior uveitis in BS patients may be treated with topical agents. However some patients may have hypopyon uveitis which is a severe form of anterior uveitis and some patients with isolated anterior uveitis develop posterior uveitis over time. Although it is not easy to predict which patients are at risk, it was shown that young men with an early age at disease onset have a higher risk of more severe disease. A systemic immunosuppressive such as azathioprine may be considered in such patients with the anticipation that it may have a protective effect. However there is no data yet, that shows such an effect.

**Recommendation 4 –Acute deep vein thrombosis**

**For the management of acute deep vein thrombosis in BS, glucocorticoids and immunosuppressants such as azathioprine, cyclophosphamide or cyclosporine-A are recommended (Low QoE; Strong recommendation)**

In patients with BS deep vein thrombosis is thought to result from inflammation of the vessel wall rather than hypercoagulability. Post-thrombotic syndrome is frequent especially with recurrent episodes of deep vein thrombosis and may result in leg ulcers that are very difficult to treat. One of the most controversial issues regarding the management of BS is whether deep vein thrombosis should be treated with immunosuppressives, anticoagulants or both.77

We performed a meta-analysis of the 3 retrospective studies that reported on the efficacy of immunosuppressives and/or anticoagulants for preventing recurrences of deep vein thrombosis in patients with BS.78-80 A pooled estimate of the relapse risk of deep vein thrombosis in BS patients treated with immunosuppressives and anticoagulants compared to those treated with only anticoagulants favored the use of immunosuppressives with a RR of 0.17 (95%CI 0.08-0.35). On the other hand treatment with anticoagulants and immunosuppressives compared to immunosuppressives alone did not provide a significant benefit in preventing relapses (RR 0.75, 95%CI 0.48-1.17).

There was no data to mandate the preference of one immunosuppressive agent over the others. Azathioprine, cyclophosphamide or cyclosporine-A are agents that can be preferred in such patients. Cyclophosphamide may be reserved for patients with extensive thrombosis of larger veins such as vena cava due to its potential adverse events.

**Recommendation 5 – Refractory Venous thrombosis**

**Monoclonal anti-TNF antibodies could be considered in refractory patients (Very low QoE; Conditional recommendation). Anticoagulants may be added, provided the risk of bleeding in general is low and coexistent pulmonary artery aneurysms are ruled out (Very low QoE; Conditional recommendation).**

There was no data to guide the management of patients with refractory venous thrombosis. Monoclonal anti-TNF antibodies may be used since beneficial results have been obtained in BS patients with refractory arterial involvement. Interferon-alpha may be tried in selected cases.

Although our meta-analysis indicated that adding anticoagulants to immunosuppressives did not decrease the relapse risk, there is a retrospective study suggesting that not using anticoagulants may increase the risk of post-thrombotic syndrome (OR 3.8, 95%CI 1.04-14.1).81 The task force felt that no recommendation against anticoagulant use can be made because of the lack of prospective controlled trial data demonstrating that anticoagulant do not decrease the relapse risk and the frequency of post-thrombotic syndrome in patients with BS.

However great caution is required with respect to bleeding in anticoagulated patients with BS. This is especially important since arterial aneurysms are closely associated with deep vein thrombosis in BS. Patients need to be scrutinized for aneurysms when starting anticoagulants and physicians should be alert about the risk of developing aneurysms during the course of treatment since almost all BS patients with aneurysms have a history of deep vein thrombosis.82

**Recommendation 6 – Arterial Involvement**

**For the management of pulmonary artery aneurysms, high dose glucocorticoids and cyclophosphamide are recommended (Low QoE; Strong recommendation). Monoclonal anti-TNF antibodies should be considered in refractory cases (Low QoE; Strong recommendation). For patients who have or who are at high risk of major bleeding, embolization should be preferred to open surgery (Low QoE; Strong recommendation). For both aortic and peripheral artery aneurysms medical treatment with cyclophosphamide and corticosteroids is necessary before intervention to repair (Low QoE; Strong recommendation). Surgery or stenting should not be delayed if the patient is symptomatic (Low QoE; Strong recommendation).**

The primary management of pulmonary artery aneurysms and thrombosis is with high dose glucocorticoids and cyclophosphamide. Cyclophosphamide may be given as monthly intravenous pulses and glucocorticoids are usually given as 3 successive intravenous methylprednisolone pulses followed by oral prednisolone (or prednisone) at a dose of 1 mg/kg/day.83,84 Observational, uncontrolled evidence showed that infliximab provided benefit in some of the refractory patients.85 Mortality rate has been high in surgically treated patients and surgery should not be undertaken except for life threatening situations.84,86,87 Embolisation may be necessary in patients with a high risk of major bleeding. 83,87,88

Peripheral artery aneurysms require emergency surgery or stenting unless they are small asymptomatic and carry a low risk of rupture. Medical treatment with high dose corticosteroids and cyclophosphamide may be sufficient for such small aneurysms. Observational studies show that medical treatment is necessary in addition to surgery or stenting, in order to decrease the risk of postoperative complications and recurrences.88-90 Medical treatment should ideally start before an aneurysm repair is attempted.

For both pulmonary and peripheral artery aneurysms, the choice of surgical intervention between graft insertion, ligation and by-pass surgery can be made according to the size and location of the aneurysm and the surgeon’s experience. Synthetic grafts should be preferred since venous grafts have a higher risk of thrombosis in BS patients.

**Recommendation 7 – Gastrointestinal Involvement**

**Gastrointestinal involvement of BS should be confirmed by endoscopy and/or imaging (Low QoE; Strong recommendation). NSAID ulcers, inflammatory bowel disease and infections such as tuberculosis should be ruled out (Low QoE; Strong recommendation).**

One of the most challenging issues regarding gastrointestinal involvement is to diagnose it correctly since abdominal pain, diarrhoea and intestinal ulcers may commonly be related to other reasons such as NSAID ulcers and gastrointestinal infections including tuberculosis, especially among patients receiving immunosuppressives.91 Confirming the diagnosis is essential to prevent the unnecessary use of immunosuppressives that may be especially harmful if the patient has an infection.

**Recommendation 8 – Refractory/severe gastrointestinal involvement**

**Urgent surgical consultation is necessary in cases of perforation, major bleeding and obstruction (Low QoE; Strong recommendation). Glucocorticoids should be considered during acute exacerbations together with disease modifying agents such as 5-ASA or azathioprine (Very low QoE; Strong recommendation). For severe and/or refractory patients monoclonal anti-TNF antibodies and/or thalidomide should be considered (Low QoE; Conditional recommendation).**

The evidence available for the management of gastrointestinal involvement relies on retrospective observational data since there are no controlled trials for this relatively uncommon type of involvement.91 The choice of the initial treatment modality depends on the severity of gastrointestinal involvement. Glucocorticoids are thought to help the rapid healing of ulcers during acute exacerbations. There is some concern about the potential of high dose glucocorticoids to facilitate perforation in patients who already carry a high risk of perforation, however there is no data to show this. Milder gastrointestinal involvement may be treated with 5-ASA derivatives whereas more severe cases can be treated with azathioprine.91-93 Retrospective data showed that infliximab, adalimumab and thalidomide may be beneficial in patients with severe involvement, refractory to azathioprine.94-99 Infliximab and thalidomide may be used concomitantly in selected cases.

A cohort study of BS patients with gastrointestinal involvement showed that almost a third of these patients required emergency surgery due to perforation, major bleeding or obstruction.91 Timely recognition of these complications is very important since they may be fatal if left untreated. Immunosuppressives seem to decrease the risk of postoperative recurrences and complications in such patients.

**Recommendation 9 – Nervous System Involvement**

**Acute attacks of parenchymal involvement should be treated with high dose glucocorticoids followed by slow tapering, together with immunosuppressants such as azathioprine (Low QoE; Strong recommendation). Cyclosporine should be avoided (Low QoE; Strong recommendation). Monoclonal anti-TNF antibodies should be considered in severe disease as first-line or in refractory patients (Very low QoE; Strong recommendation). The first episode of cerebral venous thrombosis should be treated with high dose glucocorticoids followed by tapering (Low QoE; Strong recommendation). Anticoagulants may be added for a short duration (Very low QoE; Conditional recommendation). Screening is needed for vascular disease at an extra-cranial site (Very low QoE; Strong recommendation).**

The two types of central nervous system involvement, namely parenchymal involvement and cerebral venous thrombosis (CVST) rarely occur in the same patient. CVST usually manifests as an extension of vascular involvement in BS. This obviates the need of screening for early and occult vascular lesions in patients diagnosed with CVST. There are differences in the management of these two types of nervous system involvement and the recommendations for both are supported by only uncontrolled observational studies.

For the treatment of parenchymal involvement high-dose glucocorticoids should be started together with an immunosuppressive such as azathioprine. A typical glucocorticoid regimen would be starting with daily pulses of intravenous methylprednisolone 1 gr/day that may be continued for up to 7 days followed by oral prednisolone (or prednisone) at 1 mg/kg/day for one month and tapered by 5-10 mg every 10-15 days. Patients who have severe parenchymal involvement at onset, those who have persistent or relapsing disease despite corticosteroids and azathioprine and patients with chronic progressive nervous system involvement that is a more severe form of parenchymal involvement may benefit from monoclonal anti-TNF antibodies.43,64,101-104 Limited observations with tocilizumab have also shown some benefit.105

The task force members agreed that an acute cerebral venous thrombosis (CVST) episode should be treated with high dose glucocorticoids to obtain a rapid remission. However there is no data showing the benefit of adding immunosuppressives in the first episode of CVST and the group felt that this may not be necessary since relapses are not frequent in this type of involvement. Anticoagulants may be added for a short duration, especially in patients who have an additional prothrombotic condition.

A meta-analysis of observational studies with cyclosporine-A showed an increased risk of nervous system involvement in patients using this agent (RR 12.66, 95% CI 4.75 to 33.76).106-109 Thus the task force recommended to avoid cyclosporine-A in BS patients with nervous system involvement, even if the nervous system involvement is no longer active.

**Recommendation 10 – Joint involvement**

**Colchicine should be the initial treatment in BS patients with acute arthritis (Moderate QoE; Strong recommendation). Acute monoarticular disease can be treated with intra-articular glucocorticoids (Very low QoE; Conditional recommendation). Azathioprine, interferon-alpha or tumor necrosis factor alpha inhibitors should be considered in recurrent and chronic cases (Low QoE; Conditional recommendation).**

Colchicine was shown to be beneficial for preventing arthritis episodes in RCTs.7-9 Some members of the task force favored the use of continuous low dose corticosteroids in patients whose arthritis is not controlled with colchicine whereas others preferred azathioprine, interferon-alpha or TNFis.10,38,45,52,64,96,110-112 Intra-articular glucocorticoids may be helpful during an acute monoarticular attack. However this may not be necessary in many cases since the arthritis episodes are usually self-limiting and disappear in 2-3 weeks.

**DISCUSSION**

EULAR Recommendations for the management of Behçet’s disease were updated by notably revising the 2008 Recommendations and adding 5 overarching principles and one recommendation regarding the surgical management of arterial aneurysms. We also changed the title of the project to 'EULAR Recommendations for the Management of Behçet’s Syndrome'. Some experts felt a designation of 'syndrome' was more accurate for Behçets, actually a constellation of symptoms. The presence of geographic differences in disease expression, symptom clusters some of which are more frequent in familial cases and differences in drug response between different types of organ involvement especially with different cytokine inhibitors support this contention.113 There was a discussion among the authors and the disagreeing colleagues suggested that these considerations are also true for several complex and multifactorial diseases such as systemic lupus erythematosus, systemic sclerosis or ANCA associated vasculitis, none of which is called a 'syndrome'. A separate online vote was held among the authors. 10/23 members preferred 'syndrome', 7/23 preferred 'disease" and 6/23 voted 'neutral'. It was also commented that this issue needed to be further discussed among a larger group of experts.

Recommendations are especially important for conditions that require the collaboration of different specialties for management. The current recommendations aim to standardize the care of patients with BS, however there will inevitably be differences in management across countries depending on the geographic variation of the disease, differences in healthcare systems, cultural differences leading to differences in the expectations and preferences of patients and reimbursement policies. Some examples of such differences are related to the dose and duration of glucocorticoid use, more frequent use of biologics in some centers, preference of interferon-alpha instead of TNFis, anticoagulation in patients with deep vein thrombosis and the type of surgical intervention used for arterial involvement. One of the strengths of the EULAR Recommendations for the management of BS is that the task force comprised experts from several countries and from all disciplines involved in the care of BS patients allowing the incorporation of many perspectives regarding different aspects of the disease. Another strength was the involvement of 2 patients with BS who were actively involved in all stages including the selection of research questions for the systematic review. The task force tried to cover management issues in different settings and different types of patients. We anticipate that these recommendations would also be useful in parts of the world where BS is less prevalent and physicians rarely facing patients with this condition or a specific type of involvement of the condition. We also aimed to guide the physicians on to the appropriate timing for referral to a specialist center.

Despite the continuous accrual of research data for BS management, the main limitation of these Recommendations is that they were still rely on mostly observational and uncontrolled evidence and expert opinion for the treatment of vascular, gastrointestinal and nervous system involvement; as a consequence strong recommendations were derived at by broadening the suggested management options. There were RCTs with several agents for mucocutaneous, joint and eye involvement, but very few were head-to head trials; in potentially controversial cases any specific therapeutic option was only suggested conditionally. Moreover the heterogeneity in study design, outcome measures and patient selection made it difficult to compare the efficacy of different agents. There is also a lack of studies evaluating the efficacy of different treatment strategies for BS such as a “step-up” versus a “step-down” approach. Another limitation of these Recommendations is that we did not include economic considerations which can show important differences across countries.

Finally, after completing the Recommendations we listed the research questions that need to be answered in the future for improving the management of BS patients and proposed a research agenda (Table 2). In particular, further research is warranted for controversial issues such as the role of anticoagulation in patients with thrombosis and the comparative efficacy of interferon-alpha and TNFis in patients with eye involvement.

In conclusion, we revised the EULAR Recommendations for the management of BS and developed 5 overarching principles and 10 Recommendations related to the different types of organ and system involvement of BS. Implementation of these Recommendations into clinical practice will be an important endeavor. The dissemination of the Recommendations could be facilitated by translation into different languages and presentations in national meetings of different specialties involved in the management of patients with BS.

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**References**

1. Hatemi G, Silman A, Bang D, et al. EULAR recommendations for the management of Behcet disease. *Ann Rheum Dis.* 2008;67(12):1656-1662.

2. !!! INVALID CITATION !!! 2.

3. Ghogomu EA, Maxwell LJ, Buchbinder R, et al. Updated method guidelines for cochrane musculoskeletal group systematic reviews and metaanalyses. *The Journal of rheumatology.* 2014;41(2):194-205.

4. Guyatt GH, Oxman AD, Vist GE, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ.* 2008;336(7650):924-926.

5. Yazici H, Tuzun Y, Pazarli H, et al. Influence of age of onset and patient's sex on the prevalence and severity of manifestations of Behcet's syndrome. *Annals of the rheumatic diseases.* 1984;43(6):783-789.

6. Kural-Seyahi E, Fresko I, Seyahi N, et al. The long-term mortality and morbidity of Behcet syndrome: a 2-decade outcome survey of 387 patients followed at a dedicated center. *Medicine.* 2003;82(1):60-76.

7. Aktulga E, Altac M, Muftuoglu A, et al. A double blind study of colchicine in Behcet's disease. *Haematologica.* 1980;65(3):399-402.

8. Yurdakul S, Mat C, Tuzun Y, et al. A double-blind trial of colchicine in Behcet's syndrome. *Arthritis and rheumatism.* 2001;44(11):2686-2692.

9. Davatchi F, Sadeghi Abdollahi B, Tehrani Banihashemi A, et al. Colchicine versus placebo in Behcet's disease: randomized, double-blind, controlled crossover trial. *Mod Rheumatol.* 2009;19(5):542-549.

10. Yazici H, Pazarli H, Barnes CG, et al. A controlled trial of azathioprine in Behcet's syndrome. *The New England journal of medicine.* 1990;322(5):281-285.

11. Hamuryudan V, Mat C, Saip S, et al. Thalidomide in the treatment of the mucocutaneous lesions of the Behcet syndrome. A randomized, double-blind, placebo-controlled trial. *Ann Intern Med.* 1998;128(6):443-450.

12. Alpsoy E, Durusoy C, Yilmaz E, et al. Interferon alfa-2a in the treatment of Behcet disease: a randomized placebo-controlled and double-blind study. *Arch Dermatol.* 2002;138(4):467-471.

13. Melikoglu M, Fresko I, Mat C, et al. Short-term trial of etanercept in Behcet's disease: a double blind, placebo controlled study. *The Journal of rheumatology.* 2005;32(1):98-105.

14. Hatemi G, Melikoglu M, Tunc R, et al. Apremilast for Behcet's syndrome--a phase 2, placebo-controlled study. *The New England journal of medicine.* 2015;372(16):1510-1518.

15. Kilic H, Zeytin HE, Korkmaz C, et al. Low-dose natural human interferon-alpha lozenges in the treatment of Behcet's syndrome. *Rheumatology.* 2009;48(11):1388-1391.

16. Sharquie KE, Najim RA, Abu-Raghif AR. Dapsone in Behcet's disease: a double-blind, placebo-controlled, cross-over study. *J Dermatol.* 2002;29(5):267-279.

17. Mumcu G, Inanc N, Ozdemir FT, et al. Effects of azithromycin on intracellular cytokine responses and mucocutaneous manifestations in Behcet's disease. *Int J Dermatol.* 2013;52(12):1561-1566.

18. Grayson P, Yazici Y, Novakovich E, E. J, Goldbach RT, Sibley CH. Treatment of mucocutaneous manifestations in Behçet's disease with Anakinra: a pilot open-Label study. ACR/ARHP Annual Meeting; 2014.

19. Cantarini L, Vitale A, Scalini P, et al. Anakinra treatment in drug-resistant Behcet's disease: a case series. *Clinical rheumatology.* 2015;34(7):1293-1301.

20. Emmi G, Talarico R, Lopalco G, et al. Efficacy and safety profile of anti-interleukin-1 treatment in Behcet's disease: a multicenter retrospective study. *Clinical rheumatology.* 2016;35(5):1281-1286.

21. Dick AD, Tugal-Tutkun I, Foster S, et al. Secukinumab in the treatment of noninfectious uveitis: results of three randomized, controlled clinical trials. *Ophthalmology.* 2013;120(4):777-787.

22. Diamantopoulos AP, Hatemi G. Lack of efficacy of tocilizumab in mucocutaneous Behcet's syndrome: report of two cases. *Rheumatology.* 2013;52(10):1923-1924.

23. Cantarini L, Lopalco G, Vitale A, et al. Paradoxical mucocutaneous flare in a case of Behcet's disease treated with tocilizumab. *Clinical rheumatology.* 2015;34(6):1141-1143.

24. Mirouse A, Barete S, Monfort JB, et al. Ustekinumab for Behcet's disease. *J Autoimmun.* 2017.

25. BenEzra D, Cohen E, Chajek T, et al. Evaluation of conventional therapy versus cyclosporine A in Behcet's syndrome. *Transplant Proc.* 1988;20(3 Suppl 4):136-143.

26. Ozyazgan Y, Yurdakul S, Yazici H, et al. Low dose cyclosporin A versus pulsed cyclophosphamide in Behcet's syndrome: a single masked trial. *Br J Ophthalmol.* 1992;76(4):241-243.

27. Masuda K, Nakajima A, Urayama A, Nakae K, Kogure M, Inaba G. Double-masked trial of cyclosporin versus colchicine and long-term open study of cyclosporin in Behcet's disease. *Lancet.* 1989;1(8647):1093-1096.

28. Yamada Y, Sugita S, Tanaka H, Kamoi K, Kawaguchi T, Mochizuki M. Comparison of infliximab versus ciclosporin during the initial 6-month treatment period in Behcet disease. *Br J Ophthalmol.* 2010;94(3):284-288.

29. Tugal-Tutkun I, Guney-Tefekli E, Urgancioglu M. Results of interferon-alfa therapy in patients with Behcet uveitis. *Graefes Arch Clin Exp Ophthalmol.* 2006;244(12):1692-1695.

30. Kotter I, Zierhut M, Eckstein A, et al. Human recombinant interferon-alpha2a (rhIFN alpha2a) for the treatment of Behcet's disease with sight-threatening retinal vasculitis. *Adv Exp Med Biol.* 2003;528:521-523.

31. Bodaghi B, Gendron G, Wechsler B, et al. Efficacy of interferon alpha in the treatment of refractory and sight threatening uveitis: a retrospective monocentric study of 45 patients. *Br J Ophthalmol.* 2007;91(3):335-339.

32. Deuter CM, Zierhut M, Mohle A, Vonthein R, Stobiger N, Kotter I. Long-term remission after cessation of interferon-alpha treatment in patients with severe uveitis due to Behcet's disease. *Arthritis Rheum.* 2010;62(9):2796-2805.

33. Onal S, Kazokoglu H, Koc A, et al. Long-term efficacy and safety of low-dose and dose-escalating interferon alfa-2a therapy in refractory Behcet uveitis. *Arch Ophthalmol.* 2011;129(3):288-294.

34. Sobaci G, Erdem U, Durukan AH, et al. Safety and effectiveness of interferon alpha-2a in treatment of patients with Behcet's uveitis refractory to conventional treatments. *Ophthalmology.* 2010;117(7):1430-1435.

35. Krause L, Turnbull JR, Torun N, Pleyer U, Zouboulis CC, Foerster MH. Interferon alfa-2a in the treatment of ocular Adamantiades-Behcet's disease. *Adv Exp Med Biol.* 2003;528:511-519.

36. Krause L, Altenburg A, Pleyer U, Kohler AK, Zouboulis CC, Foerster MH. Longterm visual prognosis of patients with ocular Adamantiades-Behcet's disease treated with interferon-alpha-2a. *J Rheumatol.* 2008;35(5):896-903.

37. Gueudry J, Wechsler B, Terrada C, et al. Long-term efficacy and safety of low-dose interferon alpha2a therapy in severe uveitis associated with Behcet disease. *Am J Ophthalmol.* 2008;146(6):837-844 e831.

38. Calguneri M, Ozturk MA, Ertenli I, Kiraz S, Apras S, Ozbalkan Z. Effects of interferon alpha treatment on the clinical course of refractory Behcet's disease: an open study. *Annals of the rheumatic diseases.* 2003;62(5):492-493.

39. Wechsler B, Bodaghi B, Huong DL, et al. Efficacy of interferon alfa-2a in severe and refractory uveitis associated with Behcet's disease. *Ocul Immunol Inflamm.* 2000;8(4):293-301.

40. Niccoli L, Nannini C, Benucci M, et al. Long-term efficacy of infliximab in refractory posterior uveitis of Behcet's disease: a 24-month follow-up study. *Rheumatology (Oxford).* 2007;46(7):1161-1164.

41. Tugal-Tutkun I, Mudun A, Urgancioglu M, et al. Efficacy of infliximab in the treatment of uveitis that is resistant to treatment with the combination of azathioprine, cyclosporine, and corticosteroids in Behcet's disease: an open-label trial. *Arthritis Rheum.* 2005;52(8):2478-2484.

42. Cantini F, Niccoli L, Nannini C, et al. Efficacy of infliximab in refractory Behcet's disease-associated and idiopathic posterior segment uveitis: a prospective, follow-up study of 50 patients. *Biologics.* 2012;6:5-12.

43. Giardina A, Ferrante A, Ciccia F, Vadala M, Giardina E, Triolo G. One year study of efficacy and safety of infliximab in the treatment of patients with ocular and neurological Behcet's disease refractory to standard immunosuppressive drugs. *Rheumatol Int.* 2011;31(1):33-37.

44. Keino H, Okada AA, Watanabe T, Taki W. Decreased ocular inflammatory attacks and background retinal and disc vascular leakage in patients with Behcet's disease on infliximab therapy. *Br J Ophthalmol.* 2011;95(9):1245-1250.

45. Tognon S, Graziani G, Marcolongo R. Anti-TNF-alpha therapy in seven patients with Behcet's uveitis: advantages and controversial aspects. *Ann N Y Acad Sci.* 2007;1110:474-484.

46. Okada AA, Goto H, Ohno S, Mochizuki M, Ocular Behcet's Disease Research Group Of J. Multicenter study of infliximab for refractory uveoretinitis in Behcet disease. *Arch Ophthalmol.* 2012;130(5):592-598.

47. Capella MJ, Foster CS. Long-term efficacy and safety of infliximab in the treatment of Behcet's disease. *Ocul Immunol Inflamm.* 2012;20(3):198-202.

48. Al Rashidi S, Al Fawaz A, Kangave D, Abu El-Asrar AM. Long-term clinical outcomes in patients with refractory uveitis associated with Behcet disease treated with infliximab. *Ocul Immunol Inflamm.* 2013;21(6):468-474.

49. Al-Rayes H, Al-Swailem R, Al-Balawi M, Al-Dohayan N, Al-Zaidi S, Tariq M. Safety and efficacy of infliximab therapy in active behcet's uveitis: an open-label trial. *Rheumatol Int.* 2008;29(1):53-57.

50. Kawaguchi T, Kawazoe Y, Kamoi K, et al. Clinical course of patients with Behcet's uveitis following discontinuation of infliximab therapy. *Jpn J Ophthalmol.* 2014;58(1):75-80.

51. Ohno S, Nakamura S, Hori S, et al. Efficacy, safety, and pharmacokinetics of multiple administration of infliximab in Behcet's disease with refractory uveoretinitis. *J Rheumatol.* 2004;31(7):1362-1368.

52. Lindstedt EW, Baarsma GS, Kuijpers RW, van Hagen PM. Anti-TNF-alpha therapy for sight threatening uveitis. *Br J Ophthalmol.* 2005;89(5):533-536.

53. Sfikakis PP, Theodossiadis PG, Katsiari CG, Kaklamanis P, Markomichelakis NN. Effect of infliximab on sight-threatening panuveitis in Behcet's disease. *Lancet.* 2001;358(9278):295-296.

54. Sfikakis PP, Kaklamanis PH, Elezoglou A, et al. Infliximab for recurrent, sight-threatening ocular inflammation in Adamantiades-Behcet disease. *Ann Intern Med.* 2004;140(5):404-406.

55. Markomichelakis N, Delicha E, Masselos S, Fragiadaki K, Kaklamanis P, Sfikakis PP. A single infliximab infusion vs corticosteroids for acute panuveitis attacks in Behcet's disease: a comparative 4-week study. *Rheumatology (Oxford).* 2011;50(3):593-597.

56. Calvo-Rio V, Blanco R, Beltran E, et al. Anti-TNF-alpha therapy in patients with refractory uveitis due to Behcet's disease: a 1-year follow-up study of 124 patients. *Rheumatology (Oxford).* 2014;53(12):2223-2231.

57. Abu El-Asrar AM, Abboud EB, Aldibhi H, Al-Arfaj A. Long-term safety and efficacy of infliximab therapy in refractory uveitis due to Behcet's disease. *Int Ophthalmol.* 2005;26(3):83-92.

58. Tabbara KF, Al-Hemidan AI. Infliximab effects compared to conventional therapy in the management of retinal vasculitis in Behcet disease. *Am J Ophthalmol.* 2008;146(6):845-850 e841.

59. Yamada Y, Sugita S, Tanaka H, Kamoi K, Takase H, Mochizuki M. Timing of recurrent uveitis in patients with Behcet's disease receiving infliximab treatment. *Br J Ophthalmol.* 2011;95(2):205-208.

60. Handa T, Tsunekawa H, Yoneda M, et al. Long-term remission of ocular and extraocular manifestations in Behcet's disease using infliximab. *Clin Exp Rheumatol.* 2011;29(4 Suppl 67):S58-63.

61. Accorinti M, Pirraglia MP, Paroli MP, Priori R, Conti F, Pivetti-Pezzi P. Infliximab treatment for ocular and extraocular manifestations of Behcet's disease. *Jpn J Ophthalmol.* 2007;51(3):191-196.

62. Takeuchi M, Asukata Y, Kawagoe T, Ito N, Nishide T, Mizuki N. Infliximab monotherapy versus infliximab and colchicine combination therapy in patients with Behcet's disease. *Ocul Immunol Inflamm.* 2012;20(3):193-197.

63. Takeuchi M, Kezuka T, Sugita S, et al. Evaluation of the long-term efficacy and safety of infliximab treatment for uveitis in Behcet's disease: a multicenter study. *Ophthalmology.* 2014;121(10):1877-1884.

64. Vallet H, Riviere S, Sanna A, et al. Efficacy of anti-TNF alpha in severe and/or refractory Behcet's disease: Multicenter study of 124 patients. *J Autoimmun.* 2015;62:67-74.

65. Jaffe GJ, Dick AD, Brezin AP, et al. Adalimumab in Patients with Active Noninfectious Uveitis. *The New England journal of medicine.* 2016;375(10):932-943.

66. Bawazeer A, Raffa LH, Nizamuddin SH. Clinical experience with adalimumab in the treatment of ocular Behcet disease. *Ocul Immunol Inflamm.* 2010;18(3):226-232.

67. Perra D, Alba MA, Callejas JL, et al. Adalimumab for the treatment of Behcet's disease: experience in 19 patients. *Rheumatology (Oxford).* 2012;51(10):1825-1831.

68. Interlandi E, Leccese P, Olivieri I, Latanza L. Adalimumab for treatment of severe Behcet's uveitis: a retrospective long-term follow-up study. *Clin Exp Rheumatol.* 2014;32(4 Suppl 84):S58-62.

69. Nguyen QD, Merrill PT, Jaffe GJ, et al. Adalimumab for prevention of uveitic flare in patients with inactive non-infectious uveitis controlled by corticosteroids (VISUAL II): a multicentre, double-masked, randomised, placebo-controlled phase 3 trial. *Lancet.* 2016;388(10050):1183-1192.

70. Grekas D, Nikolaidis P, Karamouzis M, Alivanis P, Tourkantonis A. Effects of azathioprine on ciclosporin metabolism. *Nephron.* 1992;60(4):489.

71. Efficacy of Gevokizumab in the Treatment of Patients With Behçet's Disease Uveitis (EYEGUARD™-B) [updated 2015 JAf.

72. Karacorlu M, Mudun B, Ozdemir H, Karacorlu SA, Burumcek E. Intravitreal triamcinolone acetonide for the treatment of cystoid macular edema secondary to Behcet disease. *Am J Ophthalmol.* 2004;138(2):289-291.

73. Atmaca LS, Yalcindag FN, Ozdemir O. Intravitreal triamcinolone acetonide in the management of cystoid macular edema in Behcet's disease. *Graefes Arch Clin Exp Ophthalmol.* 2007;245(3):451-456.

74. Ohguro N, Yamanaka E, Otori Y, Saishin Y, Tano Y. Repeated intravitreal triamcinolone injections in Behcet disease that is resistant to conventional therapy: one-year results. *Am J Ophthalmol.* 2006;141(1):218-220.

75. Tuncer S, Yilmaz S, Urgancioglu M, Tugal-Tutkun I. Results of intravitreal triamcinolone acetonide (IVTA) injection for the treatment of panuveitis attacks in patients with Behcet disease. *J Ocul Pharmacol Ther.* 2007;23(4):395-401.

76. Park UC, Park JH, Yu HG. Long-term outcome of intravitreal triamcinolone acetonide injection for the treatment of uveitis attacks in Behcet disease. *Ocul Immunol Inflamm.* 2014;22(1):27-33.

77. Tayer-Shifman OE, Seyahi E, Nowatzky J, Ben-Chetrit E. Major vessel thrombosis in Behcet's disease: the dilemma of anticoagulant therapy - the approach of rheumatologists from different countries. *Clin Exp Rheumatol.* 2012;30(5):735-740.

78. Ahn JK, Lee YS, Jeon CH, Koh EM, Cha HS. Treatment of venous thrombosis associated with Behcet's disease: immunosuppressive therapy alone versus immunosuppressive therapy plus anticoagulation. *Clin Rheumatol.* 2008;27(2):201-205.

79. Desbois AC, Wechsler B, Resche-Rigon M, et al. Immunosuppressants reduce venous thrombosis relapse in Behcet's disease. *Arthritis Rheum.* 2012;64(8):2753-2760.

80. Alibaz-Oner F, Karadeniz A, Ylmaz S, et al. Behcet disease with vascular involvement: effects of different therapeutic regimens on the incidence of new relapses. *Medicine (Baltimore).* 2015;94(6):e494.

81. Seyahi E, Cakmak OS, Tutar B, et al. Clinical and Ultrasonographic Evaluation of Lower-extremity Vein Thrombosis in Behcet Syndrome: An Observational Study. *Medicine (Baltimore).* 2015;94(44):e1899.

82. Tascilar K, Melikoglu M, Ugurlu S, Sut N, Caglar E, Yazici H. Vascular involvement in Behcet's syndrome: a retrospective analysis of associations and the time course. *Rheumatology (Oxford).* 2014;53(11):2018-2022.

83. Hamuryudan V, Er T, Seyahi E, et al. Pulmonary artery aneurysms in Behcet syndrome. *The American journal of medicine.* 2004;117(11):867-870.

84. Saba D, Saricaoglu H, Bayram AS, et al. Arterial lesions in Behcet's disease. *Vasa.* 2003;32(2):75-81.

85. Hamuryudan V, Seyahi E, Ugurlu S, et al. Pulmonary artery involvement in Behcets syndrome: Effects of anti-Tnf treatment. *Semin Arthritis Rheum.* 2015;45(3):369-373.

86. Hamuryudan V, Yurdakul S, Moral F, et al. Pulmonary arterial aneurysms in Behcet's syndrome: a report of 24 cases. *Br J Rheumatol.* 1994;33(1):48-51.

87. Seyahi E, Melikoglu M, Akman C, et al. Pulmonary artery involvement and associated lung disease in Behcet disease: a series of 47 patients. *Medicine (Baltimore).* 2012;91(1):35-48.

88. Le Thi Huong D, Wechsler B, Papo T, et al. Arterial lesions in Behcet's disease. A study in 25 patients. *J Rheumatol.* 1995;22(11):2103-2113.

89. Saadoun D, Asli B, Wechsler B, et al. Long-term outcome of arterial lesions in Behcet disease: a series of 101 patients. *Medicine.* 2012;91(1):18-24.

90. Park MC, Hong BK, Kwon HM, Hong YS. Surgical outcomes and risk factors for postoperative complications in patients with Behcet's disease. *Clin Rheumatol.* 2007;26(9):1475-1480.

91. Hatemi I, Esatoglu SN, Hatemi G, Erzin Y, Yazici H, Celik AF. Characteristics, Treatment, and Long-Term Outcome of Gastrointestinal Involvement in Behcet's Syndrome: A Strobe-Compliant Observational Study From a Dedicated Multidisciplinary Center. *Medicine (Baltimore).* 2016;95(16):e3348.

92. Jung YS, Hong SP, Kim TI, Kim WH, Cheon JH. Long-term clinical outcomes and factors predictive of relapse after 5-aminosalicylate or sulfasalazine therapy in patients with intestinal Behcet disease. *J Clin Gastroenterol.* 2012;46(5):e38-45.

93. Jung YS, Cheon JH, Hong SP, Kim TI, Kim WH. Clinical outcomes and prognostic factors for thiopurine maintenance therapy in patients with intestinal Behcet's disease. *Inflamm Bowel Dis.* 2012;18(4):750-757.

94. Hatemi I, Hatemi G, Pamuk ON, Erzin Y, Celik AF. TNF-alpha antagonists and thalidomide for the management of gastrointestinal Behcet's syndrome refractory to the conventional treatment modalities: a case series and review of the literature. *Clinical and experimental rheumatology.* 2015;33(6 Suppl 94):S129-137.

95. Naganuma M, Sakuraba A, Hisamatsu T, et al. Efficacy of infliximab for induction and maintenance of remission in intestinal Behcet's disease. *Inflamm Bowel Dis.* 2008;14(9):1259-1264.

96. Iwata S, Saito K, Yamaoka K, et al. Efficacy of combination therapy of anti-TNF-alpha antibody infliximab and methotrexate in refractory entero-Behcet's disease. *Mod Rheumatol.* 2011;21(2):184-191.

97. Lee JH, Cheon JH, Jeon SW, et al. Efficacy of infliximab in intestinal Behcet's disease: a Korean multicenter retrospective study. *Inflamm Bowel Dis.* 2013;19(9):1833-1838.

98. Kinoshita H, Kunisaki R, Yamamoto H, et al. Efficacy of infliximab in patients with intestinal Behcet's disease refractory to conventional medication. *Intern Med.* 2013;52(17):1855-1862.

99. Tanida S, Inoue N, Kobayashi K, et al. Adalimumab for the treatment of Japanese patients with intestinal Behcet's disease. *Clin Gastroenterol Hepatol.* 2015;13(5):940-948 e943.

100. Kalra S, Silman A, Akman-Demir G, et al. Diagnosis and management of Neuro-Behcet's disease: international consensus recommendations. *J Neurol.* 2014;261(9):1662-1676.

101. Pipitone N, Olivieri I, Padula A, et al. Infliximab for the treatment of Neuro-Behcet's disease: a case series and review of the literature. *Arthritis Rheum.* 2008;59(2):285-290.

102. Borhani Haghighi A, Safari A, Nazarinia MA, Habibagahi Z, Shenavandeh S. Infliximab for patients with neuro-Behcet's disease: case series and literature review. *Clin Rheumatol.* 2011;30(7):1007-1012.

103. Zeydan B, Uygunoglu U, Saip S, et al. Infliximab is a plausible alternative for neurologic complications of Behcet disease. *Neurol Neuroimmunol Neuroinflamm.* 2016;3(5):e258.

104. Al-Araji A SA, Saip S et al. . Treatment of NeuroBehcet’s disease with infliximab: An international multi-centre case-series of 18 patients. *Clin Exp Rheumatol.* 2010;28 (Suppl 60):S119.

105. Addimanda O, Pipitone N, Pazzola G, Salvarani C. Tocilizumab for severe refractory neuro-Behcet: three cases IL-6 blockade in neuro-Behcet. *Semin Arthritis Rheum.* 2015;44(4):472-475.

106. Kato Y, Numaga J, Kato S, Kaburaki T, Kawashima H, Fujino Y. Central nervous system symptoms in a population of Behcet's disease patients with refractory uveitis treated with cyclosporine A. *Clin Exp Ophthalmol.* 2001;29(5):335-336.

107. Kotake S, Higashi K, Yoshikawa K, Sasamoto Y, Okamoto T, Matsuda H. Central nervous system symptoms in patients with Behcet disease receiving cyclosporine therapy. *Ophthalmology.* 1999;106(3):586-589.

108. Kotter I, Gunaydin I, Batra M, et al. CNS involvement occurs more frequently in patients with Behcet's disease under cyclosporin A (CSA) than under other medications--results of a retrospective analysis of 117 cases. *Clin Rheumatol.* 2006;25(4):482-486.

109. Akman-Demir G, Ayranci O, Kurtuncu M, Vanli EN, Mutlu M, Tugal-Tutkun I. Cyclosporine for Behcet's uveitis: is it associated with an increased risk of neurological involvement? *Clinical and experimental rheumatology.* 2008;26(4 Suppl 50):S84-90.

110. Kotter I, Vonthein R, Zierhut M, et al. Differential efficacy of human recombinant interferon-alpha2a on ocular and extraocular manifestations of Behcet disease: results of an open 4-center trial. *Semin Arthritis Rheum.* 2004;33(5):311-319.

111. Hamuryudan V, Moral F, Yurdakul S, et al. Systemic interferon alpha 2b treatment in Behcet's syndrome. *The Journal of rheumatology.* 1994;21(6):1098-1100.

112. Alpsoy E, Yilmaz E, Basaran E. Interferon therapy for Behcet's disease. *J Am Acad Dermatol.* 1994;31(4):617-619.

113. Yazici H, Ugurlu S, Seyahi E. Behcet syndrome: is it one condition? *Clin Rev Allergy Immunol.* 2012;43(3):275-280.

**Table 1 - Updated EULAR recommendations for the management of Behçet’s syndrome, with levels of evidence, grade of recommendations, voting rates and level of agreement**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Level** **of Evidence\*** | **Strength of Recommendation #** | **GRADE: Recommendation󠆱¥** | **Voting****(%)** | **Level of Agreement** |
| **Overarching principles*** Behçet’s syndrome is a condition that typically runs a relapsing and remitting course and the goal of treatment is to promptly suppress inflammatory exacerbations and recurrences to prevent irreversible organ damage.
* A multidisciplinary approach is necessary for optimal care.
* Treatment should be individualized according to age, gender, type and severity of organ involvement and patient’s preferences.
* Ocular, vascular, neurologic and gastrointestinal involvement may be associated with a poor prognosis.
* Disease manifestations may ameliorate over time in many patients.
 | NA | -NA | NA | 91.3 | 9.5 ± 0.7 |
| ***1-Mucocutaneous involvement***Topical measures such as local steroids should be used for the treatment of oral and genital ulcers (Low QoE; Strong recommendation). Colchicine should be tried first for the prevention of recurrent mucocutaneous lesions especially when the dominant lesion is erythema nodosum or genital ulcer (Moderate QoE; Strong recommendation). Papulopustular or acne-like lesions are treated with topical or systemic measures as used in acne vulgaris (Very low QoE; Strong recommendation). Leg ulcers in BS might be caused by venous stasis or obliterative vasculitis (Very low QoE; Conditional recommendation). Treatment should be planned with the help of a dermatologist and vascular surgeon (Very low QoE; Strong recommendation). Drugs such as azathioprine, thalidomide, interferon-alpha, tumor necrosis factor alpha inhibitors or apremilast should be considered in selected cases (Moderate QoE; Conditional recommendation). | IB/IV | A/D | Strong | 91.3 | 9.4 ± 0.8 |
| ***2-Eye involvement***Management of uveitis of BS requires close collaboration with ophthalmologists with the ultimate aim of inducing and maintaining remission (Very low QoE; Strong recommendation). Any patient with BS and inflammatory eye disease affecting the posterior segment should be on a treatment regime such as azathioprine, cyclosporine-A, interferon-alpha or monoclonal anti-TNF antibodies (Moderate QoE; Strong recommendation). Systemic glucocorticoids should be used only in combination with azathioprine or other systemic immunosuppressants (Very low QoE; Strong recommendation). Patients presenting with an initial or recurrent episode of acute sight threatening uveitis should be treated with high dose glucocorticoids, infliximab or interferon-alpha (Low QoE; Strong recommendation). Intravitreal glucocorticoid injection is an option in patients with unilateral exacerbation as an adjunct to systemic treatment (Low QoE; Conditional recommendation). | IB/IIA | A/B | Strong | 91.3 | 9.5 ± 0.6 |
| ***3- Isolated anterior uveitis***Systemic immunosuppressives could be considered for those with poor prognostic factors such as young age, male sex and early disease onset (Very low QoE; Conditional recommendation). | IV | D | Conditional | 91.3 | 9.0 ± 0.8 |
| ***4-Acute deep vein thrombosis***For the management of acute deep vein thrombosis in BS, glucocorticoids and immunosuppressants such as azathioprine, cyclophosphamide or cyclosporine-A are recommended (Low QoE; Strong recommendation) | III | C | Strong | 95.6 | 9.3 ± 0.8 |
| ***5-Refractory venous thrombosis***Monoclonal anti-TNF antibodies could be considered in refractory patients (Very low QoE; Conditional recommendation). Anticoagulants may be added, provided the risk of bleeding in general is low and coexistent pulmonary artery aneurysms are ruled out (Very low QoE; Conditional recommendation).  | III | C | Conditional | 95.6 | 8.7 ± 0.8 |
| ***6-Arterial involvement***For the management of pulmonary artery aneurysms, high dose glucocorticoids and cyclophosphamide are recommended (Low QoE; Strong recommendation). Monoclonal anti-TNF antibodies should be considered in refractory cases (Low QoE; Strong recommendation). For patients who have or who are at high risk of major bleeding, embolization should be preferred to open surgery (Low QoE; Strong recommendation). For both aortic and peripheral artery aneurysms medical treatment with cyclophosphamide and corticosteroids is necessary before intervention to repair (Low QoE; Strong recommendation). Surgery or stenting should not be delayed if the patient is symptomatic (Low QoE; Strong recommendation). | III | C | Strong | 95.6 | 9.2 ± 0.9 |
| ***7-Gastrointestinal involvement***Gastrointestinal involvement of BS should be confirmed by endoscopy and/or imaging (Low QoE; Strong recommendation). NSAID ulcers, inflammatory bowel disease and infections such as tuberculosis should be ruled out (Low QoE; Strong recommendation). | III | C | Strong | 91.3 | 9.2 ± 0.9 |
| ***8-Refractory/severe gastrointestinal involvement***Urgent surgical consultation is necessary in cases of perforation, major bleeding and obstruction (Low QoE; Strong recommendation). Glucocorticoids should be considered during acute exacerbations together with disease modifying agents such as 5-ASA or azathioprine (Very low QoE; Strong recommendation). For severe and/or refractory patients monoclonal anti-TNF antibodies and/or thalidomide should be considered (Low QoE; Conditional recommendation).  | III | C | Conditional | 91.3 | 8.8 ± 0.9 |
| ***9-Nervous system involvement***Acute attacks of parenchymal involvement should be treated with high dose glucocorticoids followed by slow tapering, together with immunosuppressants such as azathioprine (Low QoE; Strong recommendation). Cyclosporine should be avoided (Low QoE; Strong recommendation). Monoclonal anti-TNF antibodies should be considered in severe disease as first-line or in refractory patients (Very low QoE; Strong recommendation). The first episode of cerebral venous thrombosis should be treated with high dose glucocorticoids followed by tapering (Low QoE; Strong recommendation). Anticoagulants may be added for a short duration (Very low QoE; Conditional recommendation). Screening is needed for vascular disease at an extra-cranial site (Very low QoE; Strong recommendation). | III | C | Strong | 91.3 | 9.1 ± 1.2 |
| ***10-Joint involvement***Colchicine should be the initial treatment in BS patients with acute arthritis (Moderate QoE; Strong recommendation). Acute monoarticular disease can be treated with intra-articular glucocorticoids (Very low QoE; Conditional recommendation). Azathioprine, interferon-alpha or tumor necrosis factor alpha inhibitors should be considered in recurrent and chronic cases (Low QoE; Conditional recommendation). | IB | A | Strong | 91.3 | 9.0 ± 1.0 |

**NA: not applicable; QoE: quality of evidence; TNF: tumor necrosis factor alpha**

\*Level of evidence indicates evidence from: IA: meta-analysis of RCTs; IB: at least one RCT; IIA: at least one controlled study without randomisation; IIB: at least one type of quasi-experimental study; III: descriptive studies, such as comparative studies, correlation studies or case–control studies; IV: expert committee reports or opinions and/or clinical experience of respected authorities.

# Strength of recommendation is based on evidence: A: category I evidence; B: Category II evidence or extrapolated recommendations from category I evidence; C: category III evidence or extrapolated recommendation from category I or II evidence; D: Category IV evidence or extrapolated recommendation from category II or III evidence

¥According to GRADE a strong recommendation implies for patients that most people in their situation would want the recommended course of action and only a small proportion would not. Similarly for clinicians that most patients should receive the recommended course of action and for policy makers the recommendation can be adapted as a policy in most situations. On the other hand a conditional recommendation would indicate for a patient that the majority of people in their situation would want the recommended course of action, but many would not. Similarly for clinicians they would mean that they should be prepared to help patients to make a decision that is consistent with the patients’ own values and finally for the policy makers that there is a need for substantial debate and involvement of stakeholders.

**Table 2 – Research agenda**

|  |  |
| --- | --- |
| Eye involvement | Head to head trial comparing interferon-alpha to TNFis |
| Controlled trials with IL-1 and IL-6 blockers |
| Trials assessing the comparative efficacy and safety of different TNFis |
| Determining how long TNFis or interferon-alpha should be continued after remission is obtained |
| Defining remission regarding a decision to switch to a maintenance therapy or considering treatment discontinuation for eye involvement |
| Determining whether glucocorticoids reduce the efficacy of interferon-alpha |
| Vascular involvement | Controlled trials to assess the efficacy and safety of anticoagulation for preventing relapses of venous thrombosis, post-thrombotic syndrome and recurrent arterial occlusive events. |
| Studies to identify individual differences (saccular / diffuse fusiform / large vs small) that guide the choice of surgical intervention.  |
| Determining the optimal dose and duration of immunosuppressives after surgical intervention for peripheral artery aneurysms. |
| Determining the optimal treatment of post-operative recurrent anastomotic aneurysms (extra-anastomosis by-pass vs local aneurysm repair).  |
| Determining the optimal management of intracardiac thrombosis. |
| Nervous system involvement | Controlled studies for determining the optimal management of initial, refractory and recurrent parenchymal nervous system involvement and cerebral venous thrombosis. |
| Determining the role of MRI and other laboratory tests in making treatment decisions and follow up of patients with nervous system involvement. |
| Gastrointestinal system involvement | Controlled studies for determining the optimal management of initial, refractory and recurrent gastrointestinal system involvement.  |
| Determining the role, optimal dose and duration of corticosteroids in acute relapses and whether they increase the risk of perforation. |
| Determining whether a control colonoscopy is needed in patients with clinical remission and the optimal timing for control colonoscopy. |
| Overall | Trials to assess the benefit of concomitant immunosuppressive use TNFis. |
| Studies assessing the efficacy of treatment modalities for patient important outcomes such as fatigue. |

\* TNFis: tumor necrosis factor alpha inhibitors

Excluded:

•Wrong study design, n= 129

•Wrong outcome, n = 41

•Overlapping patients, n=18

•Other than selected language, n = 17

•Wrong patient population, n=9

Excluded after reading title/abstract

n = 3532

PUBMED/MEDLINE, EMBASE Cochrane Library Databases, DARE, HTA, IPAD, ACR abstracts (since 2010), EULAR abstracts (since 2002), ICBD abstracts(since… )

Keyword combination:

“Behcet\* AND (Colchicine OR Azathioprine OR Cyclosporine-A OR Cyclosporine OR Interferon OR Infliximab OR Etanercept OR Adalimumab OR Anakinra OR Canakinumab OR Rilonacept OR Gevokizumab OR Tocilizumab OR Rituximab OR Secukinumab OR Daclizumab OR Apremilast OR Corticosteroid OR Surgery OR Triamcinolone OR Methotrexate OR Sulfasalazine OR Mycophenolate mofetil OR Chlorambucil OR Tacrolimus OR Cyclophosphamide OR IVIG OR Azithromycin OR Pimecrolimus cream OR Protopic cream OR Rebamipide OR Levamisole OR Biologic dressings OR Anticoagulant OR coumadin OR warfarin OR Thalidomide)”

 n= 3927

n = 3927

Full-text evaluated

n = 395

Hand search

n = 11

Included in the analyses

 n= 192\*

Joint involvement

 n = 17

Skin and

mucosa involvement

 n=27

Vascular involvement

 n = 43

Gastrointestinal involvement

 n = 14

Nervous system involvement

 n = 25

Eye involvement
 n = 83

**Figure.** Flowchart of the study selection process

\* Some studies assessed more than one type of involvement