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Treatment of Ocular Inflammatory Disorders with Adalimumab: A Retrospective Case Series

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Abstract. To determine the efficacy and safety of adalimumab in the treatment of ocular inflammatory disorders the records of five patients with sight threatening ocular inflammatory disorders resistant to other immunosuppressive agents treated with Adalimumab 20-40 mg every two weeks were analyzed. A total of 5 patients: two patients had Behcet's disease; 1 had juvenile idiopathic arthritis associated uveitis, 1 had anterior uveitis secondary to ankylosing spondilitis, and 1 had Idiopathic nodular scleritis. Five patients were treated (eight eyes examined) with Adalimumab; 4 males and 1 female, ranging in ages 9 to 52 years (mean: 27-years-old). All patients except patient 4 and 5 showed marked improvement in signs of ocular inflammation within 4 weeks from onset of therapy. However, patients' No. 4 and 5 showed complete improvement in signs of ocular inflammation within 6 and 12 weeks, respectively.

Keywords: Adalimumab, Ocular inflammatory disorders, Uveitis, Scleritis, Behcet's disease.

Introduction

Ocular inflammatory disorders as uveitis and scleritis have great potential for visual morbidity and visual loss.

Immunosuppressive therapy is the mainstay of treatment in patient with ocular inflammatory disorders who are unresponsive to topical or periocular corticosteroids[1].

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Tumor necrosis factor (TNF) is an inflammatory protein that plays a major role in pathogenesis of different forms of ocular inflammatory disorders[2,3]. Blocking this cytokines can interrupt the cascade of events that can cause damage to involved tissues.

Based on the improved understanding of the immune system, a new pharmaceutical approach is being designed and used to control inflammation in various forms of ocular inflammatory disorders, such agents include etanercept, infliximab, daclizumab and adalimumab[4-8].

Recent reports have shown that anti-TNF-α therapy may be effective in the treatment of different forms of uveitis, including juvenile idiopathic arthritis (JIA), associated iritis and Behcet's disease[4-10].

Adalimumab (Abbott Laboratories, North Chicago, IL USA) is a complete humanized injectable, IgG monoclonal anti-TNF antibody that blocks the inflammatory effects of TNF alpha in rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis (AS), and Crohn's disease[10-14]. FDA approved this product on December 2002 for the treatment of rheumatoid arthritis. It has a longer terminal half life than other anti-TNF-α agents and self administered subcutaneously (SC) by the patients. It was also approved in the use of monotherapy and in combination with methotrexate (MTX)[11].

In this case series we present our clinical experience with Adalimumab in treating various patients with refractory ocular inflammatory disorders.

Materials and Methods

We reviewed the records of patients with uveitis or ocular inflammatory disorders at Maghrabi Eye Center who have received treatment with adalimumab. These patients were either resistant to, or were intolerant to conventional therapies. After careful discussions with the patients, treatment was implemented: An inpatient with acute severe uveitis such as Behcet's disease, adalimumab was started as a rescue therapy bypassing the conventional therapies. Patients with simultaneous severe acute anterior uveitis and ankylosing spondilitis that were started on adalimumab by rheumatologist were included in the study. Thus, patients with known history of hypersensitivity to the drug were excluded from the treatment. As well as patients with ocular inflammatory

disorders secondary to infectious etiology were also not eligible to receive the treatment. Cost and risk of the treatment were explained to the patients.

All patients had a baseline laboratory evaluation in the form of complete blood count, liver function test, blood urea nitrogen, serum creatinine level, chest X-ray and tuberculin skin sensitivity test – purified protein derivative of Mycobacterium tuberculosis (PPD). A detailed medical history and evaluation were performed for each patient by a rheumatologist before starting the treatment.

Adalimumab was administered subcutaneously (SC) at a dose of 20 to 40 mg every two weeks for 1 year and later it was discontinued, depending on the clinical respond of each patient. During each clinical visit a Snellen chart, an intraocular pressure measurement, and an evaluation of intraocular inflammation were performed. A complete ophthalmologic examination, including visual acuity by using slit lamp and dilated fundus examination were also conducted.

A degree of anterior chamber and posterior segment inflammation were recorded according to the system proposed by Kimura and colleagues[15]. The intraocular inflammation was considered active or uncontrolled if the inflammatory activity was graded 1 + or more either in the anterior chamber or in the anterior vitreous.

Through drawing, photograph or both were used in documented scleral injection and inflammation. The improvement of nodular scleritis was evaluated subjectively for the improvement of pain supported by documented photograph in the decrease of scleral inflammation.

Complete blood count, liver function, urea and creatinine were evaluated every 4 weeks during the treatment course; other immunosuppressive therapies were adjusted according to each patient clinical response.

Adalimumab therapy was discontinued if the patient showed worsening of the clinical condition, medication intolerance, and if patient request because of the high cost of the treatment.

Case Series

The patients' characteristics are shown in Table 1.

Table 1. Patients characteristics and clinical diagnosis.

No. of patient (Eyes)	Age	Sex	Diagnosis	Laterality	OD/OS	Follow-up (Months)
1(1)	27	M	Behcet's	OS	OS	9
2(2)	52	M	Iridocyclitis, AS	OD	OD	6
3(3)	9	M	JIA, Bilateral iritis	OU	OD	12
3(4)	9	M	JIA, Bilateral iritis	OU	OS	12
4(5)	35	M	Behcet's	OU	OD	14
4(6)	35	M	Behcet's	OU	OS	14
5(7)	30	F	Nodular scleritis	OU	OD	16
5(8)	30	F	Nodular scleritis	OU	OS	16

Case 1

A 27-years-old male, diagnosed with Behcet's disease in 2002 was presented with a bilateral recurrent uveitis. He had light perception vision in his right eye and 20/60 visual acuity in his left eye. He was on 10 mg/day Prednisolone, 400 mg/day cyclosporine, and colchicines 0.5 mg twice a day. He developed a severe exacerbation in his left eye with decrease in visual acuity of 20/200. He had +3 cells and flares in the anterior chamber and +3 vitreitis. Prednisolone was increased to 60 mg/day and he was started on adalimumab 40 mg SC every 2 weeks.

Four weeks after the first dose of adalimumab, his anterior chamber reaction and vitreitis were completely resolved, and the visual acuity improved to 20/70 in his left eye. Prednisolone was tapered to 5 mg/day by 12 weeks and cyclosporine was reduced to 150 mg/day at 4 months. Colchicine was discontinued at 6 months.

The patient had no further attacks at 9 months; was followed up while he was on adalimumab SC every 2 weeks.

Case 2

A 52-years-old male patient was presented with a right recurrent iridocyclitis. He was diagnosed as having AS in 2003. He had 20/50-vision in his right eye and 20/20-vision in his left eye. He was on prednisolone acetate 1% drops twice a day and on ketorolac tromethamine 0.5% drops 4 times a day on the right eye.

The patient had 5 attacks of iridocyclitis in one year. When Pred Forte (prednisolone acetate 1%) was reduced to once a day, he developed an exacerbation of inflammation. His visual acuity dropped to 20/100 in his right eye and had +4 reactions in the anterior chamber. Prednisolone acetate 1% was increased to every hour. As the patient had exacerbation of spondilitis, his Rheumatologist started him on adalimumab SC every 2 weeks after consulting the ophthalmologist. In this case, it was determined to start adalimumab instead of immunosuppressives. At 4 weeks he had complete resolution of iridocyclitis and a 20/50 visual acuity in his right eye. The visual acuity did not improve further as he developed posterior subcapsular cataract. Prednisolone acetate 1% was discontinued after 8 weeks. At 6 months follow-up, patient is still on ketorolac tromethamine 0.5% drops 4 times a day and adalimumab SC every 2 weeks with no recurrence of iridocyclitis.

Case 3

A 9-years-old boy with a known case of JIA was presented with bilateral iritis. He had 20/25 vision in his right eye and 20/40 in his left eye. He had an uncontrolled iritis for one year and was resistant to oral cyclosporine, naproxen, and MTX. His visual acuity dropped to 20/60 in his right eye and 20/70 in his left eye, and he had +2 cells in the anterior chamber right eye and +3 cells in the anterior chamber left eye. The patient was kept on the same immunosuppressive medication and was started on Prednisolone acetate 1% drops every hour on both eyes.

At the same time he was started on adalimumab SC 20 mg every 2 weeks. Four weeks after the first dose of adalimumab: the iritis resolved completely in both eyes and prednisolone acetate 1% was stopped after 8 weeks. Cyclosporine was discontinued after 4 months and MTX was discontinued after 6 months. The patient was kept on naproxen with no recurrence after 1-year follow-up.

Case 4

A 35-years-old male diagnosed with Behcet's disease in 2004 had bilateral recurrent retinal vasculitis. His visual acuity was 20/80 in his right eye and 20/100 in his left eye.

The patient was on azathioprine 150 mg/day, prednisolone 7.5 mg/day and colchicine 0.5 mg twice a day. He developed a severe exacerbation in both eyes with a decrease in visual acuity to 20/400 in his right eye and counting finger on his left eye. On slit lamb examination, he had 4+ cells and flares on both eyes, and on fundus examination he had bilateral 2+ vitreitis, cystoid macular edema, and retinal vasculitis on both eyes. The patient was started on prednisolone acetate 1% drops every hour and prednisolone was increased to 60 mg/day.

After discussing with the patient about the treatment options, like cyclosporine, and having him convinced of the encouraging results, it was decided to treat the patient with Adalimumab. Adalimumab SC 40 mg was given to the patient every 2 weeks and complete resolution of inflammation was seen in 6 weeks. His visual acuity improved to 20/80 in his right eye and 20/200 in his left eye with posterior subcapsular cataract. Cystoid macular edema was resolved completely in both eyes.

Prednisolone and azathioprine were discontinued after 8 months. The patient was kept on colchicine 0.5 mg twice a day and adalimumab 40 mg SC every two weeks with no recurrence after 14 months follow-up.

Case 5

A 30-years-old female was presented with the history of recurrent idiopathic bilateral nodular scleritis for the past seven years. Her visual acuity was 20/20 in both eyes. She was on prednisolone 15 mg/day, diclofenac sodium 0.1% drops 4 times a day, and ibuprofen 400 mg three times a day. The patient was intolerant to azathioprine, cyclosporine, and MTX. She refused cyclophosphamide treatment because of the side effects of the medication. She was given multiple subconjunctival triamcinolone injections 40 mg/ml to control the recurrent attacks. She was started on infliximab for 9 months trial, however, we couldn't control her attacks and we were unable to reduce steroids to less than 15 mg/day. On July 2006, she developed bilateral exacerbation with severe nodular scleritis, therefore, prednisolone was increased to 40 mg/day and she was started on prednisolone acetate 1% drops every hour. Adalimumab 40 mg SC was given every 2 weeks with rapid control of scleritis in both eyes within 3 months. Prednisolone was tapered slowly to 10 mg/day after 6 months and an attempt to reduce it to 7.5 mg/day was failed, so patient was kept on prednisolone 10 mg/day, diclofenac

sodium 0.1% drops 4 QD, ibuprofen 400 mg PRN, and adalimumab 40 mg SC every 2 weeks with no recurrence over 16 months follow-up.

Results

Five patients were treated with adalimumab (4 males and 1 female) (Table 1). The average patient age was 27 years (range 9 to 52 years). Two patients had Behcet's disease, 1 patient had AS, 1 had JIA, and 1 had idiopathic nodular scleritis. Eight eyes in five patients were affected at the initiation of therapy. Three of the 5 patients who were treated with adalimumab responded to the therapy within 4 weeks of the first dose (case 1, 2, and 3). In cases 4 and 5 the clinical response to therapy was seen after 6 weeks and 12 weeks, respectively. The mean time to response was 8 weeks (range 4-12 weeks). Improved visual acuity and resolution of ocular inflammation were noted in all patients (Table 2). The doses of immunosuppressive therapy in all the patients(Table 3) were able to be discontinued or reduced. No patient had an adverse reaction related to the medication. No significant laboratory abnormalities occurred during the course of therapy. No recurrent attacks were noted during the course of therapy. The mean duration of follow up was 11 months (range 6-16 months). Adalimumab was not discontinued in any of our patients.

Table 2. Visual improvement with Adalimumab.

No. of patient (Eyes)	OD/OS	Visual acuity pre -Adalimumab	Visual acuity post-Adalimumab	Response (Weeks)
1(1)	OS	20/200	20/70	4
2(2)	OD	20/100	20/50	4
3(3)	OD	20/60	20/25	4
3(4)	OS	20/70	20/40	4
4(5)	OD	20/400	20/80	6
4(6)	OS	CF 1 m	20/200	6
5(7)	OD	20/20	20/20	12
5(8)	OS	20/20	20/20	12

Table 3. The status of immunosuppressive drugs before and after Adalimumab.

No. patients	Adalimumab dose	Pre-Adalimumab treatment	Post-Adalimumab treatment
1	40 mg	Prednisolone +Cyclosporine +Colchicine	Prednisolone (tapered) + Cyclosporine
2	40 mg	Prednisolone acetate eye drops + Ketorolac tromethamine	Ketorolac tromethamine eye drops
3	20 mg	Cyclosporine +Naproxen +Methotrexate +Prednisolone acetate eye drops	Naproxen
4	40 mg	Prednisolone +Azathioprine +Colchicine	Colchicine
5	40 mg	Prednisolone +Ibuprofen +Diclofenac sodium eye drops +Subconjunctival Triamcinolone +Infliximab	Prednisolone (tapered) + Ibuprofen + Diclofenac sodium eye drops

Discussion

This report shows the efficacy of adalimumab in the treatment of patients with ocular inflammatory disorders *i.e.*, JIA associated anterior uveitis, Behcet's disease, ankylosing spondylitis associated iridocyclitis and nodular scleritis. The effectiveness of anti-TNF-α drugs including adalimumab in uveitis have been reported in various studies[4-10,16-19]. However, this is the first report documenting improvement of nodular scleritis with adalimumab.

Autoimmune arthritis and non-infectious uveitis share similarities not only in immune mechanisms but also in the group of drugs used in their treatments; such as steroids, non-steroidal anti-inflammatory drugs, and immunomodulators like MTX, cyclosporine, and mycophenolate mofetil[20]. In addition to these, there are new group of drugs, which can block TNF-α, a potent pro-inflammatory cytokine, namely infliximab, etanercept and adalimumab[16]. The efficacy of these anti–TNF-α drugs on arthritis were reported to be comparable in various studies and in case

reports, but adalimumab appears to be more effective than the other two in the treatment of uveitis[8].

Infliximab, a chimeric anti-TNF-α monoclonal antibody contains 75% human and 25% mouse peptide sequences. It is administered intravenously and always has to be co-administered with MTX[17] Etanercept is a recombinant human TNF receptor (p 75) – Fc artificial fusion protein[20]. Adalimumab is the first fully human (100% human peptide sequences) anti-TNF-α monoclonal antibody, which can bind the TNF-α cytokine on cell surfaces not just in the circulation[8,16]. This could be the reason for the superiority of the adalimumab over either etanercept or infliximab especially in treating the patients with uveitis. In addition it has convenient biweekly subcutaneous administration and does not need the co-administration of MTX[16].

Suhler *et al.*[17] evaluated the efficacy of infliximab in refractory uveitis in a prospective non-randomized trial. It showed that the infliximab was effective as a short-term immunosuppressive agent, but had unacceptably severe toxic effects like pulmonary embolism and congestive heart failure.

In this present study, eight eyes of five patients were given treatment with adalimumab. Two patients had Behcet's disease, 1 patient had ankylosing spondylitis, 1 had JIA, and 1 had idiopathic nodular scleritis. All the patients showed improvement of inflammation. Patient Nos. 1, 2, and 3 responded to the therapy within 4 weeks of the first dose. In Patient No. 4, the clinical response to therapy was seen after 6 weeks. The patient with nodular scleritis showed response after 12 weeks. Improved visual acuity and resolution of ocular inflammation were noted in all patients. These results are in accordance with previous reports described with anti-TNF-α agents, infliximab[5,17] and adalimumab[8,10,18].

In Patient No. 5, with nodular scleritis, who had severed and recurrent pain were not controlled with systemic and topical steroids, non-steroidal anti-inflammatory drugs, and infliximab showed dramatic improvement with adalimumab within 12 weeks after the administration. In the Medline/Pubmed survey, we could not find any other studies, which documented the efficacy of adalimumab in patients with nodular scleritis. The patients did not respond to infliximab and showed dramatic response with adalimumab. The reason for this favorable response of adalimumab over infliximab is not clear; both of them can block TNF-α,

both in circulation (soluble) and both on the surface (membrane bound)[8,18]. Adalimumab may block the surface TNF cytokine better than infliximab as it is fully humanized monoclonal antibody. Mushtaq *et al.,*[10] recently showed that switching over to adalimumab from infliximab therapy decreases the recurrences in patients with Behcet's disease.

The doses of other immunosuppressive therapy in all patients (Table 3) were reduced. This shows the efficacy of adalimumab as a potent anti-inflammatory agent.

Anti-TNF treatment is not totally safe as there are multiple side effects, increasingly reported includes; reactivation of latent tuberculosis[21], endogenous endophthalmitis[22], demyelinating disease[23], bilateral optic neuropathy[24], and sudden death in patients with cardiac insufficiency[19].

In this study, any of these adverse reactions were not encountered. No significant laboratory abnormalities or recurrent attacks occurred during the course of therapy. Being a retrospective case series, this study had its limitation with respect to number of cases and the follow-up period. The high cost of the treatment, the possible side effects and the availability of time tested drugs may influence the treatment decision, however adalimumab may appear to be better than its fellow drugs in its group of anti TNF alpha therapy; such as infliximab and etanercept in being the fully human monoclonal antibody, thus avoiding the immunogenicity and co-administration of immunosuppressives such as MTX. This, however, needs further verification by randomized controlled studies. In addition, adalimumab can be self administered by the patient subcutaneously, thus avoiding hospitalization.

The present study of case series suggests that adalimumab is effective in the treatment of ocular inflammatory disorders including Behcet's disease, ankylosing spondilitis related iridocyclitis, JIA related iritis, and nodular scleritis. However, further randomized controlled studies are warranted to establish its role in these ocular inflammatory disorders.

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علاج اضطرابات العين الالتهابية مع أداليموماب: سلسلة حالات استعادية

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المستخلص. دراسة تحديد الفعالية ودرجة الأمان لاستخدام أداليموماب فى علاج أمراض العين الالتهابية. متابعة خمس مرضى مصابون بأمراض التهابية فى العين مقاومة للمثبطات المناعية، وتؤدى للعمى، حيث تم علاجهم بأداليموماب، ٢٠–٤٠ ملغم كل أسبوعين، ومن ثم تحليل نتائج العلاج. الحالات المرضية: هما مريضتان مصابتان بداء بهجت، ومريض مصاب بالتهاب المفاصل الشبابى الذاتى المنشأ والمترافق مع التهاب العنبية، ومريض مصاب بالتهاب عنبية أمامي تالي لالتهاب الفقار اللاصق، ومريض مصاب بالتهاب الصلبة العقدي الذاتي المنشأ. تمت معالجة ٨ عيون من المرضى الخمسة بأداليموماب (٤ إناث ورجل واحد)، وتراوحت الأعمار من ٩–٥٢ سنة (المتوسط ٢٧ سنة). كل المرضى أظهروا تحسناً ملحوظًا خلال ٤ أسابيع من المعالجة، باستثناء المريض رقم ٤، والمريض رقم ٥ اللذان أظهرا شفاءً تامًا خلال ٦ و ١٢ أسبوعًا على التوالي. متوسط مدة العلاج كان ١١ شهرًا (٦–١٦ شهرًا). لم تظهر تفاعلات عكسية متعلقة بالدواء على أي مريض. أداليموماب علاج فعال للأشكال المختلفة من الأمراض الالتهابية فى العين، مع درجة أمان ممتازة. لا زال هناك حاجة لإجراء دراسات عديدة مع فترة متابعة أطول للمرضى، لتأكيد هذا الانطباع عن هذا الدواء.