Patient and physician perception of the infusion process of the biologic agents abatacept, infliximab, and rituximab for the treatment of rheumatoid arthritis

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Abstract

Objective

To assess the process related to each infusible biologic used in rheumatoid arthritis (RA) with regard to patient and physician engagement in the infusion process, ancillary services required, and participant preferences.

Methods

This was a cross-sectional survey of patients with RA and their physicians. Biologic-naïve patients with RA starting abatacept, infliximab, or rituximab were included. Both patients and physicians completed detailed questionnaires related to the infusion and satisfaction with the process.

Results

A total of 205 patients were enrolled: abatacept (n=102), infliximab (n=74), rituximab (n=29). Patients were primarily female (75%), Caucasian (85%), with a mean age of 58 years. Patients had a mean disease duration of approximately 8 years and had typically failed multiple DMARDs. Rituximab required the most pre-infusion preparation and the longest infusion time. Abatacept was associated with a shorter mean infusion time (42 minutes) than infliximab (131 minutes; $p<0.0001$) or rituximab (274 minutes; $p<0.0001$) and required less time away from work/home ($p=0.01$ and $p<0.0001$, respectively). Abatacept patients reported significantly less discomfort than rituximab patients ($p=0.03$), while discomfort was similar between abatacept and infliximab. From the physicians' perspective, compared to infliximab and rituximab abatacept was very easy to administer (57% vs. 27% and 5%, respectively), caused no pain/discomfort (52% vs. 42% and 31%), and had very infrequent infusion reactions (75% vs. 30% and 44%).

Conclusion

The process involved in infusion administration, as perceived by both the patient and physician, seems to differ across the three infusible biologic agents and may have an impact on the decision-making process regarding which infusible biologic to use.

Key words

Abatacept, infliximab, rituximab, infusible biologics, infusion administration.

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Support for this study was provided by Bristol-Myers Squibb.

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Received on October 24, 2008; accepted in revised form on June 4, 2009.

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Conflict of interest: Dr Y. Yazici is a consultant for BMS, Centocor, Roche, Celgene, and UCB and is a speaker for BMS and UCB; Dr B.J. McMorris was an employee of Innovus, Ingenia, Eden Prarie, MN, which was contacted by Bristol-Myers Squibb to conduct this researchstudy; Dr L.C. Rosenblatt is an employee of Bristol-Myers Squibb; Dr T. Darkow has declared no competing interests.

Introduction

Biologic disease-modifying antirheumatic drugs (bDMARDs) for the treatment of rheumatoid arthritis (RA) have been welcome additions to treatment regimens used by rheumatologists. These biologic agents are used as either subcutaneous injections or intravenous (IV) infusions with varying dosing schedules. Three infusible biologic agents, abatacept, infliximab, and rituximab, are currently available for the treatment of RA. Infliximab, a tumour necrosis factor (TNF) inhibitor, was approved in 1999. Infliximab administration includes a loading dose and bimonthly IV infusions (1). Abatacept, commercially available in 2006, is a T-cell signalling modulator. Its administration also uses a loading regimen (2). Lastly, rituximab, approved in 2006 for the treatment of RA, is administered as two infusions two weeks apart, with recommended reinfusion at no sooner than four months, as symptoms require (3).

All three agents have been shown to be effective in the treatment of RA (4-9). Even though there are no head-to-head randomised clinical trials (RCT) available to compare efficacy, these agents seem to be similarly effective in the treatment of RA and are often used as additions to methotrexate (MTX) in patients who have had an inadequate response or no longer respond to MTX (10). Infliximab and abatacept have an indication to be used as first-line agents but are not commonly used in that way (11). As for adverse event (AE) profiles, some minor differences exist among the three agents; however, this has not translated into an effect on utilisation profiles (12).

Given that trials have reported similar efficacy of these treatments in disease activity and differences in AEs have not been confirmed, infusion process and patient and physician preferences become important factors in deciding to use one agent over the other. All three biologics require trained staff and proper patient monitoring, as per their labels, due to the risk of infusion reaction. However, there may be some differing aspects to each infusion process that would aid in the physician's and patient's choice of infusible biologic agent. This study was conducted to answer questions about the process and level of participant engagement related to each infusible biologic and ancillary services required. In addition, patient-reported outcomes and physician perceptions regarding abatacept, infliximab, or rituximab infusions were examined to better define level of satisfaction among these different infusible biologic agents.

Methods

This study was a cross-sectional survey of patients with RA and their physicians. Seventy-seven physicians were contracted to participate in the study, of whom 48 completed the physician survey and 44 recruited patients for the study. Patients with RA who were naïve to infusible biologic therapy and were initiating therapy with one of these agents at the time of enrolment were recruited for the study. Both patients and physicians completed detailed questionnaires related to the infusions and satisfaction with the overall infusion process.

Study design

The study design included a patient survey, a physician survey, and collection of data with regard to patient and provider time required for administration of abatacept, infliximab, and rituximab. Patients were recruited during the course of usual care. Institutional Review Board (IRB) approval was obtained from Copernicus Group, a central IRB.

Study patients

Physician Investigators: Rheumatologists in community clinic settings who saw and treated individuals with RA were targeted for selection. Physicians who administered infusion therapy on-site, had internet access in their office, and practiced rheumatology in the United States (US) were invited to participate in the study.

Patient sample: Physicians identified eligible patients during regular office visits or scheduled visits to an infusion center. For this descriptive, exploratory

study, a formal sample size calculation was not conducted. Instead, the study design targeted a total of 100 abatacept patients, 70 infliximab patients, and 30 rituximab patients for data collection and descriptive analyses. A total of 205 patients with RA were enrolled into one of three study cohorts based upon the infused bDMARD administered on the day of enrolment: abatacept (n=102), infliximab (n=74), or rituximab (n=29). Physicians determined the most appropriate treatment for the patient's condition in the course of usual care. To be eligible for the study, patients met the following additional inclusion criteria: a diagnosis of RA; initiating abatacept, infliximab, or rituximab therapy at the enrollment visit; no previous or current use of abatacept, infliximab, or rituximab for RA for any other indication; age 18 years or older; and ability to understand and read English.

Data collection

An infusion care flow sheet was used to record different components on patient and physician engagement in the infusion process, including time for different infusion-related activities. Upon completion of the infusion, patients completed a self-administered patient satisfaction survey on paper to capture their experiences and satisfaction with the infused bDMARD. Patients were provided with a postage-paid envelope and handed the sealed envelope containing the completed questionnaire to the physician or staff prior to leaving. Study physicians completed a one-time physician survey on their overall perceptions of and prior and current experience with infused bDMARD therapies (not limited to infusions administered during this study).

Patient characteristics and clinical history: Demographic and clinical characteristics of the study patients were collected from both physicians, via a Case Report Form (CRF), and from patients via the patient survey. Demographic information included age, gender, educational level, and employment status. The physician investigator supplied information with regard to disease duration, previously failed DMARDs, and DMARDs used concurrently with the study bDMARD. Physicians were asked to indicate the total number of swollen or tender joints and were asked to indicate whether patients had selected comorbidities, including immune system-mediated inflammatory conditions (*i.e.* ankylosing spondylitis, psoriatic arthritis, Crohn's disease, ulcerative colitis, systemic lupus erythematosus, psoriasis), other immunocompromised states (*i.e.* HIV/AIDS, post-transplant status, cancer), respiratory conditions (*i.e.* allergic rhinitis, asthma, COPD), cardiovascular conditions (*i.e.* CHF, angina and other ischemic heart disease, arrhythmia), and other chronic conditions (*i.e.* chronic renal disease, chronic liver disease). Finally, patients completed the Health Assessment Questionnaire – Disability Index (HAQ-DI) to assess their physical function (13, 14)

Patient and provider time: Patient time requirements associated with receipt of abatacept, infliximab, and rituximab was collected via the patient survey and the infusion care flow sheet. Time away from work/home was determined, including not only the time for the actual infusion but also travel time and time spent waiting in the physician office or infusion center. Employed individuals were asked additional questions related to work time lost, and all patients were asked whether a friend or family member missed work to bring them in for the infusion. Provider labour time prior to, during, and following the infusion was captured via the infusion care flow sheet. Tasks prior to infusion included patient arrival preparation, patient preparation (*e.g.* vitals, review of patient chart, initiation of IV hydration), infusion preparation, and pre-medication preparation and administration (if relevant). Tasks during the infusion included infusion initiation, standard monitoring unrelated to infusion reactions, additional care and monitoring related to infusion reactions (if they occurred), and infusion completion (*e.g.* removal of venous access). Tasks following the infusion included post-infusion monitoring, patient discharge (*e.g.* provision of patient educational materials, chart documentation), and clean-up. If an infusion reaction occurred, additional information was collected. The specific reaction experienced (*e.g.* anaphylaxis, flushing, urticaria) was documented, and any rescue medications given (*e.g.* acetaminophen, diphenhydramine) or other actions taken (*e.g.* decreasing the infusion rate, stopping the infusion) were recorded. Additionally, it was indicated whether the patient's discharge was delayed due to the infusion reaction.

Patient experience: Patients' experience and satisfaction with the infusion were collected via the patient survey. Patients were asked to indicate the level of pain and the amount of discomfort experienced during the infusion, with 0 indicating no pain/discomfort and 10 indicating "pain as bad as it could be" (in the case of pain) or severe discomfort (in the case of discomfort). In addition, patients were asked to rate overall satisfaction with the infusion experience (0 = totally dissatisfied; 10 = extremely satisfied).

Physician ratings: Physicians completed a survey with several questions with regard to their overall experience with infused bDMARDs. These questions were about all of their experiences with these three agents but were not limited to the infusions given related to this study. Physicians were asked to rate each agent with which they had experience in terms of ease of use (from "very easy" to "very difficult"), staff burden (from "a lot" to "none"), medication effectiveness (from "very effective" to "very ineffective"), and patient tolerability (from "very tolerable" to "very intolerable"). In addition, physicians rated their overall satisfaction with each agent, with 0 indicating totally dissatisfied and 10 indicating extremely satisfied.

Statistical methods

Data extraction and statistical analyses were performed using SAS®, version 9.1 (SAS Institute, Cary, NC). All baseline and outcome variables were compared between study cohorts: abatacept versus infliximab; abatacept versus rituximab; abatacept versus infliximab and rituximab; and infliximab versus

rituximab. Baseline characteristics, patient and provider time, and patient experience outcomes were compared via *t*-tests and Fisher's exact tests. Friedman's test was used to compare differences in ranked ratings of ease of use, staff burden, medication effectiveness, and patient tolerability (15-17). Paired *t*-tests were used to compare providers' mean satisfaction scores across bDMARDs.

Results

A total of 205 patients with RA were enrolled in the study: abatacept (n=102), infliximab (n=74), and rituximab (n=29). Patients were primarily female (75%) and Caucasian (85%), with a mean age of 58 years, and approximately half had some college education (47%). Mean disease duration was 7.96 years (Table I). Swollen and tender joint counts were highest for the rituximab group and similar between the abatacept and infliximab groups. HAQ-DI scores were similar among the three groups.

The most common DMARD used concurrently with the study bDMARD was MTX, and patients had failed a mean of 1.8, 1.4, and 2.3 DMARDs, respectively, in the abatacept, infliximab, and rituximab cohorts ($p<0.05$ for the comparison of infliximab to rituximab). Approximately 31% of abatacept and rituximab patients were not receiving any concurrent DMARD therapy, with the difference between abatacept and infliximab patients (18%) being significantly different ($p=0.03$). Overall, injectable TNF inhibitors and MTX were the most frequently reported previously failed DMARDs; more patients receiving abatacept and rituximab had failed etanercept or MTX compared to the infliximab group (Table I).

Within the abatacept cohort, the most common comorbidities reported were respiratory conditions including allergic rhinitis, asthma, and COPD (11.8%), and cardiovascular conditions including CHF, angina and other ischemic heart disease, and arrhythmia (11.8%). Less frequently reported were immune system-mediated inflammatory conditions including ankylosing spondylitis, psoriatic arthritis, Crohn's disease, ulcerative colitis, systemic lupus erythematosus, and psoriasis (4.9%) and other immunocompromised states including HIV/AIDS, post-transplant status, and cancer (8.8%). Respiratory conditions (18.9%) were the most frequently reported comorbid conditions in the infliximab cohort, followed by immune system-mediated inflammatory conditions (9.5%).

Table I. Demographic and clinical characteristics of study patients.

		Cohort			*p*-values*		
		Abatacept	Infliximab	Rituximab	Abatacept *vs.* Infliximab	Abatacept *vs.* Rituximab	Infliximab *vs.* Rituximab
Number of patients	n.	102	74	29			
Age, years	mean (SD)	57.58 (12.69)	59.69 (13.46)	57.21 (13.21)	0.2897	0.8905	0.3994
	median	57	61	54			
Female	n. (%)	79 (77.45)	53 (71.62)	22 (75.86)	0.3846	0.8082	0.8069
Highest education level							
Less than high school graduate	n. (%)	16 (16.49)	17 (23.61)	8 (27.59)	0.1323	0.2027	0.9054
High school graduate	n. (%)	28 (28.87)	26 (36.11)	9 (31.03)			
Some college	n. (%)	22 (22.68)	17 (23.61)	8 (27.59)			
Associate's degree or higher	n. (%)	31 (31.96)	12 (16.67)	4 (13.79)			
Employed	n. (%)	36 (37.11)	23 (31.51)	7 (24.14)	0.6416	0.3445	0.1965
Disease duration, years	mean (SD)	10.06 (10.64)	6.97 (10.07)	6.86 (6.47)	0.0548	0.0511	0.9460
	median	7.5	3	5.5			
Number of swollen/tender joints	mean (SD)	14.14 (10.29)	11.56 (7.12)	20.63 (16.04)	0.0547	0.0546	**0.0082**
	median	12	12	18			
Health Assessment Questionnaire	mean (SD)	1.47 (0.64)	1.54 (0.71)	1.66 (0.61)	0.4968	0.1716	0.4412
Standard Disability Index	median	1.5	1.63	1.69			
Number of DMARDs failed	mean (SD)	1.77 (1.80)	1.43 (2.13)	2.34 (1.93)	0.2502	0.1403	**0.0474**
	median	1	1	2			
DMARDs used concurrently							
Adalimumab	n. (%)	0 (0)	1 (1.35)	0 (0)	0.4205	--	1.0000
Etanercept	n. (%)	0 (0)	1 (1.35)	0 (0)	0.4205	--	1.0000
Methotrexate	n. (%)	59 (57.84)	57 (77.03)	19 (65.52)	**0.0099**	0.5243	0.3188
Hydroxychloroquine	n. (%)	10 (9.80)	18 (24.32)	4 (13.79)	**0.0120**	0.5100	0.2944
Leflunomide	n. (%)	9 (8.82)	2 (2.70)	2 (6.90)	0.1223	1.0000	0.3146
Sulfasalazine	n. (%)	6 (5.88)	4 (5.41)	1 (3.45)	1.0000	1.0000	1.0000
Azathioprine	n. (%)	2 (1.96)	0 (0)	0 (0)	0.5099	1.0000	--
Gold compounds	n. (%)	0 (0)	0 (0)	2 (6.90)	--	**0.0477**	0.0733
None	n. (%)	32 (31.37)	13 (17.57)	9 (31.03)	**0.0382**	0.9724	0.1337

*Statistical comparisons were conducted using Fisher's exact tests for proportions and *t*-tests for means; significant *p*-values are in bold.
SD: standard deviation; DMARD: disease-modifying antirheumatic drug.

Table II. Patient and provider time associated with the use of abatacept, infliximab, and rituximab.

		Cohort			*p*-values*		
		Abatacept	Infliximab	Rituximab	Abatacept *vs.* Infliximab	Abatacept *vs.* Rituximab	Infliximab *vs.* Rituximab
Number of patients	n.	102	74	29			
Patient time, minutes							
Traveling to/from infusion site	mean (SD)	42.53 (28.82)	51.46 (64.11)	37.86 (28.56)	0.2798	0.4518	0.1501
	median	40	35	30			
Waiting for infusion to begin	mean (SD)	16.86 (18.06)	14.75 (16.51)	21.79 (23.38)	0.4381	0.2373	0.1533
	median	10	10	12.5			
Infusion time	mean (SD)	42.13 (15.62)	130.90 (25.44)	274.00 (57.29)	**<0.0001**	**<0.0001**	**<0.0001**
	median	40	130	275			
Discharge time	mean (SD)	16.63 (16.16)	22.00 (20.72)	21.93 (15.58)	0.0688	0.1247	0.9869
	median	10	15	20			
Total time away from work/home	mean (SD)	172.58 (186.40)	267.89 (268.68)	446.90 (165.55)	**0.0114**	**<0.0001**	**0.0001**
	median	120	240	480			
Work time lost							
Patient missed time from work to attend infusion therapy	v (%)	22 (62.86)	18 (78.26)	3 (60.00)	0.2572	1.0000	0.5737
Hours missed from work to attend infusion therapy	mean (SD)	3.27 (2.21)	8.11 (10.25)	6.67 (2.52)	0.0648	0.0216	0.8145
	median	3	6	7			
Able to return to work following infusion therapy	n. (%)	17 (44.74)	4 (17.39)	2 (28.57)	0.0503	0.6808	0.6033
Friend/family member missed time from work	n. (%)	11 (30.56)	9 (24.32)	6 (42.86)	0.6067	0.5106	0.3014
Provider labour time, minutes							
Pre-infusion tasks	mean (SD)	32.26 (23.30)	34.38 (20.09)	69.72 (31.21)	0.5302	**<0.0001**	**<0.0001**
	median	25	27.5	70			
Monitoring and additional tasks during infusion	mean (SD)	34.23 (30.86)	65.92 (62.98)	127.55 (129.67)	**0.0001**	**0.0006**	**0.0198**
	median	23.5	40	57			
Post-infusion tasks	mean (SD)	20.23 (14.07)	27.95 (14.73)	40.59 (21.76)	**0.0005**	**<0.0001**	**0.0065**
	median	15	26.5	40			
Total labour time	mean (SD)	86.72 (57.29)	128.24 (76.82)	237.86 (149.32)	**0.0001**	**<0.0001**	**0.0006**
	median	66	112	185			

*Statistical comparisons were conducted using Fisher's exact tests for proportions and *t*-tests for means; significant *p*-values are in bold.
SD: standard deviation.

Other immunocompromised states (5.4%) and cardiovascular conditions (2.7%) were less common in this cohort. The most common comorbidities among patients treated with rituximab were other immunocompromised states (17.2%), and cardiovascular conditions (17.2%), followed by respiratory conditions (13.8%) and immune system-mediated inflammatory conditions (6.9%). Cardiovascular conditions were significantly less frequent in the infliximab cohort than in the abatacept and rituximab cohorts (p=0.04 and 0.02, respectively).

Patient and provider time

Pre-infusion medications were not given to 81% of abatacept-, 31% of infliximab-, and 7% of rituximab-treated patients (p<0.0001 for comparison of abatacept *vs.* infliximab and rituximab). Rituximab required the most pre-infusion time to prepare the patient and the infusible biologic (Table II). Rituximab was associated with the longest mean infusion time; abatacept was associated with a shorter mean infusion time (42 minutes) than infliximab (131 minutes; p<0.0001) or rituximab (274 minutes; p<0.0001). In addition, infliximab- and rituximab-treated patients spent more hours away from work and/or home due to infusion compared with abatacept patients (p=0.01 and p<0.0001, respectively).

Overall, very few infusion reactions were observed. One patient treated with abatacept had an infusion reaction, a rash considered mild and requiring no pharmacologic or medical intervention. Two infliximab-treated patients experienced infusion reactions. One of these patients experienced mild urticaria, and while this patient's infusion was temporarily stopped, no other rescue treatment was given. The second patient experienced hypertension of moderate severity and required treatment with diphenhydramine and methylprednisolone. In addition, this patient's infusion was temporarily stopped and reinitiated at a lower infusion rate, resulting in delayed discharge. Four rituximab-treated patients had infusion reactions. For two of these patients, the reaction was mild and required no pharmacologic or medical intervention; one patient experienced hot flashes while the other experienced rigors and a small rash. The third patient experienced a transient, mild to moderate rash treated with diphenhydramine. The final patient experienced moderate chest discomfort and shortness of breath, requiring treatment with dexamethasone and stopping of the infusion, which was then reinitiated at a decreased rate. This patient's discharge was subsequently delayed as a result.

Table III. Physicians' ratings of abatacept, infliximab, and rituximab.

		Physician ratings			*p*-values*		
		Abatacept	Infliximab	Rituximab	Abatacept *vs.* Rituximab	Abatacept *vs.* Infliximab	Infliximab *vs.* Rituximab
Ease of use	n.	46	48	42			
Very easy	n. (%)	26 (56.52)	13 (27.08)	2 (4.76)	**0.0017**	**<0.0001**	**<0.0001**
Somewhat easy	n. (%)	14 (30.43)	22 (45.83)	15 (35.71)			
Neither easy nor difficult	n. (%)	3 (6.52)	10 (20.83)	9 (21.43)			
Somewhat difficult	n. (%)	2 (4.35)	2 (4.17)	15 (35.71)			
Very difficult	n. (%)	1 (2.17)	1 (2.08)	1 (2.38)			
Staff burden	n.	45	48	41			
A lot	n. (%)	1 (2.22)	2 (4.26)	6 (14.63)	**0.0184**	**0.0007**	**<0.0001**
Some	n. (%)	13 (28.89)	8 (17.02)	14 (34.15)			
Moderate	n. (%)	9 (20.00)	21 (44.68)	14 (34.15)			
Mild	n. (%)	15 (33.33)	13 (27.66)	6 (14.63)			
None	n. (%)	7 (15.56)	3 (6.38)	1 (2.44)			
Medication effectiveness	n.	46	46	41			
Very effective	n. (%)	14 (31.11)	36 (78.26)	12 (29.27)	**<0.0001**	**0.7630**	**<0.0001**
Somewhat effective	n. (%)	26 (57.78)	7 (15.22)	25 (60.98)			
Neither effective nor ineffective	n. (%)	1 (2.22)	0 (0)	0 (0)			
Somewhat ineffective	n. (%)	1 (2.22)	0 (0)	2 (4.88)			
Very ineffective	n. (%)	3 (6.67)	3 (6.52)	2 (4.88)			
Patient tolerability	n.	45	47	40			
Very tolerable	n. (%)	29 (64.44)	20 (42.55)	12 (30.00)	**0.0253**	**0.0184**	**0.0956**
Somewhat tolerable	n. (%)	7 (15.56)	15 (31.91)	14 (35.00)			
Neither tolerable nor intolerable	n. (%)	1 (2.22)	3 (6.38)	5 (12.50)			
Somewhat intolerable	n. (%)	0 (0)	4 (8.51)	4 (10.00)			
Very intolerable	n. (%)	8 (17.78)	5 (10.64)	5 (12.50)			
Overall satisfaction	n.	45	47	41			
(0=totally dissatisfied;	mean (SD)	7.18 (1.45)	7.87 (1.19)	6.73 (1.76)	**0.0109**	**0.2094**	**<0.0001**
10=extremely satisfied)	median	8	8	7			

*Statistical comparisons were conducted using Friedman's test to compare differences in ranked ratings within providers and a paired *t*-test to compare mean satisfaction; significant *p*-values are in bold.
SD: standard deviation.

Patient experience

Across the treatment cohorts, patients reported very little pain associated with infusion, with mean (SD) pain scores of 2.1 (2.9), 2.2 (2.6), and 2.3 (3.1) in the abatacept, infliximab, and rituximab cohorts, respectively. None of these differences were statistically significant. Scores were low for infusion-related discomfort across all treatments. Abatacept-treated patients reported significantly less discomfort than rituximab-treated patients (1.2 *vs.* 2.3; p=0.03), while mean discomfort scores were similar between abatacept and infliximab (1.4). All patients reported very high satisfaction, with mean (SD) satisfaction scores of 8.0 (3.3), 8.0 (3.1), and 7.5 (3.4) in the abatacept, infliximab, and rituximab cohorts, respectively. None of these differences were statistically significant.

Physician ratings

In comparing abatacept to infliximab and rituximab, more physicians felt abatacept infusions were very easy to administer (57% *vs.* 27% and 5%, respectively; Table III). Additionally, more physicians responded that abatacept was associated with no infusion-related pain or discomfort (52% *vs.* 42% and 31% for infliximab and rituximab, respectively) and very infrequent infusion reactions (75% *vs.* 30% and 44% for infliximab and rituximab, respectively). Physicians also stated more frequently that abatacept has high tolerability (64%) compared with infliximab (43%) or rituximab (30%). Overall, nearly all physicians rated these agents as at least somewhat effective. However, more physicians rated infliximab as very effective (78%) than either abatacept (31%) or rituximab (29%).

Discussion

This cross-sectional study examined events related to infusing one of the three available bDMARDs – abatacept, infliximab, and rituximab – and studied patients' and physicians' satisfaction with these treatment options. Overall, patients receiving infliximab and rituximab had to spend more time for infusion, required more pre-medication, had more infusion reactions, and lost more time from work/home compared with patients receiving abatacept. Both patients and physicians felt comfortable with any of the three medications, with physicians reporting greater ease of use with abatacept compared to infliximab and rituximab, and with infliximab compared to rituximab. It was interesting to note the low number of infusion reactions across medications, which may be reassuring to both physicians and

patients when choosing to use an infusible biologic agent. Nonetheless, each agent does require appropriate monitoring due to the possibility of infusion reaction. Physicians felt that infliximab was somewhat more efficacious compared to abatacept and rituximab, which may partly be explained by the fact that infliximab has been available longer and that, therefore, physicians have more experience with infliximab in different kinds of patients.

Several limitations of this study need to be considered when interpreting the results. First, as this was a cross-sectional study, we do not know if patients' responses would change with continuing treatment and developing familiarity with the infusions over time. Additionally, we do not know if the differences noted here would in any way affect long-term outcomes. Patients in this study may not be reflective of most patients with RA. For example, study patients had approximately eight years of disease duration on average, and evidence exists to suggest that biologics are being used earlier in the treatment of RA (18, 19). which may have an impact on infusion reactions and satisfaction with treatment, both of which we would suggest would be better if patients were treated earlier in the course of disease (20).

In conclusion, the infusion process, as perceived by both the patient and physician, seems to differ among the three infusible biologic agents and may have an impact on the decision regarding which infusible biologic agent to use. This should be seen as an exploratory study, and larger, prospectively followed cohorts can provide further information with regard to the impact that infusible biologics have on the everyday lives of patients.

Acknowledgements

The authors wish to acknowledge Shenita Bolstrom, Ami Sklar, and Fang Liu for their assistance with regard to the data collection and statistical analysis.

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