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Outcomes of Adalimumab Biosimilar ABP 501 in Patients with Inflammatory Bowel Disease: Comparison of Adalimumab Naïve and Switching from Originator

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ABSTRACT

Background: In this study, we aimed to compare the effectiveness and safety of the ABP 501 molecule in inflammatory bowel disease patients who were ADA-naive and those who were switching from the originator molecule.

Materials and Methods: Data was prospectively collected between March 2020, and October 2022. The outcomes of the study were therapeutic failure free remission, and therapeutic failure.

Results: Seventy-four patients were analyzed for ABP 501-ADA naïve group (67.9% males; 9.4% biologics experienced; 69.8% CD; 30.2% UC) and ABP 501-ADA switch group (47.6% males; 14.3% biologics experienced; 85.7% CD; 14.3% UC). Median of total disease duration was 5.95 years (IQR 2.68-11.89), and follow-up time was 10.43 months (IQR 5.78-15.75). There was no significant difference between ABP 501-ADA naive and switch group respectively, in the rates of therapeutic failure free remission (86.8% vs. 90.5%) or therapeutic failure (13.2% vs. 9.5%), ($p>0.05$). There was no significant difference in terms of therapeutic failure-free survival between two groups ($p=0.207$).

Conclusion: Results from this study showed no significant differences between ABP 501-ADA naïve and 501-ADA switch group in terms of therapeutic failure-free remission. Two groups were also found to be similar in terms of the therapeutic failure-free survival.

I. INTRODUCTION

Inflammatory bowel diseases (IBD) are chronic, relapsing, and lowering the quality-of-life with an increasing prevalence all over the world. Clinical remission, steroid-free remission, lowering the requirement for hospitalization and surgery, and mucosal healing can all be considered the endpoints of an IBD treatment. Patients who have failed to respond to prior treatments are given preference for biological agents because of their high efficacy in remission induction and maintenance (1). The first biologic agents to be approved for use

in the treatment of IBD were TNF-alpha inhibitors, which have been proven to be successful in achieving failure-free remission, promoting mucosal healing, reducing hospitalization, and the need for surgery in both Crohn's disease (CD) and ulcerative colitis (UC) patients (2).

Earlier studies have shown that biosimilar compounds share the same side-effect and efficacy characteristics as their original counterparts. ABP 501, the first ADA biosimilar to be approved, has been licensed since 2018 in the US and in the countries of the European Union. Regarding physicochemical characteristics and biological action, ABP 501 is remarkably similar to the ADA originator molecule (3, 4). Real-world studies on ABP 501 have proved that it is just as effective and safe in this regard as ADA (5). The availability of medications to patients has improved with the emergence of biosimilar medicines.

Studies comparing ABP 501 biosimilar in ADA-naive patients and switching from originator as well as examining the effectiveness and safety of switching from ADA originator to ABP 501 biosimilar in IBD are still lacking in the current literature. Thus, in this study, we aimed to compare the remission and maintenance of ABP 501 biosimilar molecule in ADA-naive patients and patients switching from originator.

II. MATERIAL and METHODS

The present study was planned as prospective, real-world follow-up research conducted between March 2020 and October 2022. The patients who received ABP 501 treatment for IBD and were followed up during the study period in our clinic were eligible for the study. The patients with pouchitis, rheumatologic condition, and those receiving ABP 501 for less than three months were excluded.

Prior to the administration of ABP 501 medication, all patients underwent tests for hepatitis B, C, tuberculosis, and other viruses. ABP 501 was first administered to all patients with a diagnosis of UC or CD at a dose of 160 mg on day one of treatment. The dosage was maintained at 80 mg the following week and 40 mg every two weeks after that. ADA switching individuals were dosed at 40 mg every 2 weeks.

The patients were divided into two groups: those who had never had infliximab before and those who had. Patients who were biologically naïve were grouped as either received ABP 501 as a first biologic agent or were switched from the ADA originator molecule. Similar distinctions were made between individuals who received ABP 501 and those who switched from the ADA originator molecule for infliximab-experienced patients.

All patients' genders, smoking histories, family histories, UC and CD involvement patterns, CD disease behavior, perianal disease presence, and presence of extra-intestinal symptoms were assessed. The previous surgical history, prior medical history, immunomodulatory drug resistance, if any, and concurrent medications of the patients were assessed. The patients' initial CRP, hemoglobin, albumin, CDAI, MAYO endoscopic, and MAYO total scores were noted. Ages of all patients at the time of IBD diagnosis and administration of ABP 501, the overall duration of the disease, the interval between IBD diagnosis and administration of ABP 501, and the follow-up intervals while taking ABP 501 were noted.

The outcomes of the study were therapeutic failure-free remission (drug persistence and ADA discontinuation because of sustained remission), and therapeutic failure defined as primary lack of response (p-LOR), secondary loss of response (s-LOR), which includes steroid needed, hospitalization, surgery, and switching to another biotherapy as well as serious adverse events (SAE). Therapeutic failure-free remissions and therapeutic failure cases were evaluated. The rate of therapeutic failure-free remission, therapeutic failure and drug persistence treated with ADA biosimilar ABP 501 based on the diagnosis, drug switch, Anti-TNF experience and IM concomitating recorded.

III. Statistical analysis

The distributions of quantitative variables were examined by the Shapiro-Wilk's test, normality plots and skewness/kurtosis statistics. Hemoglobin was summarized by mean ± standard deviation, as other quantitative variables were reported by median (IQR: first quartile-third quartile). Frequency (%) was supplied for qualitative variables.

Student's t-test and Mann-Whitney U test were performed to compare ABP 501-ADA naïve and ABP 501-ADA switch groups with respect to the quantitative variables. Pearson chi-square test, Fisher's exact test and Fisher-Freeman-Halton test was used in comparisons of qualitative variables. Therapeutic failure-free survivals of ABP 501-ADA naïve and ABP 501-ADA switch groups were evaluated by the log-rank test. Mean failure-free survivals estimated by the Kaplan-Meier method were provided for each group, as the probability of failure-free survival was higher than 50% at the end of the follow-up in ABP 501-ADA naïve group. A p-value<0.05 was considered statistically significant.

Kaplan-Meier survival curves were drawn in R version 4.1.3 (R Foundation for Statistical Computing, Vienna, Austria). All other statistical analyses were performed via IBM SPSS Statistics 22.0 software (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.).

IV. RESULTS

Eighty-eight patients who were given ABP 501 with the diagnosis of IBD were analyzed. A total of 14 patients, 12 of whom had a follow-up period of less than 3 months, 1 due to rheumatologic disease, and 1 due to pouchitis were excluded from the study. A total of 74 patients were analyzed (Figure 1). While 53 (71.6%) of the patients had ABP 501 and ADA naïve (ABP 501-ADA naïve group), 21 patients were switched from ADA to ABP 501 (ABP 501-ADA switch group). The ABP 501-ADA nave group included 67.9% males, 9.4% with biologics experience, 69.8% with CD, and 30.2% with UC. The ABP 501-ADA switch group included 47.6% males, 14.3% experienced biologics, 85.7% CD, and 14.3% UC patients. The median total disease duration was 5.95 years (IQR 2.68-11.89), age at ABP 501-ADA initiation was 41.06 years (IQR 27.62-50.17), and the follow-up time from then was 10.43 months (IQR 5.78-15.75). In the naïve and ADA switch groups, the patients' ages at the time of diagnosis were 30.51 years (22.61-39.05) and 31.96 years (23.45-46.21), respectively. However, the total disease duration was 4.18 years (2.31-9.24) in the naive group and 11.24 years (6.83-16.71) in the switch group, this difference was statistically significant (p<0.001). In the switch group, the age at which ABP 501 was delivered was 43.79 years (37.53-57.69) and in the naive group, it was 38.93 years (26.49-46.13); the difference was statistically significant (p=0.022).

When comparing the switch group to the naive group, the interval between the onset of IBD and the administration of ABP 501 was statistically significantly longer in the ABP 501-ADA switch group [3.82 years (1.27-8.20), 10.49 years (5.22-15.49), respectively] (p=0.001). In terms of family history, disease location, severity, disease behavior for CD and the presence of perianal disease, extraintestinal findings, history of surgery, prior immunomodulatory drug history, IM drug resistance, and blood test results, there were no statistically significant differences between the groups (p>0.05) (Table 1).

Median follow-up time was 9.23 months (IQR: 4.90-16.07) and 11.47 months (IQR: 7.47-15.39) after starting ABP 501-ADA naïve and switch group, respectively (p= 0.297). Over this period, there was no significant difference between ABP 501-ADA naïve and switch group respectively, in the rates of therapeutic failure free remission (86.8% vs. 90.5%) and therapeutic failure (13.2% vs. 9.5%), (p>0.05) (Table 1).

There was no significant difference between the two groups in terms of therapeutic failure subgroups analysis, such as p-LOR (3.8% vs. 0%), s-LOR (7.5% vs. 9.5%), and SAE (1.9% vs. 0%) respectively (p>0.05). There

was also no significant difference between concomitant immunomodulator therapy and monotherapy with respect to the therapeutic failure outcomes (p>0.05) (Table 2). Mean therapeutic failure-free survival was 21.12 months (95% CI: 19.12-23.11) in the ABP 501-ADA naïve group and 25.56 months (95% CI: 21.19-29.94) in the ABP 501-ADA switch group. There was no significant difference in terms of therapeutic failure-free survival between two groups (p=0.207) (Figure 2).

V. DISCUSSION

Inflammatory bowel diseases are chronic, relapsing and life-threatening diseases in which immune dysregulation and intense inflammation play a role in their pathophysiology. Inhibitors of TNF-alpha, which is one of the inflammatory cytokines that play a role in the pathophysiology of the disease, constitute a key role in both remission induction and maintenance therapy in resistant diseases (6, 7). Since the original molecules of anti-TNF drugs are expensive and often difficult to obtain, using biosimilar medications is a crucial step in the treatment of IBD. Biosimilar drugs need to have an acceptable equal efficacy and safety profile to the original molecules to be favored in therapy. The ADA biosimilar ABP 501, the first to be approved in Europe and the United States, was examined in our study, and it was discovered that, when compared to the literature, it had effects that were comparable to those of the original molecule (8-10). In our study a total of 74 patients were assessed. Two categories of patients were compared: ABP 501-ADA naïve patients and switch from originator molecule patients. There was no statistically significant difference between the two groups in the rates of therapeutic failure free remission and therapeutic failure over the follow-up period after starting ABP 501-ADA naive and switch group. In terms of the examination of the therapeutic failure subcategories, such as p-LOR, s-LOR, and SAE, there was similarly no statistically significant difference between the two groups. There was no discernible difference between the two groups in terms of mean treatment failure-free survival.

The biosimilars of anti-TNF medications are regularly compared with the original molecules, according to a review of the literature (11-13). In their prospective multicenter observational trial (SPOSAB ABP 501), Macaluso et al. assessed 559 patients who received the ADA biosimilar ABP 501 and found that at 12 weeks, clinical response was seen in 85.5% of ADA-naive patients, with a side-effect rate of 6.4%. It was similar to the original ADA molecule in terms of safety and efficacy. (5). The ABP 501 molecule, according to their statement published in the Belgian IBD Research Group 2019, is comparable to the original molecule in terms of clinical outcomes and adverse effect profile. Additionally, it has been noted that switching the original molecule secures the maintenance of the remission (14). In our study, we compared the general demographic and disease characteristics of ABP 501 administered to ADA naïve patients who had not received ADA treatment before and those who were switched from ADA originator molecule to ABP 501. In addition, we compared the failure-free remission rates, which we took as the endpoint of our study. As a result of the analysis, we found similar failure free remission rates between the two groups given ABP 501 during the follow-up period. In this respect, we think that ABP 501 is an effective and safe choice for both ADA naïve patients and patients who will be switched while receiving ADA originator molecules.

Mocci et al. examined real-world data from 134 patients (30.6% UC and 69.4% CD) in another multicenter observational research and discovered that the ADA biosimilars GP2017 and original molecule were comparable in terms of efficacy and safety. Sixty-two (46.3%) of patients received treatment with GP2017, while 72 (53.7%) received treatment with ADA originator. One hundred and eighteen (88.1%) patients had no prior exposure to ADA. During a median follow-up of 12 months, 105 patients (78.4%) achieved clinical remission, with the GP2017 and ADA originator groups obtained remission rates of 82.3% and 75%, respectively. (15). Tursi and colleagues compared the efficacy of the ADA biosimilars SB5, APB501, GP2017, and MSB11022 in IBD patients in multicenter real-world observational research that was published in 2022. This study proved that neither ADA-naive patients nor those switching from the original molecule experienced any difference between biosimilars (16). In our study, ADA- naïve patients and patients who switched from ADA to ABP 501 were examined, and it was discovered that both groups' therapeutic failure-free remission rates were comparable. As

of right now, the effectiveness and safety of initiating ADA in naive patients with ABP 501 or switching from the originator molecule for induction or maintenance of remission are similar.

In the 2022 research by Lukas et al., patients with Crohn's disease who switched from ADA original molecule to biosimilar SB5 showed no difference in terms of clinical activity, biological parameters, or pharmacokinetics (17). In the study of Cingolani et al., the switch was made from the originator molecule to ABP 501 in 55 patients and from the originator molecule to SB5 in 25 patients. In the ABP 501 switch group, disease activity and fecal calprotectin levels were like the originator molecule during the 6-month follow-up (18). Again, in multicenter prospective research conducted by Wasserbauer et al. in 2022, ADA biosimilars FKB327 and GP2017 were found to be efficacious in Crohn's patients (19). Numerous studies have showed that ABP 501 and other ADA biosimilars have similar efficacy and safety to the original molecule. In the 2020 study by Lontai et al. with 246 IBD patients, it was discovered that the patients were in remission after a non-medical switch from the original molecule to a biosimilar drug or from a biosimilar drug to another biosimilar drug (20). Clinical remission maintained in patients in the Kamat et al. research after switching from the original ADA molecule to the biosimilar (21). In the study of Ribaldone et al., ADA biosimilars were switched from biosimilars, and no difference was found in terms of effectiveness and side effects (22). In our study, patients who made a non-medical switch from an original molecule to a biosimilar drug-maintained remission during the follow-up. Our study assessed the efficacy and safety of ABP 501, which has been shown to be safe and effective, between patients who had never received ADA and those who had switched from the originator medicine. ABP 501 was discovered to resemble the original molecule in these cases.

One of the drawbacks of our study is the small number of patients included and the lack of randomization of the participants. On the other side, when we examine the literature, the fact that our study is the first on this topic is seen as the study's strongest feature.

In our study, the efficacy and side-effect profiles of ABP 501 for both naive patients who started therapy with ABP 501 and patients who switched from the originator molecule were examined, and equivalent results were obtained. When we searched the literature, we could not find any other study comparing ABP 501 efficacy and safety between ADA naïve patients and switch from originator molecule patients as far as we could search. In this respect, our study is the first study on this subject, and based on the results of our study, we suggest that ADA biosimilar ABP 501 can be used effectively and safely in patients switched from the originator molecule as well as in ADA naïve patients.

In conclusion, between the ADA/ABP 501 naive patients we analyzed in our research and the patients who underwent switch from originator molecule, there was no appreciable difference in failure-free remission rates. Two groups were also found to be similar in terms of the therapeutic failure-free survival.

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Table 1. Demographic characteristics of patients with IBD having received ADA biosimilar ABP

	Total (n=74)	ABP 501-ADA naïve group (n=53)	ABP 501-ADA switch group (n=21)	p-value
Age at onset of IBD (years), median (IQR)	30.72 (23.01-40.45)	30.51 (22.61-39.05)	31.96 (23.45-46.21)	0.439
Total disease duration (years), median (IQR)	5.95 (2.68-11.89)	4.18 (2.31-9.24)	**11.24 (6.83-16.71)**	**<0.001**
Age at ABP 501 initiation (years), median (IQR)	41.06 (27.62-50.17)	38.93 (26.49-46.13)	**43.79 (37.53-57.69)**	**0.022**
Time interval between IBD onset and ABP 501 initiation (years), median (IQR)	4.45 (1.71-10.80)	3.82 (1.27-8.20)	**10.49 (5.22-15.49)**	**0.001**
Follow-up time from ABP 501 initiation (months), median (IQR)	10.43 (5.78-15.75)	9.23 (4.90-16.07)	11.47 (7.47-15.39)	0.297
Sex (Female/Male), n (%)	28 (37.8) / 46 (62.2)	17 (32.1) / 36 (67.9)	11 (52.4) / 10 (47.6)	0.104
Smoking status, n (%)				0.756
Current smokers	22 (29.8)	15 (28.3)	7 (33.3)	
Ex-smokers	26 (35.1)	18 (34.0)	8 (38.1)	
Non-smokers	26 (35.1)	20 (37.7	6 (28.6)	
Family history of IBD[1], n (%)	11 (15.1)	8 (15.4)	3 (14.3)	>0.999
Diagnosis n, (%)				0.158
UC	19 (25.7)	16 (30.2)	3 (14.3)	
CD	55 (74.3)	37 (69.8)	18 (85.7)	
UC Disease extension, n (%)				0.263
Left Site	12 (63.2)	9 (56.3)	3 (100.0)	
Extensive	7 (36.8)	7 (43.8)	0 (0.0)	
CD Disease location, n (%)				>0.999
Ileal (L1)	27 (49.1)	18 (48.7)	9 (50.0)	
Colonic (L2)	3 (5.4)	2 (5.4)	1 (5.6)	
Ileo-colonic (L3)	25 (45.5)	17 (45.9)	8 (44.4)	
Concomitant Upper GI disease, n (%)	6 (10.8)	4 (10.8)	2 (11.1)	>0.999
CD Disease behavior, n (%)				0.380
Inflammatory disease (B1)	35 (63.7)	25 (67.6)	10 (55.6)	
Stenosing (B2)	12 (21.8)	6 (16.2)	6 (33.3)	
Penetrating (B3)	8 (14.5)	6 (16.2)	2 (11.1)	
CD perianal disease, n (%)	23 (41.8)	16 (43.2)	7 (38.9)	0.759
Extra-intestinal manifestations, n (%)	44 (59.5)	30 (56.6)	14 (66.7)	0.427
Peripheral arthralgia	34 (45.9)	21 (39.6)	13 (61.9)	0.083
Peripheral arthritis	10 (13.5)	6 (11.3)	4 (19.0)	0.456
Ankylosing spondylitis	11 (14.9)	6 (11.3)	5 (23.8)	0.275
Sacroiliitis	3 (4.1)	1 (1.9)	2 (9.5)	0.192
Erythema nodosum	5 (6.8)	4 (7.5)	1 (4.8)	>0.999
Pyoderma gangrenous	1 (1.4)	0 (0.0)	1 (4.8)	0.284
Aphthous ulcer	16 (21.6)	9 (17.0)	7 (33.3)	0.208
Uveitis	2 (2.7)	1 (1.9)	1 (4.8)	0.490
Episcleritis	1 (1.4)	1 (1.9)	0 (0.0)	>0.999

Prior major abdominal surgery[2], n (%)	16 (22.5)	10 (20.0)	6 (28.6)	0.536
Prior medical experience				
Mesalazine	54 (73.0)	38 (71.7)	16 (76.2)	0.695
Sulfasalazine	4 (5.4)	2 (3.8)	2 (9.5)	0.318
Budesonide	16 (21.6)	12 (22.6)	4 (19.0)	>0.999
Steroids	57 (77.0)	40 (75.5)	17 (81.0)	0.763
Thiopurine	60 (81.1)	43 (81.1)	17 (81.0)	>0.999
Methotrexate	11 (14.9)	8 (15.1)	3 (14.3)	>0.999
Infliximab	8 (10.8)	5 (9.4)	3 (14.3)	0.680
Prior IM resistance, n (%)	62 (83.8)	43 (81.1)	19 (90.5)	
Thiopurine resistance	48 (64.9)	35 (66.0)	13 (61.9)	0.737
Methotrexate resistance	7 (9.5)	5 (9.4)	2 (9.5)	>0.999
Concomitant medication, n (%)				
Thiopurine	30 (40.5)	**27 (50.9)**	3 (14.3)	**0.004**
Methotrexate	14 (18.9)	12 (22.6)	2 (9.5)	0.324
Mesalazine	30 (40.5)	21 (39.6)	9 (42.9)	0.798
Sulphapyridine	2 (2.7)	1 (1.9)	1 (4.8)	0.490
Budesonide	5 (6.8)	4 (7.5)	1 (4.8)	>0.999
Steroids	38 (51.4)	28 (52.8)	10 (47.6)	0.686
Therapeutic failure free remission n (%)	65 (87.8)	46 (86.8)	19 (90.5)	>0.999
Drug persistence	62 (83.8)	43 (81.1)	19 (90.5)	
Stop because of sustained remission	3 (4.1)	3 (5.7)	0 (0.0)	
Therapeutic failure, n (%)	9 (12.2)	7 (13.2)	2 (9.5)	>0.999
Baseline CRP[2] (mg/L), median (IQR)	6.70 (2.30-19.60)	7.55 (2.78-20.78)	6.40 (1.83-15.35)	0.304
Baseline HB[2] (mg/dL), mean±SD	13.24±1.92	13.27±1.95	13.18±1.90	0.859
Baseline Albumin[2] (g/dL), median (IQR)	4.30 (4.00-4.60)	4.30 (4.00-4.70)	4.10 (4.00-4.45)	0.358
Baseline CDAI[1] **(CD),** median (IQR)	267 (150-350)	287 (153-350)	238 (132-357)	0.349
Baseline MAYO endoscopic score, median (IQR)	3 (2-3)	3 (2-3)	2 (2-3)	0.559
Baseline MAYO Total score, median (IQR)	10 (8-12)	10 (8-12)	8 (8-10)	0.712

There are missing values; [1]n=1, [2]n=3,
IBD: Inflammatory Bowel Disease, CD: Crohn's Disease, UC: Ulcerative Colitis, GI: Gastrointestinal, IM: Immunomodulator, CRP: C-Reactive Protein, HB: Hemoglobin, CDAI: Crohn's Disease Activity Index, IM:Immunmodulatory
SD: Standard deviation, IQR: 1st quartile-3rd quartile
Bold statistics are significantly higher than those in the other group.

Table 2. The rate of therapeutic failure and drug persistence treated with ADA biosimilar ABP 501 based on the diagnosis, drug switch, Anti-TNF experience and IM concomitation.

	Total (n=74)	Diagnosis		Drug Switch		Anti-TNF Experience		+IM Concomitation	
		UC (n=19)	CD (n=55)	ADA naïve group (n=53)	ADA switch group (n=21)	Anti-TNF naïve (n=66)	Anti-TNF Exp. (n=8)	ABP 501 Mono (n=30)	ABP 501 + IM (n=44)
Therapeutic failure free remission, n (%)	65 (87.8)	14 (73.7)	**51 (92.7)**	46 (86.8)	19 (90.5)	58 (87.9)	7 (87.5)	28 (93.3)	37 (84.1)
Drug persistence, n (%)	62 (83.8)	12 (63.2)	**50 (90.9)**	43 (81.1)	19 (90.5)	55 (83.3)	7 (87.5)	26 (86.7)	36 (81.8)
Stop because of sustained remission, n (%)	3 (4.1)	2 (10.5)	1 (1.8)	3 (5.7)	0 (0.0)	3 (4.5)	0 (0.0)	2 (6.7)	1 (2.3)
Therapeutic failure, n (%)	9 (12.2)	**5 (26.3)**	4 (7.3)	7 (13.2)	2 (9.5)	8 (12.1)	1 (12.5)	2 (6.7)	7 (15.9)
Secondary loss of response, n (%)	6 (8.1)	3 (15.8)	3 (5.5)	4 (7.5)	2 (9.5)	5 (7.6)	1 (12.5)	2 (6.7)	4 (9.1)
Steroid needed	4 (5.4)	**4 (21.1)**	0 (0.0)	4 (7.5)	0 (0.0)	3 (4.5)	1 (12.5)	0 (0.0)	4 (9.1)
IBD-related hospitalization	4 (5.4)	**3 (15.8)**	1 (1.8)	4 (7.5)	0 (0.0)	4 (6.1)	0 (0.0)	0 (0.0)	4 (9.1)
IBD-related surgery	1 (1.4)	0 (0.0)	1 (1.8)	1 (1.9)	0 (0.0)	1 (1.5)	0 (0.0)	0 (0.0)	1 (2.3)
Switch to another biotherapy	8 (10.8)	**5 (26.3)**	3 (5.5)	6 (11.3)	2 (9.5)	7 (10.6)	1 (12.5)	2 (6.7)	6 (13.6)
Primary loss of response, n (%)	2 (2.7)	**2 (10.5)**	0 (0.0)	2 (3.8)	0 (0.0)	2 (3.0)	0 (0.0)	0 (0.0)	2 (4.5)
Serious adverse events, n (%)	1 (1.4)	0 (0.0)	1 (1.8)	1 (1.9)	0 (0.0)	1 (1.5)	0 (0.0)	0 (0.0)	1 (2.3)

CD: Crohn's Disease, UC: Ulcerative Colitis, IBD: Inflammatory Bowel Disease, IM: Immunmodulatory, ADA: Adalimumab,

Bold rates are significantly higher than those in the other subgroup of the corresponding factor.

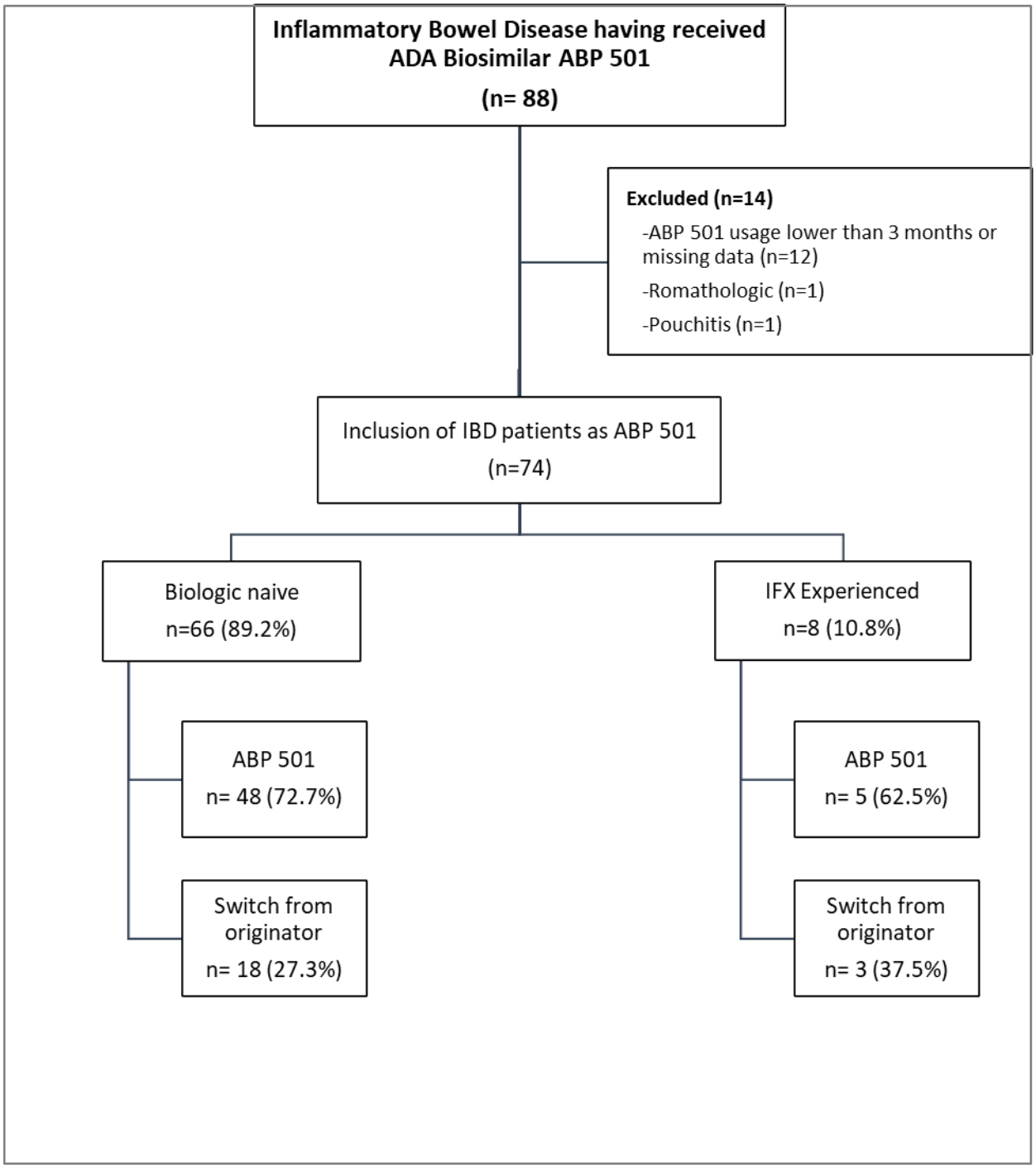

Figure 1. Flow chart of patients for identification of patients with inflammatory bowel disease having received ADA biosimilar ABP 501.

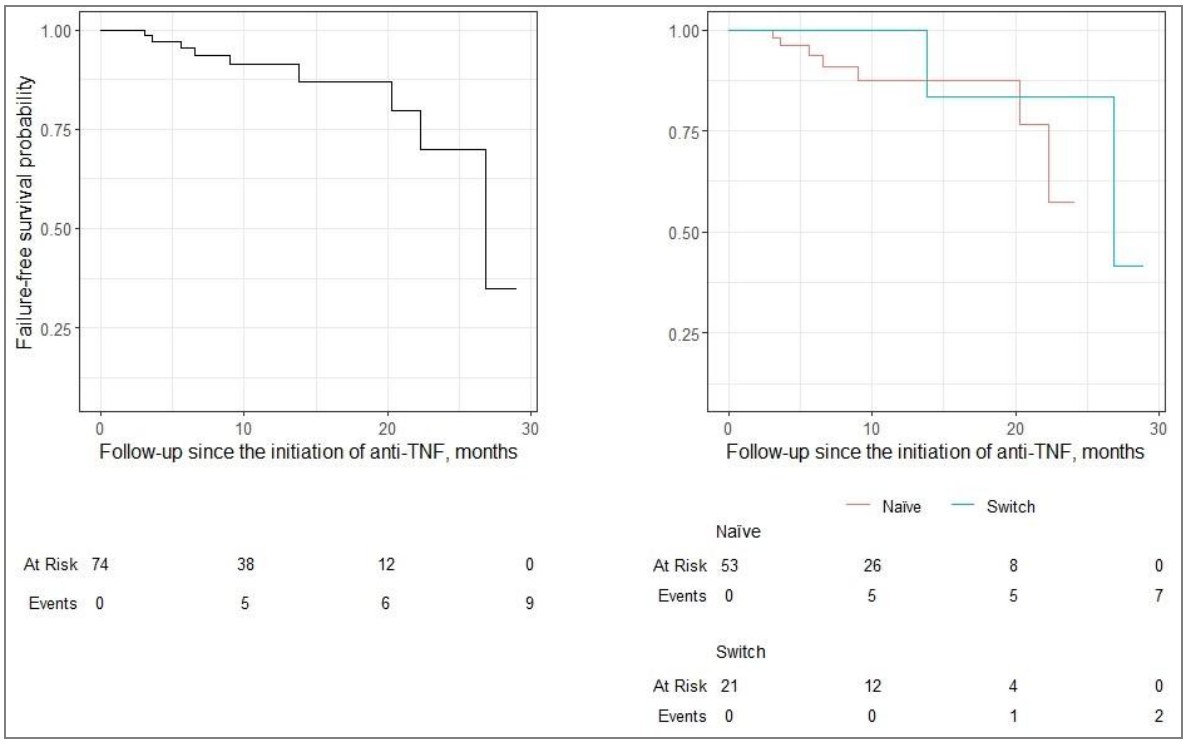

Figure 2. Therapeutic failure-free survival curves for all patients (left) and based on the drug switch (right).