



*POST-ASH* Issue 5, 2014

# **BTK Inhibitor Ibrutinib for Relapsed/ Refractory Waldenström's Macroglobulinemia**

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## CME INFORMATION

### OVERVIEW OF ACTIVITY

Each year, thousands of clinicians, basic scientists and other industry professionals sojourn to major international oncology conferences, like the American Society of Hematology (ASH) annual meeting, to hone their skills, network with colleagues and learn about recent advances altering state-of-the-art management in hematologic oncology. As such, these events have become global stages where exciting science, cutting-edge concepts and practice-changing data emerge on a truly grand scale. This massive outpouring of information has enormous benefits for the hematologic oncology community, but the truth is it also creates a major challenge for practicing oncologists and hematologists.

Although original data are consistently being presented and published, the flood of information unveiled during a major academic conference is unprecedented and leaves in its wake an enormous volume of new knowledge that practicing oncologists must try to sift through, evaluate and consider applying. Unfortunately and quite commonly, time constraints and an inability to access these data sets leave many oncologists struggling to ensure that they're aware of crucial practice-altering findings. This creates an almost insurmountable obstacle for clinicians in community practice because they are not only confronted almost overnight with thousands of new presentations and data sets to consider but they are also severely restricted in their ability to review and interrogate the raw findings.

To bridge the gap between research and patient care, this CME activity will deliver a serial review of the most important emerging data sets on novel therapeutic options in the treatment of multiple myeloma (MM) and Waldenström's macroglobulinemia (WM) from the latest ASH meeting, including expert perspectives on how these new evidence-based concepts may be applied to routine clinical care. This activity will assist medical oncologists, hematologists, hematology-oncology fellows and other healthcare professionals in the formulation of optimal clinical management strategies and the timely application of new research findings to best-practice patient care.

### LEARNING OBJECTIVES

- Integrate recent clinical research findings with proteasome inhibitors and immunomodulatory agents into the development of individualized induction and maintenance treatment strategies for patients with MM.
- Develop an understanding of emerging efficacy and side-effect data with novel agents and combination regimens — including anti-CD38 antibodies and AKT, BTK, KSP and novel proteasome inhibitors — under evaluation for newly diagnosed and relapsed/refractory MM and WM and, where appropriate, facilitate patient access to ongoing trials of these agents.
- Appraise recent clinical research findings on the efficacy and safety of novel proteasome inhibitor- and/or BTK inhibitor-based therapeutic strategies for WM, and consider this information for the treatment of patients.

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**FACULTY** — The following faculty (and their spouses/partners) reported real or apparent conflicts of interest, which have been resolved through a conflict of interest resolution process:

Rafael Fonseca, MD  
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Chair, Department of Internal Medicine  
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BioOncology/Biogen Idec, Millennium: The Takeda Oncology Company, Onyx Pharmaceuticals Inc, Seattle Genetics and Spectrum Pharmaceuticals Inc.

Hardware/Software Requirements:

A high-speed Internet connection

A monitor set to 1280 x 1024 pixels or more

Internet Explorer 7 or later, Firefox 3.0 or later, Chrome, Safari

3.0 or later

Adobe Flash Player 10.2 plug-in or later

Adobe Acrobat Reader

(Optional) Sound card and speakers for audio

Last review date: March 2014

Expiration date: March 2015

To go directly to slides and commentary for this issue, [click here](#).

One might view current clinical research in multiple myeloma (MM) as being in a consolidation phase after the introduction of proteasome inhibitors, immunomodulatory drugs and bisphosphonates brought forth a huge wave of progress. This idea is reflected in many of the new MM reports presented in New Orleans, where we were treated to intriguing data attempting not only to help optimize the impact of our current tools but also to uncover novel agents that will launch a new era with even better outcomes. For this second MM issue of our ASH review series, Dr Rafael Fonseca comments on a handful of papers that help take the next step in what will hopefully be another quantum leap forward in this fascinating corner of oncology.



**Rafael Fonseca, MD**

● **More on up-front carfilzomib/lenalidomide/dexamethasone (dex) (CRd)**

MM is only one of a number of tumor types in oncology today for which there is considerable interest in moving newly approved agents up earlier in the course of the disease. In this regard, we have already seen preliminary data from Andrzej Jakubowiak, and at ASH [the NCI presented](#) another major single-arm study evaluating induction CRd followed by maintenance therapy — in this case lenalidomide. As in the work presented by Dr Jakubowiak, in this study patients received long-term maintenance and transplant was optional, and with the extraordinary risk-benefit value of this regimen (near complete response [CR] or better in 73% of the 43 patients, 100% minimal residual disease negativity assessed by flow cytometry among 27 patients with near CR or stringent CR and no Grade 3 or 4 neuropathy), Dr Fonseca can foresee a time when treatment will be individualized based on depth of response, with transplant avoided in some patients and survival extended significantly. However, in terms of current practice, like most MM investigators Dr Fonseca believes that while preliminary data on this and similar regimens are very encouraging, carfilzomib should not be used up front outside of a trial setting and recommends that patients interested in this approach be referred to the major Intergroup study comparing CRd to RVD.

- **Carfilzomib/cyclophosphamide/dex (CCd) up front in elderly patients**

In the same vein as the previous study, another ASH data set reported on recent efforts to incorporate carfilzomib into popular and currently employed bortezomib-based up-front regimens. **This Phase II trial** looked at CCd (similar to CyBorD) induction in 55 evaluable patients aged 65 and over with newly diagnosed MM. The bottom line is that despite significant activity (47% near CR or better) and relatively good tolerability (14% of patients discontinued treatment because of toxicity, which is considerably fewer than in prior studies for elderly patients), Dr Fonseca — a major proponent of CyBorD — urges us all to hold off on CCd outside a clinical trial.

- **Pomalidomide (POM)/carfilzomib/dex in relapsed/refractory (RR) disease**

Combining the 2 new kids on the block, POM and carfilzomib, always seemed like a natural next step, and at ASH we saw encouraging data with this appealing regimen. **A multicenter Phase I/II effort** for patients with heavily pretreated lenalidomide-refractory MM (a median of 5 prior treatments) resulted in a 70% overall response rate among 79 evaluable patients and a manageable toxicity profile. Even more, this report demonstrates that the regimen is not only a viable option in very advanced disease but also an approach that is of great interest in up-front trials.

In a related manner, ASH also featured **2 data sets** providing updates from trials evaluating POM with low-dose dex in RR disease. Dr Fonseca's take-away from these presentations is that while patients with extensive prior treatment and adverse cytogenetic profiles often benefit from this therapy, myelosuppression in these individuals must be managed carefully with dose adjustments and growth factors.

- **An all-oral "RVD"**

For the past several years we have profiled the early development of the oral proteasome inhibitors ixazomib and oprozomib, and at ASH **Paul Richardson presented more data** from his Phase I/II study looking at ixazomib/lenalidomide/dex in previously untreated MM. This study, which evaluated twice-weekly ixazomib, revealed activity (94% response rate among 62 patients) similar to what is typically seen with RVD but slightly more peripheral neuropathy (PN) (Grade 3 in 5% of 64 patients) than has been observed in trials using weekly administration of this fascinating agent. Not surprisingly, Dr Fonseca is eagerly and optimistically awaiting the results of ongoing Phase III trials.

- **Cool new compounds**

For the immediate future most myeloma investigators like Dr Fonseca believe monoclonal antibodies represent the most likely path to dramatically catapult survival in this disease, and there is great hope that a rituximab-like agent may be identified. The 2 compounds we have heard the most about up to now are the anti-CD38 antibody daratumumab, which has garnered FDA breakthrough therapy status, and elotuzumab,

which is directed against human CS1 (a cell surface antigen glycoprotein that is highly expressed on MM cells) and appears to result in an R-squared-like synergy with lenalidomide.

However, for a disease diagnosed in “only” about 20,000 individuals a year in the United States, a stunning amount of active drug development is under way in MM, and at ASH we were provided with a preview of some of the agents and strategies we may be hearing a lot more about in the next few years:

#### – **SAR650984**

Similar to daratumumab, **this anti-CD38 antibody** was shown to have significant single-agent efficacy in patients with relapsed MM (31% response rate among 13 patients receiving the 10-mg/kg dose every 2 weeks) and minimal toxicity other than manageable infusion reactions. Dr Fonseca stated that “this is probably one of most important molecules for future MM therapy.”

#### – **Filanesib**

A report from a **Phase II trial** of this selective inhibitor of kinesin spindle protein alone or in combination with dex demonstrated a 15% response rate among 55 evaluable patients receiving the combination and manageable toxicity. What seems most exciting about this data set is that activity was absent in patients with high serum levels of  $\alpha$ -1 acid glycoprotein (which binds the drug, making it unavailable), potentially opening the door for a predictive biomarker.

#### – **Afuresertib**

AKT is a critical signaling node in MM, and this **single-arm Phase IB trial** evaluated the potent AKT inhibitor afuresertib in combination with dex and bortezomib in 81 patients with relapsed or refractory disease. The overall response rate was 65% and the clinical benefit rate was 73% among 37 patients in the safety expansion cohort. The results are favorable enough to justify further study, but of particular interest was the demonstration of consistent increases in the levels of the phosphorylated form of the drug target in MM cells.

#### ● **Bonus feature: Two compelling data sets in Waldenström’s macroglobulinemia (WM)**

WM is unusual in oncology in that investigators focused on both lymphomas and plasma cell disorders are involved in clinical research and patient care. Most importantly, borrowing from progress in both of these fields, the outlook for the 1,500 US patients diagnosed annually continues to improve as reflected in the following data sets:

## – Carfilzomib

The lack of PN with carfilzomib, even in indirect comparison to weekly subcutaneous bortezomib, is particularly appealing in WM, in which PN is part of the disease biology. As such, this agent was **evaluated in a Phase II study** combining it with rituximab and dex for 31 patients with symptomatic WM. As reported at ASH, this combination resulted in a best overall response rate of 81% and significant IgM declines along with improved marrow profiles and hemoglobin levels. Even more important, PN of Grade 2 or higher was not reported, leading the authors to conclude that the regimen represents a “neuropathy-sparing approach” for the treatment of WM. In relation to these findings, Dr Fonseca verbalized his concern that the rarity of this disease has led to a dearth of FDA-approved therapies, making it a considerable challenge to obtain reimbursement for novel agents with proven patient benefit.

## – Ibrutinib

Now approved for mantle-cell lymphoma and chronic lymphocytic leukemia, perhaps it should not be that big of a surprise that ibrutinib is effective in WM, especially since a somatic mutation (MYD88 L265P) that appears to support malignant growth through Bruton tyrosine kinase is present in more than 90% of these patients. Indeed, in this **exciting Phase II study** 51 of 63 patients (81%) had best overall responses — which were usually rapid, often with rising hematocrit and reductions in serum IgM — strongly suggesting that this agent is destined to have a critical role in the care of these patients.

Next up, we focus on papers in Hodgkin lymphoma and the rapidly emerging role of the antibody-drug conjugate brentuximab vedotin.

Neil Love, MD

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Miami, Florida

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# **BTK Inhibitor Ibrutinib for Relapsed/Refractory Waldenström's Macroglobulinemia**

**Presentation discussed in this issue**

Treon SP et al. **A prospective multicenter study of the Bruton's tyrosine kinase inhibitor ibrutinib in patients with relapsed or refractory Waldenström's macroglobulinemia.** *Proc ASH 2013*; **Abstract 251.**

**Slides from a presentation at ASH 2013 and transcribed comments from a recent interview with Rafael Fonseca, MD (2/14/14)**

## **A Prospective Multicenter Study of the Bruton's Tyrosine Kinase Inhibitor Ibrutinib in Patients with Relapsed or Refractory Waldenström's Macroglobulinemia**

**Treon SP et al.**

*Proc ASH 2013*; Abstract 251.

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## Background

- Whole genome sequencing has revealed highly prevalent somatic mutations in Waldenström's macroglobulinemia (WM) (*Proc ICML 2013*;Abstract 093).
- MYD88 L265P mutation is present in >90% of patients with WM and supports malignant growth via signaling involving Bruton's tyrosine kinase (BTK).
- Ibrutinib inhibits BTK and in vitro induces apoptosis of WM cells bearing MYD88 L265P (*Blood 2013*;122:1222).
- WHIM-like mutations in CXCR4 are present in one third of patients with WM, and their expression induces BTK activity and confers decreased sensitivity to ibrutinib-mediated growth suppression in WM cells (*Proc ASH 2013*;Abstract 4424).
- **Study objective:** To evaluate the efficacy and tolerability of ibrutinib in relapsed/refractory WM and examine the impact of MYD88 L265P and WHIM-like CXCR4 mutations on ibrutinib response.

Treon SP et al. *Proc ASH 2013*;Abstract 251.

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## Study Methods

- Sixty-three patients with symptomatic WM who received at least 1 prior treatment, including 17 patients with relapsed disease, were enrolled on this prospective clinical trial.
- Intended therapy consisted of 420 mg of oral ibrutinib daily for 2 years or until progression or unacceptable toxicity.
- Sanger sequencing was used to determine MYD88 and CXCR4 mutations in sorted bone marrow lymphoplasmacytic cells from 43 and 40 patients, respectively.
- Forty of 43 (93%) and 10 of 40 (25%) patients had MYD88 L265P and WHIM-like CXCR4 mutations, respectively.

Treon SP et al. *Proc ASH 2013*;Abstract 251 (abstract only).

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## Baseline Patient Characteristics

Characteristic – median	n = 63
Age	63 years (range: 44-86)
Number of prior therapies	2 (range: 1-6)
Hematocrit levels	30.8% (range: 24.5-41.5)
Hemoglobin levels	10.5 g/dL (range: 8.2-13.8)
Serum IgM	3,610 mg/dL (range: 735-8,390)
Serum M-protein	2.14 g/dL (range: 0.5-5.4)
B2M	3.9 mg/L (range: 1.3-14.2)
Bone marrow disease involvement	65% (range: 3.2-95)

Treon SP et al. *Proc ASH 2013*;Abstract 251 (abstract only).

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## Study Results

- At best response, median serum IgM levels and M-protein declined to 1,340 mg/dL and 0.84 g/dL, respectively ( $p < 0.00001$ ).
- Median hematocrit and hemoglobin rose to 38.1% and 12.6 g/dL, respectively ( $p < 0.00001$ ).
- Post-treatment bone marrow assessment at 6 months was available for 34 patients and indicated a reduction in WM disease involvement from 70% to 45% ( $p = 0.0006$ ).

Treon SP et al. *Proc ASH 2013*;Abstract 251 (abstract only).

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## Response Evaluation

	<b>n = 63</b>
Best overall response rate ( $\geq$ minor response [MR])*	51 (81.0%)
Very good partial response (VGPR)	4 (6.3%)
Partial response (PR)	32 (50.8%)
MR	15 (23.8%)
Stable disease	11 (17.5%)
Nonresponsive	1 (1.6%)
Major response rate ( $\geq$ PR)	36 (57.1%)

\* Using consensus criteria adapted from the Third International Workshop on WM

- Median follow-up = 6 cycles (range: 2-15)
- Median time to response = 4 weeks

Treon SP et al. *Proc ASH 2013*;Abstract 251 (abstract only).

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## Adverse Events (AEs)

<b>Grade &gt;2 AEs</b>	<b>n = 63</b>
Neutropenia	19.1%
Thrombocytopenia	14.3%
Stomatitis	1.6%
Atrial fibrillation	1.6%
Diarrhea	1.6%
Herpes zoster	1.6%
Hematoma	1.6%
Hypertension	1.6%
Epistaxis	1.6%

- 59 patients remain on study with 7 on reduced doses of ibrutinib.

Treon SP et al. *Proc ASH 2013*;Abstract 251 (abstract only).

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## Tumor Sequencing

- Attainment of major responses was affected by mutations in CXCR4 but not MYD88 L265P in patients who underwent tumor sequencing.
- Major response rate was 77% for patients with wild-type CXCR4 versus 30% for those with WHIM-like CXCR4 mutations ( $p = 0.018$ ).
- Decreases in serum IgM ( $p = 0.047$ ) and IgM M-spike ( $p = 0.012$ ) and improvements in hemoglobin ( $p = 0.058$ ) were greater in patients with wild-type CXCR4.
  - Patients with wild-type CXCR4 also had increased peripheral lymphocytosis after ibrutinib treatment compared to those with WHIM-like CXCR4 mutations ( $p = 0.001$ ).

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## Author Conclusions

- Ibrutinib is highly active and well tolerated in patients with relapsed or refractory WM.
- Rapid reductions in serum IgM and improved hematocrit occur in most patients receiving ibrutinib.
- The presence of WHIM-like CXCR4 mutations affects responses and peripheral lymphocytosis in patients with WM undergoing ibrutinib treatment.

Treon SP et al. *Proc ASH 2013*;Abstract 251 (abstract only).

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## **Investigator Commentary: A Prospective Multicenter Study of the BTK Inhibitor Ibrutinib in Patients with Relapsed or Refractory WM**

The development of BTK inhibitors in WM is truly a bench-to-bedside story. The group from Dana-Farber, using genome sequencing, described a mutation now known as MYD88, which supports malignant growth via signaling involving BTK, in virtually all patients with Waldenström. And obviously, with the recent availability of the BTK inhibitor ibrutinib, this study made sense. The authors reported on 63 patients with WM — 17 of whom were considered to have refractory disease — and reported that patients had significant evidence of antitumor activity after ibrutinib therapy. With a reported median follow-up of 6 cycles, the best overall response rate was 81% with 4 VGPRs, 32 PRs and a PR or better rate of 57%. These are clear data that this agent will be effective in this setting.

The agent seems to be manageable with regard to toxicity. Obviously, ibrutinib has been tested more in the relapsed/refractory setting. But, with this toxicity profile and tolerability, I believe studies for larger populations of patients in the up-front setting are clearly needed.

***Interview with Rafael Fonseca, MD, February 14, 2014***

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