Journal of Clinical and Nursing Research, 2024, Volume 8, Issue 5
http://ojs.bbwpublisher.com/index.php/JCNR
Online ISSN: 2208-3693
Print ISSN: 2208-3685

Treatment Efficacy and Safety of Bortezomib Combined with Dexamethasone and Lenalidomide Chemotherapy Regimen for Multiple Myeloma

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Abstract: *Objective:* To analyze the effect of bortezomib combined with dexamethasone and lenalidomide in the treatment of multiple myeloma. *Methods:* 60 cases of multiple myeloma patients admitted to our hospital from January 2022 to December 2023 were selected randomly, with 30 cases in each group. Bortezomib combined with dexamethasone was administered in the control group, and bortezomib combined with dexamethasone and lenalidomide was given to the observation group, and the treatment effect was analyzed. *Results:* After treatment, CD3+ and CD4+ of the observation group were higher than that of the control group, CD8+ was lower than that of the control group, and the total treatment efficiency was higher, which was statistically significant ($P < 0.05$), and there was no difference in the total incidence of adverse reactions between the two groups ($P > 0.05$). *Conclusion:* Bortezomib combined with dexamethasone and lenalidomide is effective in the treatment of multiple myeloma as it regulates the immune function and is safe, thus it can be promoted in clinical practice.

Keywords: Multiple myeloma; Bortezomib; Dexamethasone; Lenalidomide; Efficacy; Safety

Online publication: June 14, 2024

1. Introduction

Multiple myeloma is a malignant plasma cell tumor that usually occurs in the bone marrow, resulting in abnormal plasma cell proliferation and bone destruction [1]. It is difficult to cure and is mostly controlled by chemotherapy and other treatments to prolong patient survival [2]. Bortezomib is a proteasome inhibitor, which inhibits the function of proteasomes, induces apoptosis of plasma cells, inhibits plasma cell proliferation, and ameliorates skeletal lesions. However, the efficacy of bortezomib alone in the treatment of multiple myeloma is limited, which can easily lead to drug resistance and adverse reactions, limiting its clinical application [3]. The effect of bortezomib combined with dexamethasone and lenalidomide in the treatment of multiple myeloma is

more significant, which can effectively control the tumor load and disease progression, and improve the quality of survival and prognosis [4].

2. General information and methods

2.1. General information

140 cases of multiple myeloma patients admitted to our hospital from January 2022 to December 2023 were selected, and 60 patients who met the inclusion criteria were divided into two groups according to different treatments, with 30 cases in each group. The control group had 16 men and 14 women, aged 46–82 (61.25 ± 3.75) years old, duration of disease was 1–11 (5.18 ± 1.63) months. The observation group had 17 males and 13 females, aged 45–81 (61.28 ± 3.73) years old, disease duration was 2–10 (5.14 ± 1.66) months. There was no significant difference in the data between the two groups ($P > 0.05$).

Inclusion criteria: the selected patients met the diagnostic criteria of multiple myeloma. Exclusion criteria: missing information; no communication ability; extremely poor vascular status.

2.2. Methods

The control group was treated with bortezomib combined with dexamethasone at a dose of 1.3 mg/m² of bortezomib, which was administered by subcutaneous injection on days 1, 4, 8, and 11. The dose of dexamethasone was 20 mg per dose, applied on days 1, 2, 4, 5, 8, 9, 11, and 12. The course of treatment was 28 days for three sessions.

The observation group was treated with a combination of lenalidomide, bortezomib, and dexamethasone with a single dose of 25 mg by the oral route, once a day in the morning. The administration period was 1–21 days. During the treatment period, the same dosing regimen as in the control group was maintained.

During the treatment period, the efficacy of the treatment was analyzed and evaluated, reasonable adjustments were made to the treatment plan, the occurrence of adverse reactions was observed, and the abnormalities were dealt with promptly.

2.3. Observation indexes

(1) Immune function (CD3+, CD4+, and CD8+)

(2) Clinical efficacy (complete remission, partial remission, stability, and progress)

(3) Adverse reactions (leukopenia, peripheral neuropathy, alopecia, and nausea and vomiting)

2.4. Statistical methods

SPSS20.0 software was used to process the data.

3. Results

3.1. Immune function

After treatment, CD3+ and CD4+ of the observation group were higher than that of the control group, and CD8+ was lower than that of the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Immune function (mean ± standard deviation, %)

Group	Number of cases	CD3+		CD8+		CD4+	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control group	30	52.24 ± 3.71	62.84 ± 2.43	39.34 ± 2.42	34.58 ± 2.34	31.57 ± 2.41	30.85 ± 2.12
Observation group	30	52.15 ± 3.63	66.57 ± 2.65	39.42 ± 2.46	31.15 ± 2.15	31.51 ± 2.36	39.45 ± 2.24
t	-	0.095	5.682	0.127	5.912	0.097	15.273
P	-	0.925	0.000	0.899	0.000	0.923	0.000

3.2. Clinical efficacy

The total treatment efficacy rate of the observation group was higher than that of the control group ($P < 0.05$), as presented in **Table 2**.

Table 2. Clinical efficacy [*n* (%)]

Group	Number of cases	Complete remission	Partial remission	Stable	Progress	Overall effectiveness rate
Control group	30	8 (26.67)	12 (40.00)	6 (20.00)	4 (13.33)	20 (66.67)
Observation group	30	11 (50.00)	16 (53.33)	2 (6.67)	1 (3.33)	27 (90.00)
χ^2	-	-	-	-	-	4.812
P	-	-	-	-	-	0.028

3.3. Adverse reactions

There was no difference in the total incidence of adverse reactions between the two groups ($P > 0.05$), as demonstrated in **Table 3**.

Table 3. Adverse reactions [*n* (%)]

Group	Number of cases	Leukopenia	Peripheral neuropathy	Alopecia	Nausea and vomiting	Overall effectiveness rate
Control group	30	3 (10.00)	2 (6.67)	3 (10.00)	4 (13.33)	12 (40.00)
Observation group	30	3 (10.00)	2 (6.67)	2 (6.67)	3 (10.00)	10 (33.33)
χ^2	-	-	-	-	-	0.287
P	-	-	-	-	-	0.592

4. Discussion

Multiple myeloma is a common hematologic malignancy that mainly occurs in the bone marrow, and patients often suffer from anemia, bone pain, bone fracture, hypercalcemia, and other symptoms, which affect the quality of life [5]. The treatment of multiple myeloma is currently gaining attention, and chemotherapy plays a crucial role. Bortezomib combined with dexamethasone is a first-line regimen for the treatment of multiple myeloma, which has achieved certain efficacy [6]. Bortezomib is a proteasome inhibitor, which inhibits tumor progression by blocking the metabolism and growth of cancer cells, and in combination with dexamethasone can improve the efficacy. However, there are some shortcomings in the treatment process, and adverse reactions such as osteoporosis and liver and kidney function impairment may occur, and long-term use may lead to

drug resistance [7]. In recent years, bortezomib combined with dexamethasone and lenalidomide has a broader antitumor activity, which plays a role by interfering with DNA synthesis and inhibiting the proliferation of tumor cells, and it has a certain killing effect on the bortezomib-resistant cells, which demonstrates a better therapeutic effect [8].

The present study found that after treatment, CD3+ and CD4+ of the observation group were higher than that of the control group, and CD8+ was lower than that of the control group. Bortezomib is a protease inhibitor for the treatment of multiple myeloma, and its action mainly includes intervention in the protein degradation pathway and inhibition of tumor cell proliferation and survival. Dexamethasone is a synthetic corticosteroid drug that suppresses the inflammatory response and immune cell function in several ways. Lenalidomide is an immunomodulator, which affects immune system function and intervenes in the tumor microenvironment in multiple ways to achieve regulation of immune indicators [9]. Bortezomib combined with dexamethasone and lenalidomide can produce regulation of immune cell subpopulations, affect the activity of proteases, intervene in the cell cycle and apoptosis regulatory proteins, mediate the immune response to regulate the number and function of immune cells, inhibit the antigenic expression of macrophages and dendritic cells, inhibit the proliferation of the cells, prompt the activation of autophagy, enhance the activity of T-cells and their proliferation, and regulate macrophage activity that enhances the interaction between immune cells and immune response [10]. Therefore, bortezomib combined with dexamethasone and lenalidomide regulates immune cells CD3+, CD4+, and CD8+, regulates the function of the immune system, and enhances the immune surveillance and killing effect of the tumor microenvironment, and achieves good therapeutic effects [11].

The total treatment efficiency of the observation group was higher than that of the control group. Bortezomib is an effective treatment for multiple myeloma, inhibiting protease activity and promoting apoptosis of tumor cells. Dexamethasone is a synthetic corticosteroid drug with anti-inflammatory and immunosuppressive effects. Lenalidomide is an immunomodulator that has a synergistic effect of multiple mechanisms in combination therapy, showing significant efficacy. Bortezomib combined with dexamethasone has a synergistic effect, bortezomib inhibits protease activity causing cell cycle arrest and promoting apoptosis, while dexamethasone can inhibit the proliferation of myeloma cells at multiple levels and enhance the tumor cell killing effect of bortezomib, and the combination of the two can enhance each other to increase therapeutic effects [12]. The combination of lenalidomide with bortezomib and dexamethasone can improve immune regulation. Lenalidomide is an immunomodulator that regulates the immune system, increases the activity of natural killer cells, promotes the activation of T-cells and the release of cytokines, and strengthens the immune-killing effect on leukemia and multiple myeloma cells, so that the therapeutic effect will be more comprehensive and long-lasting [13].

There is no difference in the total incidence of adverse reactions between the two groups. Bortezomib combined with dexamethasone and lenalidomide is more individualized compared with other treatment options, and there are differences in patients' tolerance and response to the drugs, which are adjusted according to the patients' specific conditions to reduce the adverse reactions that occur in the course of the treatment and improve treatment safety. The interaction between bortezomib combined with dexamethasone and lenalidomide showed a high degree of safety, and the three drugs work together to form a synergistic effect [14]. Compared with other drug combinations, the resulting drug interactions are more manageable, resulting in a lower risk of adverse effects during treatment. In combination therapy, long-term application does not significantly increase the risk of toxicity to the patient's heart, kidneys, and other vital organs, making it a relatively safe long-term treatment option. Bortezomib combined with dexamethasone and lenalidomide in the treatment of multiple myeloma has higher safety relative to other treatment options embodied in individualized treatment,

drug interactions, and long-term treatment, and in clinical application, it still requires doctors to consider comprehensively according to the patient's specific situation to ensure the best effect of the treatment and minimize the incidence of adverse reactions [15].

5. Conclusion

In conclusion, bortezomib combined with dexamethasone and lenalidomide is effective in the treatment of multiple myeloma, it enhances the immune function and has a higher degree of safety, which is worth promoting.

Funding

Shandong Medical Association Clinical Research Specialization (YXH2022ZX03231)

Disclosure statement

The authors declare no conflict of interest.

References

[1] Mao P, Yang C, 2023, Efficacy and Safety Evaluation of Bortezomib Combined with Dexamethasone and Lenalidomide Chemotherapy in the Treatment of Multiple Myeloma. Journal of Practical Cancer, 2023(3): 502–506.

[2] Xu H, Wang M, Jiang X, et al., 2022, Efficacy and Safety of Bortezomib Combined with Lenalidomide and Dexamethasone in the Treatment of Newly Diagnosed Multiple Myeloma. Journal of Clinical Hematology, 35(1): 46–51.

[3] Lin HL, 2023, Efficacy of Lenalidomide Combined with Bortezomib and Dexamethasone in the Treatment of Multiple Myeloma and Its Effect on MMP-13 and NF-κBp65. Journal of Clinical Rational Drug Use, 16(27): 111–114.

[4] Vaxman I, Visram A, Kapoor P, et al., 2020, Outcomes of Multiple Myeloma Patients with Del 17p Undergoing Autologous Stem Cell Transplantation, 136(11): 21–22.

[5] Wang Y, 2021, Efficacy of Bortezomib, Dexamethasone and Lenalidomide in the Treatment of Multiple Myeloma. Contemporary Medicine, 19(20): 109–111.

[6] Wang G, 2021, Analysis of the Effective Value of Applying Lenalidomide Combined with Low-Dose Dexamethasone in the Treatment of Relapsed Refractory Multiple Myeloma. Northern Pharmacology, 2021(6): 125–126.

[7] Zhang Y, Zhou M, 2022, Clinical Efficacy of Bortezomib Combined with Lenalidomide and Dexamethasone (VRD) Regimen and Bortezomib Combined with Thalidomide and Dexamethasone (VTD) Regimen in the Treatment of Multiple Myeloma. Systems Medicine, 7(1): 102–105.

[8] Lazana I, Floro L, Christmas T, et al., 2022, Autologous Stem Cell Transplantation for Multiple Myeloma Patients with Chronic Kidney Disease: A Safe and Effective Option. Bone Marrow Transplantation, 2022(57): 959–965.

[9] Huang D, Zhu YY, Xiao Y, et al., 2022, Cost-Utility Analysis of Dexamethasone Combined with Bortezomib and Lenalidomide for the Treatment of Newly Diagnosed Multiple Myeloma. China Pharmacy, 33(16): 2001–2005.

[10] Zhou Q, Xu F, Wen J, et al., 2023, Evaluation of the Efficacy of Sequential Lenalidomide Continuous Therapy with Bortezomib-Based Initial Chemotherapy in Untransplanted Primary Multiple Myeloma. West Med, 35(9): 1304–1309.

[11] Kuypers J, Simmance N, Quach H, et al., 2022, Nutrition Support Use and Clinical Outcomes in Patients with Multiple Myeloma Undergoing Autologous Stem Cell Transplant. Supportive Care in Cancer, 30(11): 9341–9350.

[12] Tao J, Zhu XJ, Liu YB, 2022, Effect of Bortezomib-Containing PAD, PCD, VRD Regimen in the Treatment of Primary Multiple Myeloma and Its Impact on Cellular Immunity Indexes and Safety. Clinical Misdiagnosis and Mistreatment, 35(5): 35–38.

[13] Chen L, 2021, Efficacy of Lenalidomide Combined with Bortezomib in the Treatment of Multiple Myeloma and Its Effect on the Content of Immune-Related Cytokines. Medicine and Health Care, 29(4): 53–54.

[14] Cai Y, Ding L, Chen T, et al., 2023, Study on the Safety of Bortezomib Combined with Dexamethasone and Lenalidomide Chemotherapy in the Treatment of Multiple Myeloma. Systemic Medicine, 8(14): 44–47.

[15] Martino M, Pitino A, Tripepi G, et al., 2021, The Burden in Caregivers of Multiple Myeloma Patients Undergoing Outpatient Autologous Stem-Cell Transplantation Compared to Inpatient Transplantation. Clinical Lymphoma Myeloma and Leukemia, 21(4): e402–e409.